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Lukáš Lafférs
Matej Bel University

Bernhard Schmidpeter
RWI, Christian Doppler Lab, JKU Linz and IZA

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IZA – Institute of Labor Economics

Schaumburg-Lippe-Straße 5–9
53113 Bonn, Germany

Phone: +49-228-3894-0
Email: publications@iza.org

www.iza.org

ABSTRACT

Early Child Development and Parents' Labor Supply*

The impact of children's early development status on parental labor market outcomes is not well established in the empirical literature. We combine an instrumental variable approach to account for the endogeneity of the development status with a model of non-random labor force participation to identify its impact. A one unit increase in our poor child development index reduces long-term maternal weekly hours worked by 9 hours and weekly income by 215 Australian Dollars. We provide evidence that mothers substitute working time with childcare to compensate for early disadvantages. We do not find any responds of fathers to early child development.

JEL Classification: C21, I23, J13, J31, J64

Keywords: child development, maternal labor supply, sample selection, instrumental variables estimation, time use

Corresponding author:
Bernhard Schmidpeter
RWI - Leibniz Institute for Economic Research
Hohenzollerstr. 1-3
45128 Essen
Germany

E-mail: bernhard.schmidpeter@rwi-essen.de

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1 Introduction

Over the past years the number of children with reported health and development problems has increased substantially (McNeil, 1993; Currie and Stabile, 2006, 2009). Almost 14 million children between 0 and 17 years in the US, or roughly 19% of all children, have special caring needs, such as learning disabilities, speech and behavioral problems, and development delay. In Europe, on average 17% of all children at age 15 assess their own health as fair or poor and 39% report to have multiple health complaints at least once per week.[1]

The presence of a child with health and development problems can impose huge burdens on parents. It can strain social relationships and increases the risk of marital dissolution (Reichman, Corman and Noonan, 2003). It can also put serious pressure on family finances by the necessity to pay for treatment and special care (Kuhlthau, Smith Hill, Yucel and Perrin, 2005). The impact of a child's health and development problems on parental labor supply is, however, ambiguous. On the one hand, if development problems lead to an increase of medical costs or additional care requirements parents might expand their labor supply in order to pay for the additional expenses. On the other hand, parents might reduce their hours worked to spend more time with their child and compensate for the early disadvantages. Which type of effect dominates is unclear and not straightforward to quantify. The response might also differ between fathers and mothers, and might also depend on the gender of the child.

In this work, we examine the labor market response of parents to the presence of a child with early development problems using the Longitudinal Study of Australian Children (LSAC), a rich survey data for Australia. We concentrate on the impact on hours worked, the intensive margin. This is a particular interesting policy parameter for at least two reasons.

First, it is very likely that a large share of parents adjust their working hours instead of entirely dropping out of the labor force as a consequence of having a child with early development problems. These adjustments on the intensive margin have important implications for policies concerning the pension and benefit system. If early development problems reduce parental hours worked this will not only lead to higher current government transfers but also to lower contributions toward pension and benefit systems in the future. This increases the likelihood of future dependencies and put pressure on public finance. Solely concentrating on the binary decision whether to participate in the labor market as the relevant margin does not capture these effects.

[1] The numbers for the US are taken from the 2016/17 Combined National Survey of Children's Health (http://www.childhealthdata.org/browse/survey/results?q=5423&r=1). The numbers for Europe are from Inchley, Currie, Young, Samdal, Torsheim, Augustson, Mathison, Aleman-Diaz, Molcho, Weber and Barnekow (2016).

Second, in most families the mother is the main caretaker. The presence of a child with development problems might force her to reduce working hours and increases the need to select jobs with higher work flexibility. Long and irregular hours worked are associated with climbing the career ladder faster, especially in high profile jobs (Bertrand, Goldin and Katz, 2010; Goldin, 2014; Azmat and Ferrer, 2017). As a consequence, affected mothers might have lower chances of being promoted, ultimately leading to persistence in gender gaps despite the steady increase in female labor force participation rates (Olivetti and Petrongolo, 2016; Blau and Kahn, 2017). Evidence on the intensive margin response of women to work disruptions is, however, scant (see, for example, Card and Hyslop, 2018).

To study the effect of children's early development on the intensive margin, we first construct an index of early child development. This index is based on the assessment of the child's kindergarten teacher within six categories of motor, language, and socio-emotional skills. Then, we exploit within an instrumental variable (IV) approach the effect of a child's handedness on early development; see also the work by Frijters, Johnston, Shah and Shields (2009) and Frijters, Johnston, Shah and Shields (2013). Here, we need to assume that the handedness of a child is not correlated with unobserved determinants of parental hours worked. In our empirical strategy we also account for the potential endogenous labor force participation decision of parents applying a novel approach (d'Haultfoeuille, 2010; Breunig, Mammen and Simoni, 2018)

Our results reveal interesting differences between mothers and fathers. For mothers, we find a negative and long-lasting effect of early development problems on usual hours worked. An increase in our poor development index by one unit decreases usual weekly hours worked by around one hour when the child attends kindergarten and decreases them further by almost 9 hours when the child is a teenager. Our long-run effects are quite sizable and economically important. They amount to a reduction in working hours of 30% relative to the selection-corrected mean and a drop in total weekly income of 215 Australian Dollars (A$).[2] We do not find any indication that paternal labor supply is affected by the child's development status, implying a limited influence of family circumstances on fathers.

We show that not correcting for selective participation would lead to different conclusions for mothers. Assuming that parents make their decision to participate in the labor force at random, we do not find any significant long-run effects. Our uncorrected results for fathers are very similar to those obtained accounting for endogenous labor force participation.

[2]One Australian Dollar is worth roughly 0.68 US-Dollar or 0.60 Euros. Applying these conversion rate the drop in total weekly income is around 146 US-Dollars or 130 Euros.

Using the LSAC time use data, we show that mothers substitute working time with childcare to compensate for the early disadvantages. A one unit increase of our poor development index is associated with an increase of 30 minutes in educational time per day. Our results do not point toward this behavior for fathers. Taken together, the evidence presented here shows that mainly mothers face a trade-off between child development and own labor market career.

A large part of the existing research concentrates on the effect of parental labor market outcomes on children's development (Baum, 2003; Ruhm, 2004; Bernal, 2008; Hsin and Felfe, 2014; Carneiro, Loken and Salvanes, 2015; Agostinelli and Sorrenti, 2018; Fort, Ichino and Zanella, 2018). These papers find in general a positive impact of family income on cognitive skills but mixed results in terms of maternal labor supply and hours worked. There exist also some works which provide evidence on children's health and development problems on parental labor supply decision on the extensive margin (Salkever, 1982; Wolfe and Hill, 1995; Powers, 2001; Corman, Noonan and Reichman, 2005; Frijters et al., 2009). The general finding of these studies is that poor child health has a negative impact on maternal employment and can substantially reduce their labor force participation.

In contrast, very little is known about the effects of early child development and health on the intensive margin. Powers (2003) finds that a child with severe disabilities reduces maternal desired usual weekly working hours by 3.7 hours. The reduced form results in Wasi, van den Berg and Buchmueller (2012) imply that a child with self-care limitations reduces maternal hours worked between 1.9% and 2.8%, depending on the marital status of the mother. A limitations of these studies is that they do not take the potential endogeneity of the child's health status into account. In addition, the issue of potential endogenous labor force participation decision is not considered when estimating the impact on the intensive margin. This is possibly the case as it is difficult to identify exogenous variation in both children's health and parental labor force participation.

In our work, we complement and extend the existing literature on this topic in important ways. We provide estimates on the intensive margin effects allowing for both endogeneity of the child's early development status and non-random parental labor force participation. Thus, we can estimate the causal effects of early child development on the intensive labor supply margin of parents. Our estimates allow us to gauge if poor development leads to long-term reduction or to intertemporal substitution of working time. This is important for defining effective policies.

Our work also contributes to the large literature on parental responses to children's ability and development (see, for example, Royer, 2009; Currie and Almond, 2011; Aizer and Cunha, 2012; Almond and Mazumeder, 2013; Yi, Heckman, Zhang and Conti, 2015; Nicoletti and Tonei, 2017; Nicoletti, Salvanes and Tominey, 2018). Most of these studies estimate the direct impact of children's ability and health on parental investments. In our work, we link early child development to parental labor market response and time investments while accounting for non-selective labor force participation. We show that in particular mothers are likely to reduce their hours worked to compensate for early disadvantages. Thus, we provide evidence that early development does not only affect maternal investments but, as mothers adjust their labor supply, it can also have negative impacts on their future labor market careers.

The remainder of the paper is organized as follows: Section 2 describes our data and measure of early child development. Section 3 discusses our empirical model. Section 4 reports our estimation results for the intensive margin while Section 5 discusses the effect of child development on parental time use. Section 6 offers concluding remarks.

2 Data and Measure of Early Child Development

Our analysis is based on the Longitudinal Study of Australian Children (LSAC), a major study following the development of young people and their families.[3] Beginning in 2003, the study follows two cohorts of in total 10,000 children over time. The first cohort comprises of 5,000 children aged 0-1 years in 2003/04, the second cohort comprises of 5,000 children aged 4/5 years in 2003/04. The data is collected every two years. In our work, we concentrate on the older cohort as Frijters et al. (2009) and use the available Waves 1 to 5.

The LSAC offers multiple advantages over other existing data sets. Information on parents is collected by bi-annually face-to-face interviews with the main person in the household, usually the mother. These interviews are conducted by trained interviewers who also undertake direct observations and assessments. Therefore, the data collected on the parent and the study child can be regarded of high quality and reliability.

The data also contains information about a child's relative performance in different categories provided by the kindergarten teacher at age 4/5. We use this information to construct our measure of early child development, similar as in Frijters et al. (2009). In particular, we create a binary value which takes the value of one if the child is "less competent" or "much less competent" than others in a) expressive language b) receptive language, c) gross motor skills, d) fine motor skills, e) socio-emotional development, and f) approaches to learning and zero otherwise.[4] We then sum each of the obtained binary variables to obtain our final measure of the child's development status. This measure lies between 0 and 6, where a higher number indicates more severe development problems.

[3]See https://growingupinaustralia.gov.au/ for more details on the study, design, and questionnaires.
[4]An example of expressive and receptive language ability is communication skills and interpreting and understanding respectively. Gross motor skills include abilities such as throwing and catching a ball, fine motor skills include dexterity and drawing. Socio-emotional skills are assessed via co-operation with other children. Approaches to learning include items such as attention.

Our index has the advantage that compared to performance measures reported by the parents it is less likely to be biased and to suffer from measurement errors. Valid information is available for 64% of all children in the sample. The vast majority of missing information comes from missing teacher's survey completion. Frijters et al. (2009) show that a wide range of child, parental and household characteristics do not predict the completion rate.

From the data, we first exclude all observations where the main respondent in the household was not the biological mother. Then, we also exclude observations where the mother was less than 20 years or more than 45 years old at birth. Teenage child bearing might be driven by unobserved characteristics for which we are not able to account for in our work (e.g Kearney and Levine, 2012). At the upper threshold of 45, most women have completed their fertility. Only a few women below age 20 or above age 45 have children in our sample. The age restriction also ensures that in our analysis we concentrate on the labor supply of prime-age workers, a group of particular interest. In a last step, we exclude all observations who report a positive numbers of hours worked but no income and those observations with *usual* weekly working hours of above 60 hours. This threshold corresponds roughly to the top 1% percentile of the hours distribution and is almost twice as high as the official working week in Australia. We trim the upper part of the hours distribution to make sure that our results are not driven by unusually large outliers. We show in Appendix C.1 that our conclusions and results are not affected when imposing less strict sample selection criteria.[5]

The distribution of the development index is depicted in Figure 1. Sixty percent of the children in our sample do not have any development difficulties. Around 15% perform worse in one category than their peers. The share of children with more development difficulties is strongly decreasing thereafter and around 3% of all children perform worse in all six categories. Looking at the distribution of the development index by pooling boys and girls together conceals, however, substantial heterogeneity. Panel b. and c. depict the distribution by gender of the study child. As one can see, girls are substantially less likely to have any development problems; almost 70% of girls perform at least equally good as their peers compared to only 52% of the boys. They are also less likely to have severe problems. Around 4% of boys perform worse in all six categories, double the share than in our girls sample. Given this strong differences in early child development (see, also, Gilliam, 2005; Ready, LoGerfo, Burkam and Lee, 2005; Bertrand and Pan, 2013), the evidence that girls mature faster than boys (Lim, Han, Uhlhaas and Kaiser, 2015), and the limited variation in the development index for girls in comparison to boys, we

[5] In Wave 1, out of 3,152 mother-child pairs with valid development index, 15 main respondents are not the biological mother of the child, 136 mothers were younger than 20 or older than 45 at the birth of the child, and 131 mothers reported either usual weekly working hours above 60 hours or positive working hours but no income. We drop a similar number of observations in Wave 2 to 5.

estimate the impact of child development on parental labor supply separately by gender of the child.[6] The little variation in the girls sample also means that given limited data sample the effect of the handedness on the development index (the first stage of our IV estimator) is likely to be estimated less precisely for this sample. This, in turn, affects the precision and stability of our main object of interest - the effect of the development index on parental labor supply. For brevity, we therefore concentrate in the main part of the paper on boys and report the results for girls in the Appendix.

