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The Influence of Family Structure on Child Outcomes: Evidence for Ireland

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Abstract: A large body of international literature has documented a correlation between non-traditional family structure and poorer child outcomes, yet researchers continue to disagree as to whether the association represents a true causal effect. This article extends this literature by employing propensity score matching using the first wave of data from the Growing up in Ireland child cohort study. We argue that the Irish case is of particular interest given the highly selective nature of non-marriage. We find that, on average, non-marriage has negative effects on a child educational development at age 9 but the effects are smaller in relation to health outcomes and the child's self-concept. However, selection effects account for a non-trivial proportion of the differences in child outcomes across lone-mother and cohabiting families although hidden bias remains an important issue. This has important implications for policies which promote marriage as the key to child development as it appears that much of the benefits of marriage are not related to marriage per se but to the socio-economic background of mothers.

I INTRODUCTION

The implications of family structure for child development have been a central topic of research for several decades. International evidence suggests that children who grow up living with both biological parents fare better than children not living with both biological parents (Acock and Demo, 1994; Amato and Booth, 1997; Amato, 2001; Cookston, 1999; Flewelling and Bauman, 1990; Frisco, Muller and Frank, 2007; Mayer, 1997; McKeown *et al.*, 1997; Patten *et al.*, 1997). Despite this evidence, it is still unclear whether the

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negative outcomes associated with unmarried motherhood, step-parenthood or divorce result from these states per se or from the socioeconomic disadvantages these women faced before they became mothers. This paper addresses the selection argument which contends that childbearing outside of marriage is associated with negative outcomes because it occurs mostly among disadvantaged young women. If the pre-existing characteristics of mothers account for the relationship between childbearing and its socio-economic consequences, assertions of causality become questionable.

To take account of selection effects, a propensity score matching approach is employed. Children in non-traditional families ("treatment" groups) are matched to those in married two-parent families ("control" group), based on the propensity to be in a non-traditional family. In other words, the matching procedure identifies similar children and determines statistically what the effect on a specific outcome might be had the parents married or remained married. The analysis thus compares various child outcomes between treatment and control groups using semi-parametric estimators.

This study extends the literature in this area in two main regards. First by employing data from the first wave of the *Growing Up in Ireland* (GUI) child cohort study; the first ever national longitudinal study of children carried out in Ireland. This paper tests the significance of effect size differences in child outcomes across families in Ireland. The Irish case is particularly interesting in a number of regards given its relatively low rates of divorce, low but increasing rates of cohabitation, high rates of unmarried motherhood among women under the age of 25 and a tradition of late age of marriage when compared to other European countries (Hannan, 2008). Second, the analysis advances the literature on propensity scores matching by employing multiple treatment groups since the non-traditional family group consists of three main treatment groups. The first being those of unmarried one-parent families (lone mothers), the second being previously married one-parent families (which in the Irish case mainly consists of separated mothers) and finally cohabitating families (excluding a small number of step-families which were dropped from the analysis).[1]

Between the 1986 and the 2011 *Census of Population in Ireland*, the number of one-parent families almost tripled. By 2011, 24.8 per cent of all families were one-parent families. The sources of the growth in one-parent families are well documented (Fahey and Russell, 2001). Up to the 1990s, there had been a dramatic rise in the proportion of births occurring outside of

[1] Step-families have been excluded from this analysis but a separate descriptive analysis of step-families is available in Fahey *et al.* (2013).

marriage; from 5 per cent in 1980 to 32 per cent in 2000 (Lunn, Fahey and Hannan, 2009). There had also been an increase in marital breakdown. Between the 1986 and the 2006 Census, the total number of people whose marriages had broken down increased five-fold, from 40,000 in 1986 to just less than 200,000 in the 2006 Census. By international standards, however, Ireland has a relatively low rate of marital breakdown. The dominance of the unmarried route into lone-parenthood appears unusual by international standards (Lunn and Fahey, 2011). The GUI data allows for a detailed analysis of these recent changes and facilitates the estimation of the effects of growing up in many different family types on child development.