We also use information provided by the interviewer about the child's dominant hand which we will later use as an instrumental variable; see Section 3. This question was asked after the child had completed a series of writing and drawing exercises. In particular, the interviewer was asked if the child had used a) the right-hand, b) the left-hand or c) both hands to complete the tasks. We create a binary variable out of this information which takes the value of one if the child used either the left or both hands. For brevity, we will refer to children in this category as left handed while keeping in mind that it contains both left- and mixed-handed children. Around 17% of boys in our samples are either left- or mix handed; see Table 1.[7]

Table 1 also provides summary statistics of parental background characteristics by Wave, where all variables are measured at the first interview in Wave 1. On average, mothers are 35 years old during the first interview and the age distribution remains stable across waves. Once can see, however, that our sample becomes slightly more selected over time. Parents participating in later waves tend to be higher educated and less likely to be Non-Australian and Single. In terms of child's characteristics, our sample remains fairly balanced across waves, although parents of children with more development problems are slightly more likely to drop out of the survey.

In our analysis, we use information on parental income and their weekly labor supply. At each wave, parents are asked if they are employed full- or part-time and how many hours per week they usually work in their paid jobs. We use the information on hours worked to construct our variable of parental labor supply treating all parents with reported positive usual working hours as participating in the labor market.[8] In addition,

[6]Another explanation might be that gender bias in the evaluation of disruptive behavior leads to a systematically lower perception of early development of boys; see also Dee (2005, 2007). While we do not have information on the gender of the teacher, the vast majority of educators in Australia are female (Weldon, 2015).

[7]There exists ample discussion in the medical literature at what age children's observed handedness corresponds to their "true" handedness (see Scharoun and Bryden, 2014, for an overview). The LSAC also provides self-reported handedness at age 14/15 of the child which exhibits strong correlation with the measure at age 4. A disadvantage of the self-reported measure is that children selectively report their preferred hand with those children who have more early development problems also those who are less likely to provide an answer to the question. Nevertheless, using later handedness as instrument, the results are qualitatively similar to the ones presented here.

[8]This definition differs from other definitions of labor force participation, such as the one used in Frijters et al. (2009). They use an indicator if a mother works full-/part-time or is currently unemployed. As

parents are asked to report their gross weekly income from all income sources. This includes wages or salary but also income from other sources such as rental properties, business, dividends, and government transfers. We use this information to account for sample selection, as we will describe in more detail in the next Section.

3 Empirical Approach

In our empirical analysis we face two important challenges. First, it is likely that early child development is potentially endogenous to maternal labor supply. Recent work on this topic shows that an increase in maternal hours worked is associated with a decline in cognitive skills and an increase in behavioral difficulties (Agostinelli and Sorrenti, 2018; Fort et al., 2018). Ignoring the potential reverse causality will give biased results. We deal with this by employing an instrumental variable approach using the handedness of the child as an instrument for early development problems.

Second, we need to deal with the fact that the parental decision whether to participate in the labor market is likely not random and we can only observe a selected sample. This is especially true for mothers. The direction of the bias when ignoring sample selection is not clear a priori. On the one side, it is possible that mothers on a higher career trajectory are less inclined to give up their career and more likely to stay in the labor market. On the other side, it is also possible that women on a higher career trajectory are more willing to cut back on hours worked in order to compensate for the child's initial disadvantage. In the following, we discuss our estimation strategy in more detail.

3.1 Handedness as Instrumental Variable

Handedness as an instrumental variable for children's development status was used in Frijters et al. (2009) and Frijters et al. (2013).[9] We first provide descriptive evidence that left handed children have more development problems for all values of our development index. Then, we briefly review the arguments why handedness can be regarded as a good instrument in our setting. Detailed first stage regression results can be found in Appendix A.1.

There exists substantial evidence that left handed individuals are over-represented at the lower part of the cognitive ability distribution. For example, evidence presented in Perelle and Ehrman (2005) show that left handed individuals have roughly double the

we are interested in the adjustment on the intensive margin, we do not consider unemployed parents as observed in the labor market.

[9] Frijters et al. (2009) provide an extensive discussion about potential threats to identification. Denny and O'Sullivan (2007), and Ruebeck, Harrington and Moffitt (2007) investigate the direct effect of handedness on labor market performance. Goodman (2014) provides and excellent review of the literature and extensions to it.

likelihood of being categorized as intellectually handicapped as right-handed ones. There is also evidence that left handed children do worse in cognitive ability tests than right handed ones (McManus and Mascie-Taylor, 1983).

Figure 2 shows the cumulative distribution function of our development index by handedness status. In line with the previous findings in the literature, one can see that the distribution of our development index for left handed children first-order stochastically dominates the distribution for right handed ones. In other words, for all values of our development index a left handed child has always a higher probability of having more severe development problems.

Hand preferences seem to be related to differentiation of the left and right hemisphere, and hence to a differentiated brain structure and usage; see Goodman (2014) and references therein. This is likely to be caused by both genetic and environmental factors. From a genetic perspective, handedness of a child is likely related to the handedness of the parents. The rate of left handedness among children increases if one or both parents are also left handed and a child is also more likely to share handedness with the mother than with the father (Harkins and Michel, 1988; McManus and Bryden, 1991). This implies that our exclusion restriction would be violated if left handed mothers work systematically different hours than right handed ones. Recent work on this topic does, however, either find no or only a weak link between maternal left handedness and their labor market outcomes (Denny and O'Sullivan, 2007; Ruebeck et al., 2007) and some twin-studies suggest modest to negligible genetic effects on handedness (Ross, Jaffe, Collins, Page and Robinette, 1999; Su, Kuo, Lin and Chen, 2005). Frijters et al. (2009) provide indirect evidence that likely left handed mothers do not differ in their labor supply.[10]

A second strand of the literature attributes left handedness to environmental factors. In particular, stress during gestation or birth might lead to a differential brain structure and a shift of handedness. This hypothesis is supported by research which shows that left handedness is more prevalent among children with problems at birth (Williams, Buss and Eskenazi, 1992). Our exclusion restrictions would be violated in this case if stress at birth has a long-run effect on mothers' labor market outcomes. We therefore proxy for any stress experienced by including in our analysis indicators if the birth was a problem birth, premature, or if it was a multiple birth.[11]

In Appendix A.2, we provide additional placebo regression to investigate the validity of our instrument. As it turns out, we do not find evidence that our instrument is related to maternal propensity to work and the skill-requirements of their current or most recent

[10] Goodman (2014) shows that left handed individuals are less likely to be found in manager/professional occupations or those where higher cognitive skills are necessary. He does not provide separate estimates by gender. Ranking occupations by skills we do not find strong evidence that mothers of left handed children sort into different occupations than mothers of right handed ones.

[11] All results are robust to excluding these variables from the estimation.

occupation. Left-handed children also do not exhibit poorer long-term health as right-handed ones.

3.2 Endogenous Sample Selection

In order to highlight the complication sample selection imposes in our setting, consider the following simple example: the parent faces the choice to either participate in the labor market and earn potential income Y or stay at home and receive ω. Here, ω can be thought of as the parental reservation wage. It is likely that both Y and ω depend on a child's development status. For example, parents of a child with early development problems might have lower work flexibility, which lowers their income potential. They also might value parental time input in their child more, for example, due to concerns about future performances. Thus, both Y and ω are simultaneously affected by the development status.

Similar as in a classical two-sector Roy Model (Roy, 1951), we only observe parents working who earn a market wage above their reservation wage rate. Defining a binary selection indicator D we therefore have:

$$D = \begin{cases} 1 & \text{if } Y > \omega \\ 0 & \text{otherwise} \end{cases}$$

Notice that in our data we observe income $Y^* = D \cdot Y$ and hours worked $S^* = D \cdot S$, while all other covariates are always observed regardless of the participation decision.

Using the "classical"' approach to sample selection, for example Heckman (1974), would require an instrument H which affects ω but not Y. Finding such an instrument is, however, not an easy task. A wide range of possible instruments, such as spousal wage or labor demand shocks, also affect the health and development of a child. For example, parents of children with poor development might have lower potential earnings as additional caring requirements prevents them from taking up more demanding employment. At the same time, these parents might also value time with their child more which leads to a higher reservation wage. The problem arises as a wide range of instruments used to account for endogenous labor force participation, such as spousal wage or labor demand shocks, also affect the health and development of a child (Case, Lubotsky and Paxson, 2002; Agostinelli and Sorrenti, 2018; Page, Schaller and Simon, 2019). As both Y and ω depend on the early development status, this introduces dependence and the exclusion restriction is violated. Other ways of dealing with selection, such as assuming missingness-at-random (Little and Rubin, 2002) or restricting the functional form (Chamberlain, 1986) are also not attractive alternatives in our setting.[12]

[12] Millimet and Tchernis (2012) provides an discussion of estimators which do not require exclusion restrictions.

In this work, we follow a different approach. Parental selection into the labor market is driven by their potential income *given* the development status of their child and parental background characteristics. We therefore follow d'Haultfoeuille (2010) and Breunig et al. (2018) and assume that there exists a variable H which is independent of the parental reservation wage once we control for our covariates X, our early child development index C, and *potential* income Y. More formally, we assume

Assumption A1a.

$$\omega \perp\!\!\!\perp H | \{Y, C, X\}. \tag{A1a}$$

Similar assumptions have been used in the literature dealing with nonignorable non-response, such as Chen (2001), Tang, Little and Raghunathan (2003), Ramalho and Smith (2013), and Breunig, Kummer, Ohnemus and Viete (2016). Fricke, Frölich, Huber and Lechner (2015) also deal with endogeneity of the treatment and non-response at the same time. They use two different instrumental variables but do not make the assumption in which they would condition on potential parental income. As pointed out above, conditioning on potential income is the main source of identification in our approach, however.

Notice that Assumption A1a allows for situation where both Y and ω are correlated with early child development (and each other). Thus, we can account for situations where parents face lower potential income and, at the same time, have a higher reservation wage.

Assumption A1a requires access to an instrument which is independent of the parental reservation wage once we control for observable characteristics, child development and potential income Y. An obvious choice in our setting is handedness of a child H. The assumption would be violated if parents of left handed children have a fundamentally different reservation wage than parents of right handed ones. For example, this is the case if parents of left handed children are themselves more likely left handed with (known) lower labor market outcomes and fundamentally different reservation wages compared to right-handed parents. As discussed in the previous section, genetics seem to play only a minor role in explaining handedness and there exists at most only a weak link between handedness and labor market outcomes.

In our correction approach we assume that income is the main driver for selection and not the outcome variable – hours worked. This is different to the work by d'Haultfoeuille (2010), Breunig et al. (2016), and Breunig et al. (2018) who use the selection variable also as outcome. Therefore, we add in addition the following assumption:

Assumption A1b.

$$\omega \perp\!\!\!\perp S | \{Y, H, C, X\}. \tag{A1b}$$

Assumption A1b requires that the parental decision on if and how many hours to work is independent of the reservation wage, after we take into account the *potential* parental income, together with the development status of the child, handedness, and other covariates. It is important to note that, similar to Assumption A1a, we allow that both the decision to work and how much to work to be correlated with potential parental income. In fact, parental income is likely the main driving force behind parents labor supply decisions.

Assumption A1b also does not rule out that parents and in particular mothers might value non-monetary job attributes, such as work flexibility, as long as the labor supply decision is driven by their potential income. It is quite realistic to assume, however, that given the potential income one can obtain in a flexible vs a non-flexible work arrangement, a parent chooses the job which offers the highest utility (or does not supply any labor at all), similar as in the model of Flabbi and Moro (2012). This also implies that there exists a potential wage Y high enough such that the parent is willing to switch from a flexible job to a non-flexible one.

Assumption A1b would be violated if parents based their labor supply decision solely on idiosyncratic taste and not potential income. For example, Flabbi and Moro (2012) show that college educated women value flexible arrangements more than women without a college degree. It is also possible that parents of children with severe development problems have higher reservation wages and a fundamentally different propensity to supply labor than parents of children with less severe problems. The marital status of parents might be another important variable affecting the labor force participation decision. For example, married individuals might choose their labor supply according to the income of the partner and their bargaining position in the household (Mazzocco, Ruiz and Yamaguchi, 2013; Bertrand, Kamenica and Pan, 2015). In order for Assumption A1b to be valid, we need to make sure that our conditioning variables (Y, H, C, X) capture variation in the reservation wage sufficiently well. For this, we include a rich set of covariates, such as marital status, educational attainment of both father and mother, in addition to our child development index in our estimation.

We can combine Assumptions A1a and A1b into one single Assumption

Assumption 1.

$$\omega \perp\!\!\!\perp (H, S)|\{Y, C, X\}. \tag{A1}$$

Denote by $A = (Y, C, X')'$. Assumption 1 guarantees that $P\left(D = 1|S, H, A\right) \overset{\text{(A1b)}}{=} P\left(D = 1|H, A\right) \overset{\text{(A1a)}}{=} P\left(D = 1|A\right)$. In other words, hours worked and handedness do not contain any information on the selection mechanism once we control for potential income, child development, and all our other covariates.

Following the arguments of d'Haultfoeuille (2010) and Breunig et al. (2018), Assumption 1 leads to the following moment condition

$$E\left[\frac{D}{P(D=1|A)} - 1|H,C,X\right] = 0.$$

In addition to Assumption 1, we impose the following functional form on the selection probability:

Assumption 2. The conditional selection probability takes the form $P(D=1|A) = \Lambda(A'\Psi)$ where $\Lambda(\cdot)$ is the logistic function and Ψ is a parameter vector.

Assumption 2 imposes a parametric restriction on the selection probability and under Assumptions A1a and 2 we can obtain the selection probabilities by solving (see d'Haultfoeuille (2010) and Breunig et al. (2018))

$$E\left[\frac{D}{\Lambda(A'\Psi)} - 1|H,C,X\right] = 0. \tag{1}$$

We furthermore assume that equation (1) ensures the identification of the selection probability.[13]

Assumption 3. The parameter vector Ψ is identified through (1).

In practice, we use the empirical analog of Equation (1) noticing that $E\left[\frac{D}{\Lambda(A'\Psi)} - 1|H,C,X\right] = E\left[\frac{D}{\Lambda(A^{*\prime}\Psi)} - 1|H,C,X\right]$ whenever $D=1$, where $A^* = (Y^*, C, X')'$. We estimate the selection function $\Lambda(A'\Psi)$ via GMM.[14]

Once we have estimates for the individual selection probabilities $\widehat{P} \equiv \widehat{P}(D=1|A)$, we use them for weighting the observed hours worked in the data. Our new re-weighted observed hours worked, denoted as $\widetilde{S}$, are corrected for the selective labor force participation decision of parents

$$\widetilde{S} = S \cdot \frac{D}{\widehat{P}}.$$

In the following subsection, we provide a detailed explanation of this correction.

[13]For sufficient rank conditions that ensure (at least local) identification of Ψ we refer the reader to Theorem 2.7 of d'Haultfoeuille (2010)). If we had a continuous instrument, we could replace Assumption 2 with a completeness condition and if $P(D=1|A) > 0$ holds, we could estimate a fully non-parametric model as in Breunig et al. (2018).

[14]This is a highly non-linear estimation problem and convergence can be sometimes difficult. We use different starting values in our analysis to ensure that our estimator always converges to the same value. In addition, we find that normalizing the covariates to lie in the unit interval helps for convergence.

3.3 Outcome Model

To obtain the causal estimates of early development on the intensive margin, we combine our selection model with an instrumental variable approach. We wish to estimate a regression of the form

$$\begin{aligned} S &= \delta + \tau C + X'\Delta + \epsilon \\ &= \psi(C, X) + \epsilon, \end{aligned} \tag{2}$$

To identify $\psi(C, X)$, we use the fact that $\Lambda(A'\Psi)$ is identified. Using the instrument H and covariates X, consider the conditional expectation of model (2)

$$E[S|H, X] = E[\psi(C, X)|H, X], \tag{3}$$

where we have assumed that child's handedness H and control covariates X are exogenous, therefore $E[\epsilon|H, X] = 0$.

Under Assumptions 1-3 and applying the law of iterated expectations, the left hand side of Equation (3) becomes $E[\widetilde{S}|H, X]$ (similar reasoning was used in Breunig et al. (2018)):

$$\begin{aligned} E[S|H, X] &= E[E[S|Y, H, C, X]|H, X] \\ &\overset{(1)}{=} E\left[E[S|Y, H, C, X] \cdot E\left[\frac{D}{Pr(D = 1|Y, H, C, X)}|Y, H, C, X\right]|H, X\right] \\ &\overset{(A1a)}{=} E\left[E[S|Y, H, C, X] \cdot E\left[\frac{D}{Pr(D = 1|Y, C, X)}|Y, H, C, X\right]|H, X\right] \\ &\overset{(A1b)}{=} E\left[E\left[S \cdot \frac{D}{\widehat{P}}|Y, H, C, X\right]|H, X\right] \\ &= E\left[S \cdot \frac{D}{\widehat{P}}|H, X\right] = E[\widetilde{S}|H, X]. \end{aligned}$$

where the first line follows from the Law of Iterated Expectations and the second line uses Equation (1). The third and fourth line follow from Assumption A1a and Assumption A1b. The last line follows from the properties of conditional expectation.

This suggests that, under the assumption that H is a valid instrument for C, we can obtain consistent estimates of our parameters of interest by first replacing S with $\widetilde{S} = \frac{S^*}{\widehat{P}}$ in Equation (2) and then using a two-stage least squares regression on our weighted outcome.[15]

[15] We note that our outcome model with Assumption 1 is satisfied in the following triangular model

$$\begin{aligned} S &= \psi(C, X) + \epsilon \\ D &= \phi(Y, C, X, \eta) \\ \eta &\perp\!\!\!\perp (H, \epsilon)|C, X. \end{aligned}$$

In the first stage, we use the child development index C as dependent variable

$$C = \alpha + \beta H + X'\Gamma + u, \tag{4}$$

where H is the binary indicator whether the child is left handed and X is the set of our control variables measured in Wave 1 and described in Table 1. In the second stage, we use the predicted development index $\widehat{C}$ as well as the selection corrected parental hours worked $\widetilde{S}$ in our outcome model

$$\widetilde{S} = \delta + \tau\widehat{C} + X'\Delta + \epsilon. \tag{5}$$

Remember that $\widetilde{S} = S \cdot \frac{D}{\widehat{P}}$, where $\widehat{P}$ was the estimated probability of participating in the labor force. In Equation (5), the coefficient τ gives us then the true effect of early child development of parental labor supply on the intensive margin.

We estimate the models separately for mothers and fathers for each wave. To obtain more stable estimates and to improve the finite sample performance of our estimator, we normalize the weights in the second stage as recommended in Breunig et al. (2018). Inference is based on the Wild bootstrap using 2,000 simulations.[16]

We want to emphasize that although we use the same instrument H to account for both sample selection and the endogeneity of child development our effect of interest is identified. This is because we use two different independence assumptions. To identify the selection probability P, we require our instrument to be independent of the reservation wage ω conditional on our covariates, potential income, and early child development (Assumption A1a). Identification of our outcome model requires that our instrument is independent of potential hours worked S given our covariates (condition $E[\epsilon|H, X] = 0$ in the outcome model). As previously discussed, using handedness as an instrument is likely to fulfill both exclusion restrictions.

4 Results

In this section, we first provide evidence that parental participation decision is driven by their income. We then present the main results of our paper.

The independence condition $\eta \perp\!\!\!\perp (H, \epsilon)|\{C, X\}$ implies $\omega \perp\!\!\!\perp (H, S)|\{Y, C, X\}$ (Assumption 1) and can be decomposed into

- $\eta \perp\!\!\!\perp H|\{C, X\}$ that implies $\omega \perp\!\!\!\perp H|\{Y, C, X\}$ (Assumption A1a) and
- $\eta \perp\!\!\!\perp \epsilon|\{C, X, H\}$ implies $\omega \perp\!\!\!\perp S|\{Y, C, X, H\}$ (Assumption A1b).

[16] Instead of the continuous age variable, we use a piece-wise constant function for age with knots at 30, 35, 40, and 45 in our estimation. We do this in order to capture possible non-linearities in labor supply in a flexible way.

4.1 Potential Income and Labor Force Participation

Key for identification is that parental labor supply is mainly driven by potential income Y. We provide evidence for this assumption graphically by plotting our estimates of the selection probability $\widehat{P}$ against the observed income for individuals with $D = 1$.[17] The results are show in Figure 3. The first row presents the results for mothers and the second row depicts the selection pattern for fathers.

Two features are apparent from the figure. First, there is a clear positive association between potential income and labor force participation for mothers. The positive association becomes stronger as the child grows older. This gives strong support for our hypothesis that maternal selection into the labor market is indeed driven by potential income. It also implies that not correcting for selection would likely underestimate the impact of child development on maternal hours worked in the long run.

Second, the selection patterns for fathers are noisier than those estimated for mothers. One reason might be as in most families the father is perceived as the main bread winner who supplies labor inelastic.[18] Despite the weaker evidence, one can see that paternal selection into labor force participation is still driven by potential income.

4.2 Effect on Parental Labor Supply

Tables 2 summarizes our estimation results for the impact of child development on parental labor supply. Columns (1) to (5) show the results for mothers where each column corresponds to estimates at different ages of the study child. In Columns (6) to (10) we present the same set of estimation results for fathers.

Our results for mothers reveal a persistent reduction in working hours as response to early development problems. A one unit increase in our development index reduces weekly working hours by an insignificant one hour when the study child is in kindergarten but decreases them significantly by almost 5 hours when it reaches school starting age. Afterward, we estimate stronger and highly significant effects with the largest reduction occurring when the child turns 12/13. At this point, a one unit increase in our development index reduces maternal weekly working hours by almost 9 hours per week.[19]

The estimates are quite substantial in magnitude and constitute a decrease of up to 30% of weekly working hours when compared to the selection adjusted mean of $\widetilde{S}$.[20]

[17] Under certain conditions, this assumption could be tested; see d'Haultfoeuille (2010) and Breunig et al. (2018). This is, however, not straightforward in our setting as we have a binary instrument and a continuous outcome. In addition, power of these tests can be very poor in practice.

[18] This thesis is indirectly supported by recent work of Murray-Close and Heggeness (2018). They show that survey respondents under-report wives' earnings and over-report husband's earnings in households where the wive out-earns the husband.

[19] We obtain very similar results when using the Strength and Difficulty Questionnaire (SDQ) composite as an alternative measure for early child development.

[20] In Appendix C.3 we show that results are qualitatively similar when concentrating on a balanced sample.

They are also economically significant. Given an average hourly wage of around A$ 37 for females, this implies a reduction of A$ 327 per week in gross potential wages in the long run.[21] This drop in wages might be partially cushioned by an increase in government transfers toward the family.[22] Using self-reported income from all sources including transfers in our data, we obtain a slightly lower but still substantial fall in weekly income by A$ 215.[23]

The estimation results for fathers, reported in Columns (6) to (10) in Table 2, differ substantially from those obtained for mothers. Our results show that also fathers tend to decrease their weekly hours worked as a reaction to the child's development difficulties. Unlike our results for mothers, however, the estimates do not show any clear pattern and are rather small and not significant on any conventional level.

Taken together our results have important implications. Mothers adjust their labor supply stronger as a consequence of the disruptive effects than fathers. The adjustments are also very persistent with no sign of reversal over a child's early life cycle. These developments have therefore likely negative effects on future career progression of mothers and the potential of widening gender pay gaps.

One explanation for our findings is that mothers are increasingly concerned about the academic achievement of their sons. As they progress through school, performance becomes more important in order to obtain a final qualification. For example, at the end of secondary school, students sit a final exam and receive an official certificate of qualification which allows them to access tertiary education or vocational education and training. Trying to compensate for the early disadvantages, mothers might therefore substitute working time with caring for the child. We discuss this explanation further in Section 5.

4.3 Importance of Sample Selection

In this section, we briefly discuss the importance of accounting for endogenous sample selection. We now estimate Equation (5) by concentrating only on parents who are actually observed in the labor market, without correcting for sample selection. The results assuming random participation decisions are reported in Table 3.

[21] Average hourly wages for females was taken from the 2018 Gender Indicator Statistics, available under https://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/4125.0~Sep%202018~Feature%20Article~Understanding%20Measures%20of%20the%20Gender%20Pay%20Gap%20(Feature%20Article)~10001.

[22] Child tax benefits in Australia depend heavily on family income. For example, the Family Tax Benefit Part A is income tested and payments are reduced by 20 cents for each dollar of income between A$ 54,677 and A$ 98,988, and by 30 cents for each additional dollar of income thereafter. Exact payments depend on various factors such as number and age of children.

[23] For brevity, we do not report detailed estimates for total income as outcome as our short run estimates are very noisy. In general, we find that the reduction in hours is accompanied by a reduction in total maternal income. Detailed estimates are available upon request.

Looking at the results for mothers reported in Columns (1) to (5) in the table, one can see that not correcting for selective labor supply can both over and underestimate the impact of early child development. The direction of the bias depends strongly on the age of the child. At age 4/5 (Wave 1) our uncorrected estimates would overestimate the intensive margin adjustment by around one hour per week. In contrast, at age 12/13 (Wave 5), we would underestimate the impact on weekly hours worked by more than 7 hours. The difference in the long run estimates are quite substantial and would lead to the wrong conclusion that the impact of early development on mothers fades out over time.

Turning to our results for fathers, reported in Columns (6) to (10) in Table 3, we do not observe large differences between our corrected and uncorrected estimates. This is not entirely surprising, as fathers in our sample tend to have in general a very high labor force participation rate. In general, our results show that the labor market careers of fathers tend to be less responsive to family circumstances and mothers bear the main consequences of children's early development problems.

The results from 2SLS estimates for the extensive margin, reported in Appendix B support the findings presented here and also highlight the necessity to account for endogenous sample selection. Especially mothers strongly adjust their participation decision to early child development. The adjustment process follows a hump-shaped pattern with stronger reaction to the child's development status early and later during the child's life cycle. In contrast, the participation decision of fathers is less strongly affected by early development problems.

5 Child Development and Time Investment

In the previous section, we have shown that early child development problems can have substantial effects on parental labor supply. We conjectured that this might be driven by increasing concerns about the performance of the child and the effort to compensate for the early disadvantages. In this section, we investigate this hypothesis and evaluate if parents substitute time at work with time spent with the child. To do so we make use of the time use records (TUD) provided in the LSAC.

During the first three waves of the LSAC, the TUD contains information about the study child's activities over 24 hours separated into 15 minutes slots and the person who was present (mother, father, grandparents/ other adult), as reported by the main person in the household. In total, the TUD distinguishes between 26 activities, 5 locations where the activity took place, and 7 possibilities with whom the activity was conducted. We follow Fiorini and Keane (2014) and categorize the 26 activities into four broader categories: general care, educational activities, media activities, and social activities.[24] In addition, following their restrictions, we also regard slots between 10pm and 6am as bed time regardless of the reported activity.

Activities such as eating, traveling, dressing, soothing or correcting/reprimanding are considered general care. Reading or singing to the child, playing educational games or teaching are considered educational activities. Social activities include visiting people or organized events. Watching TV, listening to the radio, and use of the computer are considered as media activities. As the slots are recorded in 15 minutes intervals, we assume in our analysis that the activity lasted the full 15 minutes. For each of our four categories, we record the amount of time a child spent doing the respective activity with either the mother or the father. Unlike in Fiorini and Keane (2014), we do not consider activities as mutually exclusive. For example, if the parent spent time eating with the child while at the same time watching TV we consider these activities as both media and general time.