II THE SELECTIVE NATURE OF NON-MARITAL FAMILIES

There is little agreement as to why variations in child development occur across family types. The main theoretical arguments entail resource depletion, stress proliferation and interpersonal skills deficits (Amato, 1996; Barrett and Turner, 2005; McLanahan and Sandefur, 1994; Popenoe, 1996). Essentially, children whose parents divorce/separate, or never get married, will have fewer resources, more stressors and less interpersonal skills leading to poorer outcomes in adolescence and young adulthood. It is possible, however, that marital dissolution or childbearing status is rather inconsequential. In fact, the empirical evidence on the differences in child and young adult outcomes across family types may result in a large part, or entirely, from selection bias.

The selection view of non-marriage maintains that non-traditional family structures do not necessarily "cause" poorer child outcomes. The majority of never-married mothers in Ireland are younger and come from disadvantaged backgrounds. Much of the unfavourable consequences of unmarried motherhood may therefore be an artefact of the pre-existing socio-economic disadvantages of these mothers. This selection effect is additionally confounded by the effects of *current* disadvantage in terms of lower-incomes, higher levels of unemployment, greater risk of poverty leading to poorer child development. As outlined by Fahey, Russell and Whelan (2008), childbearing outside of marriage may be viewed as a culturally rational response to poverty and limited educational/work opportunities among younger Irish women. This selection implies a two-tiered system based on age of motherhood which has implications not alone for child development but also for the stability of marriages in the Irish context. Marriage it appears is not entered into lightly and on average, not at an early age. Instead many Irish people wait to marry until they finish third-level education and are in stable jobs. Of course, this is a generalisation as there are instances of people marrying at younger ages and

having larger than average numbers of children but these cases are far less common now than they were in early twentieth century Ireland (see Hannan, 2008).

Almost all previous research on the effects of family structure on child outcomes is plagued by the problem of selection. Factors that predict selection into a particular family type, also predict the child outcomes of interest. Much of the international work in this area has not adequately assessed and/or adjusted for selection bias (Amato and Keith, 1991; Amato, 2001). Several socio-demographic characteristics like social class, parental characteristics such as employment status, and couple attributes, for example age at first marriage, are known predictors of marital stability (Amato and Previti, 2003; Call and Nonnemaker, 1999; Kowaleski-Jones and Dunifon, 2006; White, 1990). Some studies have compared child outcomes before and after the separation of parents (Cherlin *et al*., 1991), while others use a variety of innovative approaches to address the issue of selection bias.[2]

Lee (2010) used longitudinal data from the *National Longitudinal Study of Adolescent Health* in the US and found that traditional regression methods tend to overestimate the negative effects of teen motherhood on children. Teen mothers' lower levels of educational and labour market performance and higher likelihood of receiving public assistance result to a large degree from their pre-existing disadvantages. Yet, despite employing propensity score matching methods, there remained significant differences between teen mothers and their matched counterparts in the key domains of early socio-economic outcomes. Francesconi, Jenkins and Siedler (2010) found that once endogeneity was accounted for, whether by using sibling-difference estimators or two types of quasi-experiments, the evidence that family structure affects child schooling outcomes is much less conclusive (although almost all the point estimates indicated that non-intactness had an adverse effect on schooling outcomes in Germany).

Studies of this nature have highlighted a wide range of selection factors which influence child outcomes and reflect the pre-existing disadvantage of one-parent families, such as lower employment levels, lower parental education, parental smoking and drinking patterns, and religious beliefs. The key conclusion drawn from these studies is the importance of controlling for both observed and unobserved family background characteristics. In other words, the need for a wide range of covariates measured prior to the treatment

[2] These include within-family fixed-effect models, instrumental variables methods, and quasi-natural experimental approaches (Francesconi, Jenkins and Siedler (2010) compare these models).

taking place or fixed over time. The GUI study is limited in this regard given that at the time of writing, a single wave of data was available and many background factors were not collected.[3]

III A PROPENSITY SCORE MATCHING APPROACH

Propensity score matching methods use an estimate of a counterfactual group to adjust for selection bias (Rosenbaum and Rubin, 1983). In order to reduce the bias of confounding factors, we need to know the answer to the counterfactual question, such as what level of an outcome would a child have gained had their parents married? By definition the counterfactual cannot be empirically observed; however, it is possible to estimate the counterfactual by matching cases that are similar on confounding factors, but differ on the focal independent variable (i.e., family type).