To obtain the impact of child development on time use, we first estimate the selection weights using the empirical analog of Equation (1). In a second step, we use these weights in a 2SLS regression, similar as in Equation (5). This time, however, we disregard parents who are not observed in the labor market. This enables us to provide (suggestive) evidence on the substitution between hours worked and time investment into children. Table 4 report the effect of child development on parental time investment.

Looking first at the results for mothers reported in Columns (1) to (3) in Table 4, we see that early development problems increase uniformly maternal general time spent with the child. The estimates are largely insignificant at younger ages of the child but we find a significant impact at age 9/10. We also find (marginally) significant evidence that mothers increase their daily educational time with the child by almost 30 minutes per day at this age. These findings support our conjecture that mothers are increasingly concerned with the performance of the child and try to compensate for early disadvantages. Interestingly, we also find a strong reaction of media time use as a response to early development problems. Taken together, our findings imply that there is indeed a substitution effect between maternal time investment and the reduction in labor supply. It seems that only part of this extra time is, however, used to compensate directly for the early disadvantages.

In contrast to mothers we do not find strong evidence that fathers adjust their time investment as a response to early development problems. This can be seen from Columns (4) to (6) in Table 4. Our estimates are small and mostly imprecisely estimated. Given that we did not find evidence that fathers adjust their labor supply as a response to child development this is not very surprising. Our analysis provides evidence that mothers are

[24] Fiorini and Keane (2014) actually use 7 categories in their analysis: educational activities, general care, social activities, media activities, school/ day care, unknown/not sure what child was doing, and bed time. Our main focus in this work lies on the first four categories.

the main person in the household who trade in their own career and provide extra care to their children.

6 Conclusion

In this paper, we estimate the impact of early child development on parental labor market outcomes. We concentrate on weekly hours worked, the intensive margin, a particularly interesting policy parameter. To address the issue of endogeneity in both early child development and the parental labor force participation decision, we combine an instrumental variable approach which uses the exogenous variation in development associated with a child's handedness with a model of endogenous sample selection.

Our results reveal interesting impacts of boys' early development on the labor supply of mothers and fathers. We find a long-term reduction in maternal usual hours worked by almost 9 hours as a response to a boy's early development problems. Even when accounting for any other type of transfers, this reduction in working hours is associated with a fall in weekly total income of A$215. This drop is quite substantial and economically meaningful.

In contrast to mothers, we do not find any evidence that fathers react to a child's poor early development. Our estimates are mostly small and imprecisely estimated for this group. We show that the likely reason for this is that fathers have an inelastic labor supply.

We provide suggestive evidence that a boys' early development problems lead mothers to substitute their working time with home production. Using information from time use diaries, we find that mothers increase time spent with the child, but only a small fraction of this extra time is devoted to tackling the early disadvantages. We do not find similar effects for fathers. Our results indicate that mothers reduce their time at work in order to compensate for early development disadvantages and that these additional requirements conflict with working schedules.

Our results give clear indications that family circumstances can have adverse and long lasting negative effects on the labor market outcome of women. As mothers play a crucial role in providing additional time and care for their children they trade their own career for the well-being of their children. Our results also indirectly provide support for policy interventions which increase the quality of child care and school support.

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Tables

Table 1: Summary Statistics by Wave

	Wave 1 4/5 years	Wave 2 6/7 years	Wave 3 8/9 years	Wave 4 10/11 years	Wave 5 12/13 years
Maternal Characteristics					
Age at First Interview (Years)	34.83	34.90	34.96	35.05	35.01
	(4.62)	(4.58)	(4.56)	(4.50)	(4.51)
Non-Australian (%)	22.48	21.64	21.83	20.05	20.50
	(41.76)	(41.19)	(41.33)	(40.05)	(40.39)
Single (%)	12.21	11.09	10.67	9.65	9.95
	(32.75)	(31.41)	(30.89)	(29.54)	(29.94)
No. of Children	2.47	2.46	2.45	2.47	2.44
	(1.00)	(0.99)	(0.96)	(0.96)	(0.95)
High Education (%)	64.62	64.54	65.73	65.26	65.74
	(47.83)	(47.86)	(47.48)	(47.63)	(47.48)
Medium Education (%)	16.55	17.08	16.45	17.24	16.78
	(37.18)	(37.65)	(37.09)	(37.79)	(37.39)
Low Education (%)	18.83	18.38	17.82	17.49	17.47
	(39.11)	(38.74)	(38.28)	(38.01)	(37.99)
Paternal Characteristics					
Age at First Interview (Years)	37.60	37.05	36.02	35.84	35.85
	(5.83)	(7.27)	(9.57)	(9.96)	(10.00)
Non-Australian (%)	21.38	21.34	20.71	19.97	20.24
	(41.01)	(40.98)	(40.54)	(39.99)	(40.20)
High Education (%)	64.07	65.00	65.57	66.67	66.35
	(48.00)	(47.72)	(47.53)	(47.16)	(47.27)
Medium Education (%)	9.45	9.64	9.87	9.65	9.43
	(29.26)	(29.53)	(29.84)	(29.54)	(29.24)
Low Education (%)	26.48	25.36	24.56	23.68	24.22
	(44.14)	(43.52)	(43.06)	(42.53)	(42.86)
Child's Characteristics					
Attend Pre-School (%)	61.10	62.03	61.80	62.46	62.80
	(48.77)	(48.55)	(48.61)	(48.44)	(48.35)
Attend Pre-Year (%)	14.48	14.43	13.80	13.53	13.84
	(35.20)	(35.15)	(34.51)	(34.22)	(34.55)
Other Pre-Form (%)	24.41	23.54	24.40	24.01	23.36
	(42.97)	(42.44)	(42.97)	(42.73)	(42.33)
Premature Birth (%)	11.31	11.24	11.32	11.30	10.73
	(31.68)	(31.59)	(31.69)	(31.68)	(30.96)
Problem Birth (%)	15.03	14.96	14.85	15.18	14.97
	(35.75)	(35.68)	(35.57)	(35.90)	(35.69)
Young Cohort (%)	83.03	82.99	82.99	83.50	83.65
	(37.55)	(37.58)	(37.59)	(37.13)	(37.00)
Left Handed (%)	17.17	17.24	17.58	17.16	17.04
	(37.73)	(37.78)	(38.08)	(37.72)	(37.62)
Development Index	1.32	1.31	1.29	1.23	1.24
	(1.78)	(1.79)	(1.77)	(1.72)	(1.72)
Observations	1,450	1,317	1,246	1,212	1,156

The figures provided are means of variables with standard deviations in parentheses, as measured in Wave 1 of the LSAC. The development index is the sum of six binary variables with value of one if the study child is (much) less competent than other children as evaluated by the kindergarten teacher (see Section 2).

Table 2: Effect of Child Development on Parents' Hours Worked under Endogenouos Sample Selection

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Mothers					Fathers				
	Wave 1 4/5 years	Wave 2 6/7 years	Wave 3 8/9 years	Wave 4 10/11 years	Wave 5 12/13 years	Wave 1 4/5 years	Wave 2 6/7 years	Wave 3 8/9 years	Wave 4 10/11 years	Wave 5 12/13 years
Child Development	-1.14	-4.54^{*}	-6.43^{***}	-4.80^{**}	-8.84^{***}	1.05	-3.22	-0.66	-3.02	-2.71
	(3.06)	(2.41)	(2.29)	(2.41)	(3.01)	(1.69)	(2.13)	(1.98)	(2.69)	(2.65)
Mean of Dependent Variable $\widetilde{S}$	19.83	23.79	25.61	27.23	29.28	47.09	47.26	46.84	45.40	45.73
First-Stage F-Statistic	19.90	19.38	20.15	19.90	15.06	17.15	16.69	17.28	17.85	11.81
Correcting for Sample Selection	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Maternal Controls Included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Paternal Controls Included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Children Controls Included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,450	1,317	1,246	1,212	1,156	1,273	1,171	1,113	1,095	1,041

The sample of mothers consists of all biological mothers in the LSAC who were at the first interview between 25 and 45 years old, and the study child is a boy. Observations with reported usual maternal working hours above 60 hours per week are not considered in the analysis. For the father sample, in addition to the selection criteria applied to mothers, it is required that a spouse was present. The development index is the sum of six binary variables with value of one if the study child is (much) less competent than other children as evaluated by the kindergarten teacher (see Section 2). The econometric approach corrects for possible endogenous sample selection as described in Section 3. The Mean of the Dependent Variable $\widetilde{S}$ is the selection corrected mean of weekly hours worked. The First-Stage F-Statistic refers to the partial F-Statistic using child handedness as an instrument for development.

*,**,*** indicate a significance effect at a 10%, 5% and 1% level. Standard Errors are reported in parentheses and are based on the Wild bootstrap with 2,000 replications.

Table 3: Effect of Development on Parents' Hours Worked without Correction for Selection

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Mothers					Fathers				
	Wave 1 4/5 years	Wave 2 6/7 years	Wave 3 8/9 years	Wave 4 10/11 years	Wave 5 12/13 years	Wave 1 4/5 years	Wave 2 6/7 years	Wave 3 8/9 years	Wave 4 10/11 years	Wave 5 12/13 years
Child Development	−2.10	−4.80*	−5.78**	−3.58*	−1.80	−0.22	−1.29	0.13	−1.46	−2.40
	(2.37)	(2.58)	(2.34)	(1.88)	(2.28)	(1.58)	(1.44)	(1.35)	(1.29)	(1.64)
Mean of Dependent Variable S	23.10	24.13	25.60	27.24	29.49	47.19	47.15	47.00	45.23	45.38
First-Stage F-Statistic	10.46	10.99	13.61	15.92	8.47	9.14	11.09	12.39	14.10	11.36
Correcting for Sample Selection	No	No	No	No	No	No	No	No	Yes	No
Maternal Controls Included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Paternal Controls Included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Children Controls Included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	873	916	1,012	992	973	777	789	850	825	774

The sample of mothers consists of all biological mothers in the LSAC who were at the first interview between 25 and 45 years old, have usual positive weekly working hours, and the study child is a boy. Observations with reported usual maternal working hours above 60 hours per week are not considered in the analysis. For the father sample, in addition to the selection criteria applied to mothers, it is required that a spouse with usual positive weekly working hours was present. The development index is the sum of six binary variables with value of one if the study child is (much) less competent than other children as evaluated by the kindergarten teacher (see Section 2). The Mean of Dependent Variable S is the mean of the actual observed weekly hours worked of parents participating in the labor force. The First-Stage F-Statistic refers to the partial F-Statistic using child handedness as an instrument for development.

*,**,*** indicate a significance effect at a 10%, 5% and 1% level. Standard Errors are reported in parentheses and are based on the Wild boostrap with 2,000 replications.

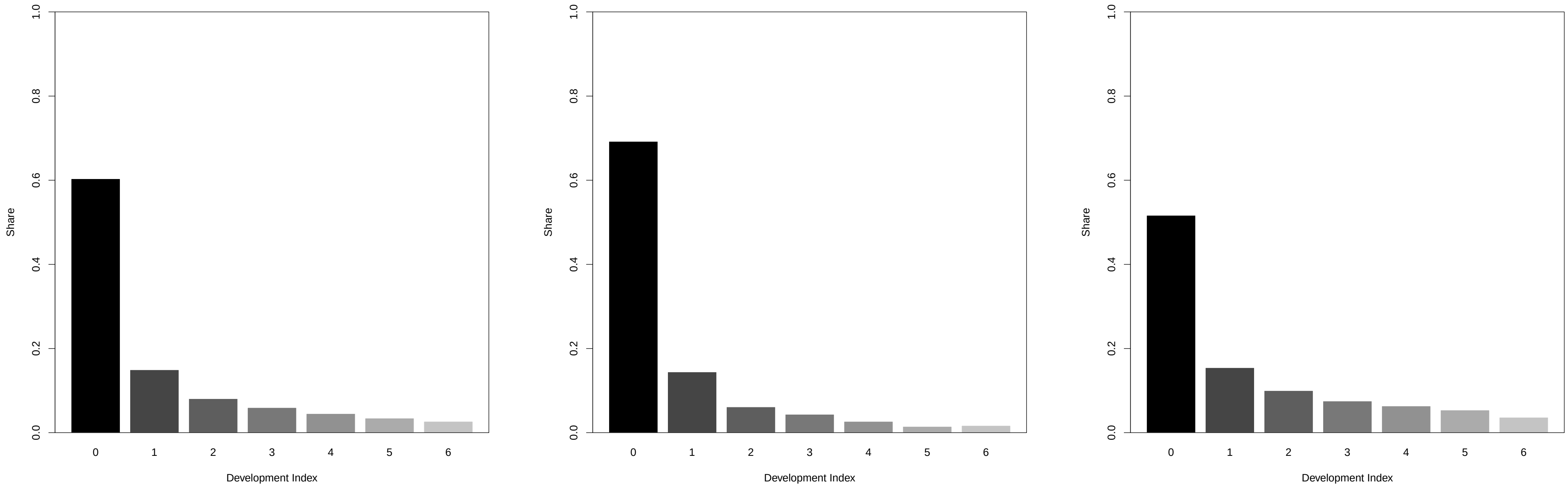
Table 4: Effect of Development on Parental Time Investment

	(1)	(2)	(3)	(4)	(5)	(6)
	Mothers			Fathers		
	Wave 1 4/5 years	Wave 2 6/7 years	Wave 3 8/9 years	Wave 1 4/5 years	Wave 2 6/7 years	Wave 3 8/9 years
General Time	3.21	0.89	1.44**	0.39	0.11	−0.09
	(1.97)	(0.82)	(0.63)	(0.32)	(0.21)	(0.23)
Educational Time	0.71	0.19	0.43*	0.09	0.06	0.11
	(0.58)	(1.27)	(0.24)	(0.15)	(0.09)	(0.11)
Social Time	1.35	0.68	0.46	−0.02	0.10	−0.16
	(1.06)	(0.77)	(0.58)	(0.26)	(0.28)	(0.26)
Media Time	2.22	−0.36	1.12**	0.00	−0.07	−0.07
	(1.26)	(0.46)	(0.56)	(0.17)	(0.15)	(0.18)
First-Stage F-Statistic	9.73	16.22	16.81	9.50	14.00	12.49
Maternal Controls Included	Yes	Yes	Yes	Yes	Yes	Yes
Paternal Controls Included	Yes	Yes	Yes	Yes	Yes	Yes
Children Controls Included	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,260	1,184	1,011	1,137	1,086	912

The sample of mothers consists of all biological mothers in the LSAC who were at the first interview between 25 and 45 years old, valid time use data is reported, and the mother has positive usual working hours. For the father sample, in addition to the selection criteria applied to mothers, it is required that a spouse with valid time use data and usual positive weekly working hours was present. The dependent variables is the daily time spent with the child in hours. The development index is the sum of six binary variables with value of one if the study child is (much) less competent than other children as evaluated by the kindergarten teacher (see Section 2). The estimates are weighted by sample selection weights, see Section 3 for a description. The First-Stage F-Statistic refers to the partial F-Statistic using child handedness as an instrument for development.
*,**,*** indicate a significance effect at a 10%, 5% and 1% level. Standard Errors are reported in parentheses and are based on the Wild boostrap with 2,000 replications.

Figures

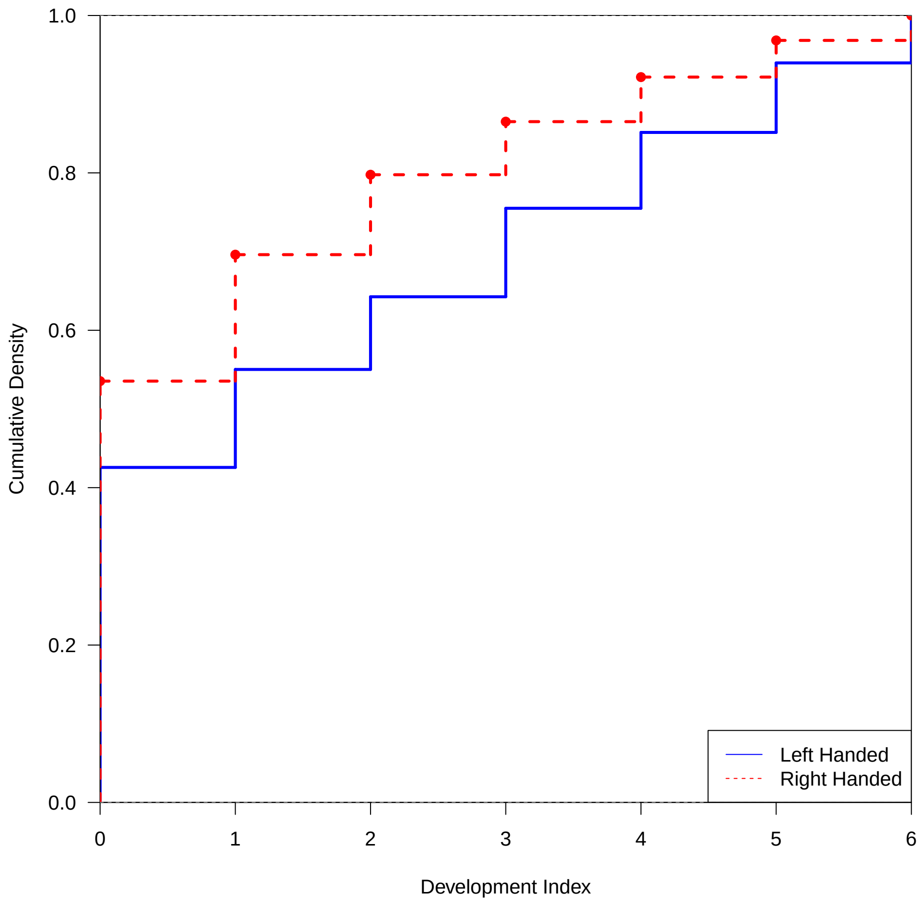
Figure 1: Distribution of the Development Index



a. Total Sample b. Girls-Only Sample c. Boys-Only Sample

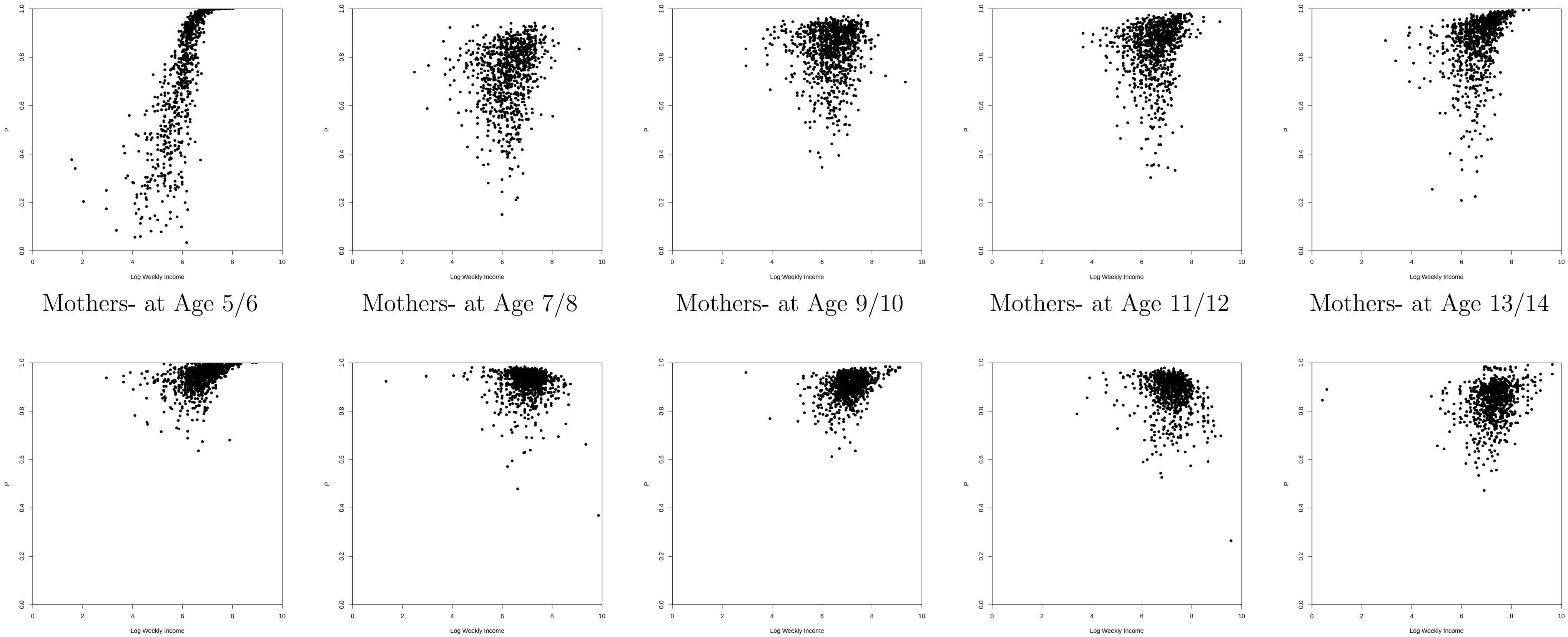
The figure depicts the distribution of the development index in the samples. The development index is the sum of six binary variables with value of one if the study child is (much) less competent than other children as evaluated by the kindergarten teacher in the categories expressive language, receptive language, gross motor skills, fine motor skills, socio-emotional development, and approaches to learning. Higher values indicate more severe development difficulties (see Section 2).

Figure 2: Distribution of the Development Index by Handedness



The figure depicts the cumulative distribution of the development index in the samples by handedness of the study child. Handedness of the child is determined by the interviewer after an extensive series of drawing and writing exercises. The development index is the sum of six binary variables with value of one if the study child is (much) less competent than other children as evaluated by the kindergarten teacher in the categories expressive language, receptive language, gross motor skills, fine motor skills, socio-emotional development, and approaches to learning.. Higher values indicate more severe development difficulties (see Section 2).

Figure 3: Selection into Labor Force Participation



Mothers- at Age 5/6 | Mothers- at Age 7/8 | Mothers- at Age 9/10 | Mothers- at Age 11/12 | Mothers- at Age 13/14

Fathers- at Age 5/6 | Fathers- at Age 7/8 | Fathers- at Age 9/10 | Fathers- at Age 11/12 | Fathers- at Age 13/14

The figure plots the estimated probability of participating in the labor force $\widehat{P}$ against the observed log weekly income for mothers and fathers during Wave 1 to 5. Each dot represents the predicted participation probability for individuals with $D = 1$ which was estimated as described in Section 3.

Online Appendix for "Early Child Development and Parents' Labor Supply"

LUKÁŠ LAFFÉRS AND BERNHARD SCHMIDPETER

July 15, 2020

This online appendix provides additional information and results not discussed in the text. In Appendix A, we provide detailed first-stage results from our instrumental variable regression and additional support for the validity of our instrument. We provide extensive margin results in Appendix B. In Appendix C, we provide additional robustness checks. The structure of this section is as follows: First, we show that our conclusions made in the main part of the paper remain valid even when applying less restrictive sample selection. Second, we show that our results are virtually identical when using a probit instead of a logit selection function. Third, we report results using a balanced sample. Finally, in Appendix D we present and discuss the estimation results for girls.

A First-Stage Results and Instrument Validity

In this section, we provide detailed results from the first stage regressions. We also provide further evidence on the validity of our instruments running a set of placebo regressions.

A.1 First-Stage Results

Here, we summarized detailed first stage estimates for our IV approach described in Section 3. Tables A.1-A.2 show the results separately for mothers and fathers . Handedness has in both samples a very strong and highly significant impact on early child development for all waves. We also find that early development difficulties are significantly related to mothers' education and age as well as problems at birth. Paternal characteristics seem to be less important in explaining early development difficulties. Most estimates are insignificant and rather small for this set of covariates.

A.2 Instrument Validity

We investigate the validity of handedness as an instrument using placebo regressions. Handedness of the child may be related to labor market outcomes of the mothers through

Table A.1: First Stage Regression Results Mothers - Boy Sample

	Wave 1 4/5 years	Wave 2 6/7 years	Wave 3 8/9 years	Wave 4 10/11 years	Wave 5 12/13 years
Instrument					
Handedness	0.599***	0.631***	0.657***	0.650***	0.577***
	(0.134)	(0.143)	(0.146)	(0.146)	(0.149)
Maternal Characteristics					
$\text{Age}_{x<30}$	−0.198	−0.299	−0.354	−0.534**	−0.613***
	(0.203)	(0.215)	(0.219)	(0.212)	(0.225)
$\text{Age}_{30\geq x<35}$	−0.444***	−0.424**	−0.451***	−0.485***	−0.569***
	(0.156)	(0.166)	(0.169)	(0.165)	(0.173)
$\text{Age}_{35\geq x<40}$	−0.325**	−0.317**	−0.340**	−0.352**	−0.450***
	(0.147)	(0.159)	(0.162)	(0.158)	(0.164)
Non-Australian	0.155	0.106	0.117	−0.011	0.037
	(0.123)	(0.134)	(0.138)	(0.135)	(0.136)
Single	−0.012	−0.090	−0.052	0.091	0.016
	(0.208)	(0.225)	(0.231)	(0.235)	(0.231)
Medium Education	−0.335**	−0.486***	−0.370**	−0.274	−0.341*
	(0.162)	(0.172)	(0.179)	(0.179)	(0.182)
High Education	−0.403***	−0.605***	−0.497***	−0.470***	−0.471***
	(0.133)	(0.141)	(0.145)	(0.146)	(0.149)
Total No. of Children	0.028	0.045	0.038	0.021	0.035
	(0.049)	(0.053)	(0.055)	(0.056)	(0.057)
Paternal Characteristics					
$\text{Age}_{x<30}$	0.027	0.169	0.151	0.264	0.303
	(0.247)	(0.264)	(0.262)	(0.254)	(0.271)
$\text{Age}_{30\geq x<35}$	−0.182	−0.104	−0.100	−0.014	0.070
	(0.148)	(0.156)	(0.159)	(0.153)	(0.160)
$\text{Age}_{35\geq x<40}$	0.109	0.053	0.103	0.140	0.043
	(0.133)	(0.141)	(0.141)	(0.136)	(0.139)
Non-Australian	0.020	0.050	0.021	0.022	0.061
	(0.126)	(0.136)	(0.141)	(0.139)	(0.141)
Medium Education	−0.325	−0.289	−0.205	−0.262	−0.133
	(0.200)	(0.211)	(0.218)	(0.212)	(0.221)
High Education	−0.285**	−0.251*	−0.252	−0.191	−0.134
	(0.143)	(0.151)	(0.155)	(0.151)	(0.153)
Child's Characteristics					
Attend Pre-School	0.186*	0.126	0.139	0.159	0.122
	(0.105)	(0.113)	(0.115)	(0.114)	(0.118)
Attend Pre-Year	0.487***	0.498***	0.438**	0.416**	0.379**
	(0.159)	(0.169)	(0.172)	(0.172)	(0.175)
Premature Birth	0.393**	0.342*	0.440**	0.495***	0.395**
	(0.177)	(0.178)	(0.187)	(0.191)	(0.194)
Problem Birth	0.090	0.077	0.092	0.062	0.017
	(0.142)	(0.149)	(0.155)	(0.149)	(0.154)
Multiple Birth	0.314	0.321	0.136	0.403	0.553
	(0.301)	(0.332)	(0.337)	(0.366)	(0.381)
Young Cohort	−0.099	−0.047	0.066	0.043	0.030
	(0.130)	(0.133)	(0.132)	(0.133)	(0.137)
Observations	1,450	1,317	1,246	1,212	1,156

The table provides first stage estimates for the boy sample. All estimates include a constant. The instrument is a binary indicator if the child is left /mix-handed. The outcome variable is the child development index taking values from 0 to 6. Robust standard errors are provided in parentheses.