Cases are matched on multiple confounding factors usually between two groups, a treatment and a control group. This follows from the rationale behind experiments. In an experiment, there would typically be two groups, who are both identical by randomisation except that one group is exposed to a "treatment'. The idea is that both groups differ only in their exposure to this treatment and therefore, any difference in outcomes can be related to that treatment. One could imagine that two children are matched on the same pre-existing characteristics, one of whom is living in a one-parent family and the other in a two-parent family. Matching can in principal be done on a range of variables but the more variables available, the more difficult it becomes to find a matched child. Instead matching is carried out on the propensity score which reflects the probability of receiving "treatment' assignment (see Rosenbaum and Rubin, 1983). It is, in principal, sufficient to match children in one-parent families with children in two-parent families, for example, who have the same estimated probability of being in a one-parent family, but who are in fact living with two parents.

In this study, the predicted probabilities of receiving the "treatment' were calculated from a series of logit models which served to match the treatment and control groups based on a limited number of pre-existing observed covariates (see Table 1).[4] The analysis entailed a number of steps. First logit

[3] We were unable to adhere strictly to this restriction since it was very difficult to focus solely on events occurring prior to the treatment, given a single wave of data and because decisions relating to family type are taken at different stages in the family cycle but information was missing on when these decisions were made.

[4] Previous research has found little difference in models which run a series of logit models as opposed to a multinomial logit model which is computationally more cumbersome (see Lechner and Pfeiffer, 2001).

Table 1: *Family Structures in the Growing Up in Ireland, Child Cohort Study*

Two Parents	*Marital Status Primary Caregiver (PCG)*	*Parental Status*
Married 78.19 per cent	Married PCG *N* = 6,840	Biological Parents 98.5 per cent
Cohabiting 4.28 per cent	Never married PCG 3.21 per cent *N* = 274	Biological Parents 98.8 per cent
	Undefined marital status 0.74 per cent *N* = 55	Biological Mother 99 per cent
	Previously married 0.33 per cent *N* = 31	
One-Parent Never married 9.46 per cent	*Includes* Never married PCG *N* = 480	Biological mother 97.4 per cent
Previously-married 8.07 per cent	Separated PCG 5.58 per cent *N* = 315	Biological mother 98.2 per cent
	Divorced PCG 1.69 per cent *N* = 105	
	Widowed PCG 0.80 per cent *N* = 41	

Source: Growing Up in Ireland, Child Cohort Study, RMF (weighted data except where *N = unweighted N)*

Notes: Families where the primary caregiver was the father of the child have been removed (N = 103 including lone-father families).

Step-families have been removed (N = 324 but many of these cases had missing data on core variables).

A small amount of information was missing as regards the biological relationship between the PCG and the Study Child (SC) (N = 97). A significant amount of data was missing as regard the biological relationship between the secondary caregiver (SCG) and the SC (N = 1,312 or 16 per cent). This was particularly the case with regard to cohabiting couples were information was missing for 20 per cent of fathers and 14 per cent of mothers.

A small number of foster and adoptive parents are included in this sample (adoptive/foster mother N = 60 most of whom (56) are in the control group and adoptive/foster father N = 66 again most of whom (65) are in the married control group).

Children in the care of other relatives including grandparents are included in the above (N = 3).

models were estimated to calculate the predicted probabilities of growing up in the various family types, which were then used as the propensity scores. In these models, every effort was made to ensure that all the observed covariates were measured prior to the outcome being measured or were fixed over time

in order to minimise reverse causality. A range of socio-demographic determinants of family status were selected drawing on previous literature in this area. Second, using the propensity scores, a sample of treatment groups and their matched cases were generated; unmarried one-parent families, previously married one-parent families and cohabitating families. These groups were matched to the control group of married two-parent families.