Table A.2: First Stage Regression Results Fathers - Boy Sample

	Wave 1 4/5 years	Wave 2 6/7 years	Wave 3 8/9 years	Wave 4 10/11 years	Wave 5 12/13 years
Instrument					
Handedness	0.603***	0.634***	0.657***	0.657***	0.546***
	(0.146)	(0.155)	(0.158)	(0.156)	(0.159)
Maternal Characteristics					
$\text{Age}_{x<30}$	−0.583**	−0.635***	−0.633***	−0.791***	−0.993***
	(0.231)	(0.242)	(0.242)	(0.231)	(0.247)
$\text{Age}_{30\geq x<35}$	−0.608***	−0.578***	−0.588***	−0.601***	−0.724***
	(0.169)	(0.180)	(0.184)	(0.178)	(0.187)
$\text{Age}_{35\geq x<40}$	−0.406**	−0.405**	−0.441**	−0.459***	−0.537***
	(0.158)	(0.170)	(0.172)	(0.167)	(0.176)
Non-Australian	0.210	0.135	0.157	0.031	0.100
	(0.134)	(0.144)	(0.148)	(0.143)	(0.147)
Medium Education	−0.242	−0.373**	−0.296	−0.189	−0.262
	(0.177)	(0.186)	(0.193)	(0.192)	(0.195)
High Education	−0.354**	−0.537***	−0.454***	−0.415***	−0.413**
	(0.149)	(0.157)	(0.161)	(0.160)	(0.164)
Total No. of Children	0.004	0.037	0.024	0.008	0.018
	(0.056)	(0.060)	(0.062)	(0.060)	(0.061)
Paternal Characteristics					
$\text{Age}_{x<30}$	0.270	0.371	0.314	0.410	0.547**
	(0.256)	(0.271)	(0.269)	(0.258)	(0.275)
$\text{Age}_{30\geq x<35}$	−0.057	0.006	−0.017	0.054	0.180
	(0.151)	(0.159)	(0.161)	(0.155)	(0.162)
$\text{Age}_{35\geq x<40}$	0.159	0.104	0.143	0.179	0.084
	(0.134)	(0.142)	(0.142)	(0.137)	(0.140)
Non-Australian	−0.012	0.029	−0.002	−0.005	0.030
	(0.128)	(0.138)	(0.143)	(0.140)	(0.142)
Medium Education	−0.361*	−0.317	−0.234	−0.283	−0.169
	(0.199)	(0.210)	(0.218)	(0.212)	(0.220)
High Education	−0.317**	−0.278*	−0.272*	−0.207	−0.169
	(0.144)	(0.152)	(0.155)	(0.151)	(0.153)
Child's Characteristics					
Attend Pre-School	0.103	0.052	0.072	0.110	0.060
	(0.114)	(0.121)	(0.123)	(0.120)	(0.127)
Attend Pre-Year	0.432**	0.443**	0.362*	0.364**	0.283
	(0.173)	(0.186)	(0.187)	(0.184)	(0.189)
Premature Birth	0.409**	0.380**	0.484**	0.577***	0.395**
	(0.188)	(0.189)	(0.194)	(0.197)	(0.200)
Problem Birth	−0.006	−0.031	−0.033	−0.087	−0.114
	(0.148)	(0.156)	(0.160)	(0.150)	(0.160)
Multiple Birth	0.380	0.386	0.189	0.437	0.656
	(0.326)	(0.366)	(0.370)	(0.382)	(0.410)
Young Cohort	−0.108	−0.085	0.026	0.018	−0.009
	(0.137)	(0.142)	(0.140)	(0.140)	(0.144)
Observations	1,273	1,171	1,113	1,095	1,041

The table provides first stage estimates for the boy sample. All estimates include a constant. The instrument is a binary indicator if the child is left /mix-handed. The outcome variable is the child development index taking values from 0 to 6. Robust standard errors are provided in parentheses.

other channels than child development. For example, mothers of left-handed children may have a in general different propensity to participate in the labor market as right handed ones. Similarly, if there is an intergenerational correlation of handedness, the handedness of the child in our analysis may capture unobserved factors such as mothers' abilities and skills.

To evaluate if mothers of left-handed children have a different propensity to participate in the labor market, we run a regression of maternal labor supply during pregnancy on our instrumental variable (and other controls), similar as in Frijters et al. (2009). The results, summarized in Column (1) in Table A.3, do not suggest that mothers of left-handed children have a substantially different labor supply propensity as mothers of right-handed ones. The estimated coefficient is small and far from being significant.

To evaluate if abilities or skills of the mother are related to the handedness of the child, we use the minimum skills required in thee current or most recent job held by the mother as outcome variable. Occupational skill requirements are measured on a scale from 1 (low skill) to 5 (high skill) using the definition of the Australian Bureau of Labor Statistics. We use the minimum required skill level and reverse the original scale so that a positive coefficient implies higher skill requirements.[1] The results are presented in Columns (2) and (3) in Table A.3.

We also do not find that mothers of left-handed children sort themselves in occupations with lower skill requirements. Our estimated coefficient is small and not statistically significant on any conventional level.

Another concern with our IV approach is that left-handed children might exhibit poorer long-term health conditions than right-handed ones. Thus, mothers of left-handed children might react to children's health problem instead of their development problems. We follow Frijters et al. (2009) and investigate if handedness predicts children's health status using two different health measures. The first measure is a binary indicator if the child currently needs or uses medicine prescribed by a doctor. The second measure is the number of times the child has been hurt, injured, or had an accident and needed medical attention from a hospital or doctor. The results are shown in Columns (5) and (6) in Table A.3.

The results do not indicate that child handedness is related to a child's health status. Neither using medication nor injuries as health measure is significantly affected by handedness. Our estimates are also rather small. Overall, the result do not point toward concerns about the validity of our instrument.

[1] The mapping of occupations to skill requirements is available on the website of the Ausralian Bureau of Labor Statistics, `https://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/1220.02013,%20Version%201.2?OpenDocument`.

Table A.3: IV Validity - Placebo Regressions

	(1) In Paid Work while Pregnant	(2) Occupational Skill Requirement	(3) Child needs Medications	(4) Child Injuries
Child Handedness	−0.02	−0.05	0.03	0.03
	(0.03)	(0.12)	(0.03)	(0.05)
Mean of Dependent Variable	0.62	2.89	0.14	0.30
Maternal Controls Included	Yes	Yes	Yes	Yes
Paternal Controls Included	Yes	Yes	Yes	Yes
Children Controls Included	Yes	Yes	Yes	Yes
Observations	1,450	1,240	1,450	1,450

The sample consists of all biological mothers in the LSAC who were at the first interview between 25 and 45 years old and the study child is a boy. Observations with reported usual maternal working hours above 60 hours per week are not considered in the analysis. Outcomes are determined at interview in Wave 1. Handedness is a binary indicator which takes a value of one if the child is left (both) handed and zero otherwise.
Occupational Skill Requirements range from 1 (low skill) to 5 (high skill), as determined by the Australian Bureau of Statistics. Child needs Medications is a binary indicator if the survey child currently needs or uses medicine prescribed by a doctor. Child Injuries is the number of times the child has been hurt, injured, or had an accident and needed medical attention from a doctor or hospital.
*,**,*** indicate a significance effect at a 10%, 5% and 1% level. Robust standard Errors are reported in parentheses.

B Extensive Margin Results

We provide estimates on the impact of early child development on parental labor force participation, the extensive margin, in this section. To do so, we use an instrumental variable approach. We use a similar first stage as described in Section 3 using the child development index C as dependent variable

$$C = \alpha^P + \beta^P H + X'\Gamma^P + u^P$$

As in the main part of our paper, H is a binary indicator if the child is left handed and X is the set of covariates.

In the second stage, we use the predicted development index $\widehat{C}$ and our control variables, and regress these on the binary participation indicator D. D takes a value of one if a parent reports positive hours of works and zero otherwise.[2]

$$D = \delta^P + \tau^P \widehat{C} + X'\Delta^P + \epsilon^P. \tag{B1}$$

In Equation (B1), the coefficient τ^P gives us then the true effect of early child development on the extensive margin. Table B.1 summarizes the results from this regression.

The labor supply of mothers react strongly to early child development, as can be seen from Columns (1) to (5) in the table. The estimated coefficient on our development index is quite large, although some are imprecisely estimated. The participation decision follows a hump shaped pattern with mothers of children with development problem in particular less likely to participate when the child is in kindergarten at age 4/5 and when the child is before the transition into secondary school, at age 12/13. For mothers of girls, we find in general a less consistent participation pattern over time as response to early child development. Our estimated coefficients point, however, toward a positive effect on the participation decision.

As also discussed in the main text, fathers react less strongly to early child development than mothers. The estimated coefficients for fathers of older boys is around 1/3 of the size compared to our estimates for mothers. This is likely the case as the labor supply of men is rather inelastic.

[2] Notice that our definition of parental labor force participation differs from Frijters et al. (2013) in that we only consider parents with positive hours worked to participate in the labor market. Frijters et al. (2013) consider both employed and unemployed mothers to participate in the labor force.

Table B.1: Effect of Development on Parental Labor Force Participation - 2SLS Estimates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Mothers					Fathers				
	Wave 1 4/5 years	Wave 2 6/7 years	Wave 3 8/9 years	Wave 4 10/11 years	Wave 5 12/13 years	Wave 1 4/5 years	Wave 2 6/7 years	Wave 3 8/9 years	Wave 4 10/11 years	Wave 5 12/13 years
Child Development	−0.10*	−0.01	−0.03	−0.05	−0.11**	0.01	−0.04	−0.01	−0.03	−0.04
	(0.06)	(0.05)	(0.04)	(0.05)	(0.05)	(0.25)	(0.04)	(0.03)	(0.04)	(0.06)
Mean of Dependent Variable D	0.60	0.70	0.81	0.82	0.84	0.95	0.92	0.91	0.88	0.85
First-Stage F-Statistic	19.90	19.38	20.15	19.90	15.06	17.15	16.69	17.28	17.85	11.81
Correcting for Sample Selection	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Maternal Controls Included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Paternal Controls Included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Children Controls Included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,450	1,317	1,246	1,212	1,156	1,273	1,171	1,113	1,095	1,041

The sample of mothers consists of all biological mothers in the LSAC who were at the first interview between 25 and 45 years old, and the study child is a boy. Observations with reported usual maternal working hours above 60 hours per week are not considered in the analysis. For the father sample, in addition to the selection criteria applied to mothers, it is required that a spouse was present. The development index is the sum of six binary variables with value of one if the study child is (much) less competent than other children as evaluated by the kindergarten teacher (see Section 2). The dependent variables is binary indicator D taking a value of one if the parent has usual positive weekly working hours and zero otherwise. The First-Stage F-Statistic refers to the partial F-Statistic using child handedness as an instrument for development.
*,**,*** indicate a significance effect at a 10%, 5% and 1% level. Robust standard Errors are reported in parentheses.

C Additional Estimation Results

In this section, we present additional estimation results. The structure is as follows: Section C.1 presents results without restricting the sample by age or trimming the maternal hours distribution. In Section C.2 we show that our results are roubst to using a probit instead of a logit selection function. We briefly discuss estimates using a balanced sample in Section C.3.

C.1 Results Imposing Fewer Sample Restrictions

This section contains the result under less strict sample restrictions. From the data described in Section 2, we now only exclude individuals who are not the biological mother and observations with a positive reported number of hours worked but no stated income. We do not restrict the sample in terms of age or *usual* weekly hours worked. Tables C.1 and C.2 summarize our estimation results when controlling and not controlling for endogenous sample selection respectively. In each table, we also report the (unweighted) maximum observed hours worked in the respective sample. As one can see from the table, not restricting the hours distribution leads to unusual large *usual* hours worked in the estimation.

Comparing our results in Table C.1 to those reported in Table 2 in the main text, one can see that not imposing any restrictions on age and not trimming the top part of the hours distribution results in stronger effects of early child development problems on maternal labor supply. For example, for mothers, the coefficient on our development index is −5.64 compared to −4.54 for our original estimates when the study child is 6/7 years old. At age 10/11 of the child the coefficient is −6.31 versus −4.80. Only at age 12/13 lie our unrestricted estimates with −7.67 slightly under our original ones of −8.84. A similar pattern holds when not accounting for endogenous selection or for fathers, as can be seen from Columns (6) to (10) in the table. Nevertheless, we can conclude that our results are not affected by our sample restrictions and all our conclusions in the main text of our work remain valid.

Table C.1: Effect of Child Development on Parental Hours Worked under Endogenouos Sample Selection - Less Restricted Sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Mothers					Fathers				
	Wave 1 4/5 years	Wave 2 6/7 years	Wave 3 8/9 years	Wave 4 10/11 years	Wave 5 12/13 years	Wave 1 4/5 years	Wave 2 6/7 years	Wave 3 8/9 years	Wave 4 10/11 years	Wave 5 12/13 years
Child Development	−1.64	−5.64*	−7.97***	−6.31**	−7.67***	−0.10	−2.90	−1.38	−2.89	−2.09
	(3.52)	(2.85)	(2.64)	(2.77)	(2.91)	(1.89)	(2.02)	(1.88)	(1.89)	(2.62)
Mean of Dependent Variable $\widetilde{S}$	20.16	24.31	26.10	27.89	30.13	47.32	47.45	47.62	45.75	46.66
Observed Maximum of S	100.00	98.00	120.00	90.00	112.00	126.00	168.00	168.00	95.00	112.00
First-Stage F-Statistic	17.38	17.63	19.43	19.39	15.76	15.58	15.69	16.35	16.95	12.90
Correcting for Sample Selection	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Maternal Controls Included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Paternal Controls Included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Children Controls Included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,533	1,388	1,314	1,281	1,218	1,332	1,222	1,163	1,146	1,091

The sample of mothers consists of all biological mothers in the LSAC and the study child is a boy.For the father sample, in addition to the selection criteria applied to mothers, it is required that a spouse was present. The development index is the sum of six binary variables with value of one if the study child is (much) less competent than other children as evaluated by the kindergarten teacher (see Section 2). The econometric approach corrects for possible endogenous sample selection as described in Section 3. The Mean of the Dependent Variable $\widetilde{S}$ is the selection corrected mean of weekly hours worked. The First-Stage F-Statistic refers to the partial F-Statistic using child handedness as an instrument for development.

*,**,*** indicate a significance effect at a 10%, 5% and 1% level. Standard Errors are reported in parentheses and are based on the Wild bootstrap with 2,000 replications.

Table C.2: Effect of Child Development on Parental Hours Worked without Correction for Selection - Less Restricted Sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Mothers					Fathers				
	Wave 1 4/5 years	Wave 2 6/7 years	Wave 3 8/9 years	Wave 4 10/11 years	Wave 5 12/13 years	Wave 1 4/5 years	Wave 2 6/7 years	Wave 3 8/9 years	Wave 4 10/11 years	Wave 5 12/13 years
Child Development	−3.15	−5.25**	−6.68***	−4.96**	−1.50	0.25	−1.25	0.42	−1.01	−2.43
	(2.65)	(2.57)	(2.47)	(2.29)	(2.33)	(1.63)	(1.41)	(1.43)	(1.33)	(1.73)
Mean of Dependent Variable S	23.57	24.61	26.16	27.85	30.15	47.13	46.95	47.11	45.31	45.56
Observed Maximum of S	100.00	98.00	120.00	90.00	112.00	126.00	168.00	168.00	95.00	112.00
First-Stage F-Statistic	9.88	11.58	15.03	14.85	8.50	15.68	18.07	17.58	18.29	14.56
Correcting for Sample Selection	No	No	No	No	No	No	No	No	Yes	No
Maternal Controls Included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Paternal Controls Included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Children Controls Included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	903	951	1,054	1,042	1,020	1,259	1,128	1,050	1,003	921

The sample of mothers consists of all biological mother in the LSAC with usual positive weekly working hours and the study child is a boy. For the father sample, in addition to the selection criteria applied to mothers, it is required that a spouse with usual positive working hours was present. The development index is the sum of six binary variables with value of one if the study child is (much) less competent than other children as evaluated by the kindergarten teacher (see Section 2). The Mean of Dependent Variable S is the mean of the actual observed weekly hours worked of mothers participating in the labor force. The First-Stage F-Statistic refers to the partial F-Statistic using child handedness as an instrument for development.
*,**,*** indicate a significance effect at a 10%, 5% and 1% level. Standard Errors are reported in parentheses and are based on the Wild bootstrap with 2,000 replications.

C.2 Results using Probit Selection Function

We also gauge how sensitive our results are to the parametric specification of the labor force participation probabilities. The selection function to estimate our main results in Section 4 is based on the logit form; see Section 3. Here, we discuss results when using a probit model instead. Table C.3 summarizes the estimates.

Comparing our results for mother to those in Table 2. in the main part of the paper, one can see that the estimates are virtually identical. There are no large differences in our estimates in terms of magnitude and significance. For fathers, using a probit instead of a logit model yields some slight gains in efficiency. The estimates turn now marginally significant when the study child is 6/7 years and 10/11 years old compared to our original estimates. The magnitudes of the estimated effects are very similar to those reported in Table 2 in the main part of the paper, however. In general, all of our conclusions made in the main part remain valid when modeling the selection probability using a probit model. We are therefore confident that our results are not driven by the functional form we impose on the selection probabilities.

Table C.3: Effect of Development on Parental Hours Worked under Endogenouos Sample Selection - Probit Selection Function

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Mothers					Fathers				
	Wave 1 4/5 years	Wave 2 6/7 years	Wave 3 8/9 years	Wave 4 10/11 years	Wave 5 12/13 years	Wave 1 4/5 years	Wave 2 6/7 years	Wave 3 8/9 years	Wave 4 10/11 years	Wave 5 12/13 years
Child Development	−0.80	−4.54*	−6.41***	−4.80**	−8.76***	1.02	−3.71*	−0.78	−3.60*	−2.98
	(3.32)	(2.52)	(2.32)	(2.41)	(3.00)	(1.63)	(2.04)	(1.70)	(1.92)	(2.69)
Mean of Dependent Variable $\widetilde{S}$	19.79	23.78	25.76	27.22	29.23	47.36	47.63	47.33	45.58	46.21
First-Stage F-Statistic	19.90	19.38	20.15	19.90	15.06	17.15	16.69	17.28	17.85	11.81
Correcting for Sample Selection	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Maternal Controls Included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Paternal Controls Included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Children Controls Included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,450	1,317	1,246	1,212	1,156	1,273	1,171	1,113	1,095	1,041

The sample of mothers consists of all biological mother in the LSAC who were at the first interview between 25 and 45 years old, and the study child is a boy. Observations with reported usual maternal working hours above 60 hours per week are not considered in the analysis. For the father sample, in addition to the selection criteria applied to mothers, it is required that a spouse was present. The development index is the sum of six binary variables with value of one if the study child is (much) less competent than other children as evaluated by the kindergarten teacher (see Section 2). The econometric approach corrects for possible endogenous sample selection as described in Section 3, replacing the logit with the normal cumulative distribution function. The Mean of the Dependent Variable $\widetilde{S}$ is the selection corrected mean of weekly hours worked. The First-Stage F-Statistic refers to the partial F-Statistic using child handedness as an instrument for development.
*,**,*** indicate a significance effect at a 10%, 5% and 1% level. Standard Errors are reported in parentheses and are based on the Wild boostrap with 2,000 replications.

C.3 Results using Balanced Sample

This section contains the results when concentrating on a balanced boy-only sample. For brevity, we only consider mothers in our estimation who participated in the survey from Wave 1 throughout Wave 5. As discussed in the main part of the paper , this likely constitutes a positively selected sample. Columns (1)-(5) in Table C.4 show the estimation results when accounting for endogenous sample selection. Columns (6)-(10) contain the results when assuming random labor force participation.

In general, we observe a similar pattern as when using the full available sample presented in Table 2. As before, we observe a strong and long lasting reduction in maternal labor supply. Our estimates are now slightly lower and less precisely estimated, however. This is not surprising given the smaller sample size. Like in our main specification, we also find that assuming random selection into labor force participation would lead to an underestimation of long term effects.

Table C.4: Effect of Development on Maternal Hours Worked - Balanced Sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Accounting for Endogenous Selection					Assuming Random Selection				
	Wave 1 4/5 years	Wave 2 6/7 years	Wave 3 8/9 years	Wave 4 10/11 years	Wave 5 12/13 years	Wave 1 4/5 years	Wave 2 6/7 years	Wave 3 8/9 years	Wave 4 10/11 years	Wave 5 12/13 years
Child Development	−2.01	−6.50***	−5.74**	−1.70**	−4.90**	−0.84	−5.49*	−5.52*	−1.54	−1.78
	(2.64)	(2.46)	(2.30)	(2.04)	(2.26)	(2.36)	(3.20)	(3.02)	(1.73)	(2.00)
Mean of Dependent Variable $\widetilde{S}$	21.54	23.93	25.57	27.56	29.77	23.17	24.25	25.72	27.59	29.87
First-Stage F-Statistic	16.84	16.84	16.84	16.84	16.84	9.06	9.06	9.06	9.06	9.06
Correcting for Sample Selection	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No
Maternal Controls Included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Paternal Controls Included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Children Controls Included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	936	936	936	936	936	561	561	561	561	561

The sample of mothers consists of all biological mother in the LSAC who were at the first interview between 25 and 45 years old, who took continuously part in the survey from Wave 1 to Wave 5, and the study child is a boy. Observations with reported usual maternal working hours above 60 hours per week are not considered in the analysis. The dependent variables is the weekly hours worked. The development index is the sum of six binary variables with value of one if the study child is (much) less competent than other children as evaluated by the kindergarten teacher (see Section 2). The econometric approach corrects for possible endogenous sample selection as described in Section 3. The Mean of the Dependent Variable $\widetilde{S}$ is the selection corrected mean of weekly hours worked. The First-Stage F-Statistic refers to the partial F-Statistic using child handedness as an instrument for development.
*,**,*** indicate a significance effect at a 10%, 5% and 1% level. Standard Errors are reported in parentheses and are based on the Wild boostrap with 2,000 replications.

D Results for Girls

In this section we briefly discuss the estimation results for girls. We first present the data and results from first stage regressions. Then, we discuss the impact of early child development problems on parental labor supply.

D.1 Data and First-Stage Estimates

We construct the sample for girls in a similar way as described in Section 2 in the main part of the paper. We exclude all non-biological mothers, mothers who were younger than 20 or older than 45 years at the birth of the child, or report *usual* weekly working hours of 60 hours and more. We also exclude mothers who reported positive working hours but no income. Table D.1 shows descriptive statistics for our girls sample.

As was it the case for boys, we observe a slight positive selection of survey participants with respect to parental education. Mothers observed in later waves tend to also be less likely to be Non-Australian. Unlike for boys, we do not see a strong selection with respect to our development index. Our development index for girls is also roughly half the size as the one obtained for boys; see Table 1 in the main part of the paper. This is in line with evidence on early gender differences and that girls mature faster than boys (see, also, Gilliam, 2005; Ready et al., 2005; Bertrand and Pan, 2013; Lim et al., 2015). There is also much less variation in the early development index for girls which likely affects both our first stage results and the precision of our estimates.

We present first stage regression results for mothers and father in Table D.2 and in Table D.3 respectively. As for boys, we also find a positive and significant relationship between handedness and early development problems for our girls sample. The coefficient is only half the size, however. We also find that being Non-Australian is significantly positive related to early child development problems. We find weaker evidence that parental education is related to early development problems compared to our first stage results for boys.

D.2 Main Estimation Results

In this section, we briefly discuss the results for girls. The estimation results when correcting for endogenous sample selection are summarized in Table D.4. Mothers of girls initially adjust their labor supply stronger compared to those of boys. This can be seen from the estimates reported in Columns (1) to (5). As the child grows older, we estimate positive effects of the development status on maternal labor supply. Our results point toward an intertemporal substitution of hours workerd, where mothers prefer to reduce working hours when the child is younger and expanding labor supply later on.

Table D.1: Summary Statistics for Girls by Wave

	Wave 1 4/5 years	Wave 2 6/7 years	Wave 3 8/9 years	Wave 4 10/11 years	Wave 5 12/13 years
Maternal Characteristics					
Age at First Interview (Years)	34.81	34.90	35.02	35.11	35.22
	(4.57)	(4.51)	(4.47)	(4.44)	(4.39)
Non-Australian (%)	23.38	22.03	21.66	21.15	20.95
	(42.34)	(41.46)	(41.21)	(40.85)	(40.72)
Single (%)	11.48	10.94	9.98	9.56	9.64
	(31.89)	(31.22)	(29.99)	(29.42)	(29.52)
No. of Children	2.46	2.46	2.45	2.46	2.46
	(0.98)	(0.98)	(0.95)	(0.95)	(0.96)
High Education (%)	64.01	64.53	65.46	66.16	66.40
	(48.01)	(47.86)	(47.57)	(47.34)	(47.25)
Medium Education (%)	15.28	15.08	14.98	15.14	15.38
	(35.99)	(35.80)	(35.70)	(35.86)	(36.10)
Low Education (%)	20.70	20.39	19.57	18.70	18.21
	(40.53)	(40.31)	(39.69)	(39.01)	(38.61)
Paternal Characteristics					
Age at First Interview (Years)	37.60	36.83	36.39	36.24	36.34
	(5.55)	(7.83)	(9.18)	(9.29)	(9.07)
Non-Australian (%)	25.00	24.61	25.36	24.28	24.49
	(43.32)	(43.09)	(43.53)	(42.90)	(43.02)
High Education (%)	66.62	67.03	67.71	68.27	67.90
	(47.17)	(47.03)	(46.78)	(46.56)	(46.71)
Medium Education (%)	8.73	8.83	9.18	9.14	9.20
	(28.24)	(28.38)	(28.88)	(28.83)	(28.91)
Low Education (%)	24.65	24.14	23.11	22.59	22.90
	(43.11)	(42.81)	(42.17)	(41.83)	(42.04)
Child's Characteristics					
Attend Pre-School (%)	60.92	61.33	61.03	61.00	61.18
	(48.81)	(48.72)	(48.79)	(48.80)	(48.75)
Attend Pre-Year (%)	18.10	17.97	17.87	17.94	17.42
	(38.51)	(38.41)	(38.33)	(38.38)	(37.94)
Other Pre-Form (%)	20.99	20.70	21.10	21.07	21.40
	(40.74)	(40.53)	(40.81)	(40.79)	(41.03)
Premature Birth (%)	10.77	10.86	10.95	10.41	10.61
	(31.02)	(31.13)	(31.24)	(30.55)	(30.81)
Problem Birth (%)	13.73	13.91	14.41	14.30	14.15
	(34.43)	(34.61)	(35.14)	(35.02)	(34.87)
Young Cohort (%)	80.70	80.78	80.92	80.96	81.79
	(39.48)	(39.42)	(39.31)	(39.27)	(38.61)
Left Handed (%)	12.61	12.73	13.29	12.69	12.73
	(33.20)	(33.35)	(33.95)	(33.30)	(33.35)
Development Index	0.68	0.68	0.65	0.62	0.65
	(1.31)	(1.32)	(1.27)	(1.23)	(1.29)
Observations	1,420	1,280	1,242	1,182	1,131

The figures provided are means with standard deviations in parentheses, as measured in Wave 1 of the LSAC. The development index is the sum of six binary variables with value of one if the study child is (much) less competent than other children as evaluated by the kindergarten teacher (see Section 2).

Table D.2: First Stage Regression Results Mothers - Girl Sample

	Wave 1 4/5 years	Wave 2 6/7 years	Wave 3 8/9 years	Wave 4 10/11 years	Wave 5 12/13 years
Instrument					
Handedness	0.274**	0.344***	0.349***	0.368***	0.312***
	(0.108)	(0.115)	(0.115)	(0.115)	(0.121)
Maternal Characteristics					
$\text{Age}_{x<30}$	0.102	0.128	0.071	0.091	0.013
	(0.162)	(0.164)	(0.171)	(0.173)	(0.186)
$\text{Age}_{30\geq x<35}$	−0.088	−0.011	−0.069	−0.023	−0.079
	(0.112)	(0.112)	(0.109)	(0.111)	(0.119)
$\text{Age}_{35\geq x<40}$	−0.033	0.043	−0.007	−0.009	−0.087
	(0.103)	(0.106)	(0.104)	(0.107)	(0.111)
Non-Australian	0.305***	0.344***	0.243**	0.288***	0.323***
	(0.090)	(0.102)	(0.102)	(0.098)	(0.107)
Single	0.254	0.202	0.184	0.275	0.149
	(0.178)	(0.191)	(0.196)	(0.189)	(0.205)
Medium Education	−0.237**	−0.270**	−0.252**	−0.274**	−0.352***
	(0.119)	(0.127)	(0.125)	(0.119)	(0.127)
High Education	−0.237**	−0.292***	−0.249**	−0.173*	−0.216*
	(0.095)	(0.102)	(0.103)	(0.103)	(0.110)
Total No. of Children	0.036	0.052	0.066	0.045	0.076
	(0.039)	(0.042)	(0.042)	(0.043)	(0.046)
Paternal Characteristics					
$\text{Age}_{x<30}$	0.355	0.424*	0.413	0.218	0.214
	(0.227)	(0.250)	(0.262)	(0.234)	(0.243)
$\text{Age}_{30\geq x<35}$	0.102	0.010	0.084	0.037	0.039
	(0.108)	(0.106)	(0.108)	(0.109)	(0.114)
$\text{Age}_{35\geq x<40}$	0.013	−0.010	−0.000	−0.012	−0.025
	(0.084)	(0.089)	(0.086)	(0.089)	(0.093)
Non-Australian	0.039	0.026	−0.013	0.019	0.001
	(0.085)	(0.091)	(0.092)	(0.090)	(0.094)
Medium Education	0.029	−0.120	−0.080	−0.038	−0.094
	(0.170)	(0.172)	(0.171)	(0.156)	(0.175)
High Education	−0.228**	−0.270**	−0.238*	−0.100	−0.246*
	(0.114)	(0.122)	(0.123)	(0.112)	(0.127)
Child's Characteristics					
Attend Pre-School	0.123	0.175**	0.144*	0.130*	0.135
	(0.077)	(0.080)	(0.079)	(0.077)	(0.082)
Attend Pre-Year	0.698***	0.664***	0.666***	0.582***	0.713***
	(0.130)	(0.137)	(0.133)	(0.134)	(0.144)
Premature Birth	0.156	0.209	0.241*	0.177	0.083
	(0.131)	(0.141)	(0.135)	(0.138)	(0.147)
Problem Birth	0.126	0.229*	0.272**	0.247*	0.286**
	(0.116)	(0.122)	(0.122)	(0.129)	(0.135)
Multiple Birth	0.497*	0.435	0.443	0.431	0.595*
	(0.275)	(0.273)	(0.274)	(0.270)	(0.305)
Young Cohort	0.258***	0.226**	0.281***	0.190**	0.282***
	(0.090)	(0.096)	(0.091)	(0.095)	(0.099)
Observations	1,420	1,280	1,242	1,182	1,131

The table provides first stage estimates for the girl sample. All estimates include a constant. The instrument is a binary indicator if the child is left /mix-handed. The outcome variable is the child development index taking values from 0 to 6. Robust standard errors are provided in parentheses.

Table D.3: First Stage Regression Results Fathers- Girl Sample

	Wave 1 4/5 years	Wave 2 6/7 years	Wave 3 8/9 years	Wave 4 10/11 years	Wave 5 12/13 years
Instrument					
Handedness	0.226**	0.298**	0.296**	0.346***	0.303**
	(0.110)	(0.116)	(0.117)	(0.119)	(0.124)
Maternal Characteristics					
$\text{Age}_{x<30}$	0.044	0.085	0.030	0.058	−0.020
	(0.179)	(0.177)	(0.186)	(0.186)	(0.196)
$\text{Age}_{30\geq x<35}$	−0.109	−0.042	−0.053	−0.046	−0.087
	(0.119)	(0.118)	(0.115)	(0.118)	(0.126)
$\text{Age}_{35\geq x<40}$	−0.087	−0.016	−0.055	−0.058	−0.135
	(0.108)	(0.110)	(0.107)	(0.112)	(0.116)
Non-Australian	0.327***	0.368***	0.257**	0.284***	0.327***
	(0.096)	(0.107)	(0.106)	(0.101)	(0.111)
Medium Education	−0.198	−0.225*	−0.191	−0.214*	−0.272**
	(0.124)	(0.133)	(0.133)	(0.127)	(0.135)
High Education	−0.174*	−0.236**	−0.200*	−0.131	−0.155
	(0.100)	(0.108)	(0.109)	(0.108)	(0.117)
Total No. of Children	0.035	0.057	0.057	0.046	0.067
	(0.040)	(0.043)	(0.040)	(0.042)	(0.046)
Paternal Characteristics					
$\text{Age}_{x<30}$	0.373	0.435*	0.414	0.217	0.209
	(0.229)	(0.250)	(0.266)	(0.236)	(0.243)
$\text{Age}_{30\geq x<35}$	0.107	0.018	0.066	0.038	0.030
	(0.109)	(0.107)	(0.109)	(0.109)	(0.114)
$\text{Age}_{35\geq x<40}$	0.026	0.009	0.003	−0.001	−0.016
	(0.084)	(0.089)	(0.086)	(0.089)	(0.093)
Non-Australian	0.033	0.023	−0.010	0.024	0.003
	(0.086)	(0.092)	(0.093)	(0.090)	(0.095)
Medium Education	0.025	−0.118	−0.087	−0.039	−0.102
	(0.171)	(0.172)	(0.171)	(0.157)	(0.175)
High Education	−0.251**	−0.286**	−0.255**	−0.108	−0.261**
	(0.113)	(0.122)	(0.123)	(0.111)	(0.127)
Child's Characteristics					
Attend Pre-School	0.183**	0.199**	0.168**	0.151*	0.136
	(0.075)	(0.081)	(0.080)	(0.079)	(0.084)
Attend Pre-Year	0.687***	0.606***	0.584***	0.533***	0.653***
	(0.129)	(0.138)	(0.131)	(0.132)	(0.143)
Premature Birth	0.326**	0.394**	0.338**	0.298**	0.225
	(0.144)	(0.153)	(0.144)	(0.148)	(0.159)
Problem Birth	−0.006	−0.031	−0.033	−0.087	−0.114
	(0.148)	(0.156)	(0.160)	(0.150)	(0.160)
Multiple Birth	0.357	0.257	0.288	0.358	0.376
	(0.281)	(0.276)	(0.277)	(0.282)	(0.306)
Young Cohort	0.243***	0.218**	0.256***	0.179*	0.271***
	(0.088)	(0.093)	(0.089)	(0.093)	(0.096)
Observations	1,257	1,140	1,118	1,069	1,022

The table provides first stage estimates for the girl sample. All estimates include a constant. The instrument is a binary indicator if the child is left /mix-handed. The outcome variable is the child development index taking values from 0 to 6. Robust standard errors are provided in parentheses.

As girls mature in general faster than boys, there might be less need for the mother to reduce her labor supply for an extended period of time. For fathers, we estimate an almost continuous increase in working hours; see Columns (6) to (10) in the tale. The coefficients are largely imprecisely estimated, however.

Overall, our results obtained for girls should be interpreted with care. In most cases, the obtained F-Statistic from our first stage regression is well below the rule-of-thumb of 10. As discussed above, one likely reason is that we do observe much less variation in the outcome for girls.

We summarize estimates not correcting for sample selection in Table D.5. For mothers, we find that our non-corrected estimates would in general underestimate the impact of development problems on their labor supply. The uncorrected estimates for fathers are in most cases similar to the corrected ones. One reason for this result is that also father of girls have in general an inelastic labor supply and do not strongly react to child development problems. As the sample sizes becomes also smaller when concentrating on parents actually observed in the labor market, the first stage F-Statistic is now even lower than before. Therefore, we caution to interpret too much into the obtained results.

Table D.4: Effect of Child Development on Parents' Hours Worked under Endogenouos Sample Selection - Girls Sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Mothers					Fathers				
	Wave 1 4/5 years	Wave 2 6/7 years	Wave 3 8/9 years	Wave 4 10/11 years	Wave 5 12/13 years	Wave 1 4/5 years	Wave 2 6/7 years	Wave 3 8/9 years	Wave 4 10/11 years	Wave 5 12/13 years
Child Development	-1.83	-14.09	-0.88	14.48***	4.26	3.80	5.49	7.39	16.54**	5.60
	(5.76)	(9.30)	(3.91)	(5.34)	(4.24)	(5.24)	(4.95)	(5.37)	(6.71)	(5.53)
Mean of Dependent Variable $\widetilde{S}$	18.85	21.86	22.20	21.76	22.59	46.78	46.32	47.28	45.59	45.30
First-Stage F-Statistic	6.43	8.96	9.17	10.19	6.67	4.23	6.58	6.41	8.53	6.02
Correcting for Sample Selection	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Maternal Controls Included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Paternal Controls Included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Children Controls Included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,420	1,280	1,242	1,182	1,131	1,257	1,140	1,118	1,069	1,022

The sample of mothers consists of all biological mothers in the LSAC who were at the first interview between 25 and 45 years old, and the study child is a girl. Observations with reported usual maternal working hours above 60 hours per week are not considered in the analysis. For the father sample, in addition to the selection criteria applied to mothers, it is required that a spouse was present. The development index is the sum of six binary variables with value of one if the study child is (much) less competent than other children as evaluated by the kindergarten teacher (see Section 2). The econometric approach corrects for possible endogenous sample selection as described in Section 3. The Mean of the Dependent Variable $\widetilde{S}$ is the selection corrected mean of weekly hours worked. The First-Stage F-Statistic refers to the partial F-Statistic using child handedness as an instrument for development.
*,**,*** indicate a significance effect at a 10%, 5% and 1% level. Standard Errors are reported in parentheses and are based on the Wild boostrap with 2,000 replications.

Table D.5: Effect of Child Development on Parents' Hours Worked without Correction for Selection - Girls Sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Mothers					Fathers				
	Wave 1 4/5 years	Wave 2 6/7 years	Wave 3 8/9 years	Wave 4 10/11 years	Wave 5 12/13 years	Wave 1 4/5 years	Wave 2 6/7 years	Wave 3 8/9 years	Wave 4 10/11 years	Wave 5 12/13 years
Child Development	0.32	−8.17	−1.20	1.08	2.53	4.01	4.82	4.59	4.59	−7.48
	(5.47)	(6.64)	(3.83)	(3.43)	(4.28)	(5.53)	(6.83)	(5.05)	(4.38)	(6.16)
Mean of Dependent Variable S	22.91	24.22	26.24	27.13	28.90	47.00	46.58	47.45	45.79	45.20
First-Stage F-Statistic	3.09	3.78	5.86	8.50	5.78	2.74	1.51	2.62	7.05	6.52
Correcting for Sample Selection	No	No	No	No	No	No	No	No	Yes	No
Maternal Controls Included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Paternal Controls Included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Children Controls Included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	878	929	987	975	966	787	785	832	793	776

The sample of mothers consists of all biological mothers in the LSAC who were at the first interview between 25 and 45 years old, have usual positive weekly working hours, and the study child is a girl.Observations with reported usual maternal working hours above 60 hours per week are not considered in the analysis. For the father sample, in addition to the selection criteria applied to mothers, it is required that a spouse with usual positive weekly working hours was present. The development index is the sum of six binary variables with value of one if the study child is (much) less competent than other children as evaluated by the kindergarten teacher (see Section 2). The Mean of Dependent Variable S is the mean of the actual observed weekly hours worked of parents participating in the labor force. The First-Stage F-Statistic refers to the partial F-Statistic using child handedness as an instrument for development.

*,**,*** indicate a significance effect at a 10%, 5% and 1% level. Standard Errors are reported in parentheses and are based on the Wild boostrap with 2,000 replications.

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