A variety of matching algorithms were considered in order to ensure that the matched cases included only those who were close enough to treatment cases in terms of the propensity score. Nearest neighbour (4) and caliper (0.01) matching with replacement were employed.[5] With caliper matching, a predetermined range of values is defined usually within one-quarter of the standard error of the estimated propensity. Any values that fall outside that range are removed. It is important to test the balance achieved by the matching exercise. This was done by assessing the reduction in absolute bias that is, the standardised percentage mean difference in each covariate between the treatment and controls groups post-matching. The propensity score estimation models were well specified, in that there was no significant difference in pre-existing observed covariates between the treatment and control groups after matching. The ultimate aim of the analysis is to assess the average difference in child outcomes across treatment and control groups. The selection bias problem highlights that one should estimate the effect of growing up in an unmarried one-parent family (technically known as the "average treatment effect for the treated" or ATT) on those children in our treatment groups rather than for all children (average treatment effect or ATE).

IV DATA

This research draws on the first wave of the *Growing Up in Ireland* (GUI) child cohort study, a large-scale survey of nine-year-old children sampled within primary schools in Ireland. The GUI study is an extremely rich data source, incorporating school principal, teacher, parent and child questionnaires as well as time diaries, and some qualitative data collection. Questionnaire data and information on reading and mathematics test score performance were employed in this study. Each child was asked to complete a test in reading and maths. This test was administered by a fully trained Study Researcher (fieldworker) who visited each school.

[5] The caliper size was set at a quarter of a standard deviation of the sample estimated propensity scores (Rosenbaum and Rubin, 1983). Reducing the caliper beyond 0.01 led to rapidly increasing numbers of off-support cases. Comparison of different models is available (Hannan, Halpin and Coleman, 2013).

The study is made up of just over 8,500 children who were selected randomly through the National School system. Data collection took place between August 2007 and May 2008. A nationally representative sample of 900 schools was selected from all over Ireland including mainstream national schools, private schools and special schools. Over 2,300 individual teachers cooperated with the study in the schools as well as principals and support staff. The sample of 8,568 nine-year-old children was then randomly selected from within these schools. The response rate at the school level was 82 per cent, with 57 per cent of families agreeing to participate. The basic data presented here were re-weighted, or statistically adjusted, in line with the sample design to ensure that the information is representative of the population of nine-year-olds in Ireland. To account for the sampling design effects in the GUI, the main analyses adjust standard errors for school-level clustering.

As noted by Lunn and Fahey (2011), while there is diversity in family structures, there remain a small number of dominant family types that account for the large majority of families in Ireland as a whole. In the GUI full sample, the majority of nine-years-olds were living with married parents in the one household; 75.6 per cent of families fell into this category and most of these parents were the biological parents of the study child. The primary caregiver was over 98.8 per cent of the time the mother of the study child (weighed full sample) but there were a small number of cases where the father was the primary caregiver. Given the different nature of these families, these cases were removed from the data analysed in this paper ($N = 103$).

Family structure was classified by whether the primary caregiver was living with a partner and their current marital status (see Table 1). Many of the less traditional family types are not really that common in Ireland and this is reflected in the GUI study with a low overall incidence of step-families ($N = 324$). This group of step-families have been removed from the analyses presented here (see Table 1). Fahey, Keilthy and Polek (2013) however, found that over half of step-children were living with cohabiting parents (2 per cent) while the rest were living in married two-parent families (1.3 per cent).

After these restrictions, one-parent families were decomposed into either never married or post-married one-parent families. In the never married one-parent family group (9.4 per cent) almost a third of the mothers (30.4 per cent) were cohabiting with the father of the child at the time of birth.[6] The post-

[6] It would have been insightful to include information on the relationship with the father at the time of child birth but this information was only asked of lone mothers. Given the nature of cohabitation within Ireland, those who cohabit tend to reflect more the practises of the never-married group rather than the married/previously married group. This follows from the selection argument which implies that those who marry (even if they then separate) tend to be on average older, more educated and more privileged than either those who never marry or cohabit.

married one-parent family group included separated mothers (5.5 per cent), a small number of widows (0.8 per cent) and 1.7 per cent of divorced mothers who were more likely to be non-Irish nationals. As outlined in Table 1, adopted/fostered children were included in the analysis and were classified according to the families in which they were living (the majority of whom were living within the control group). It is evident that there is a complex relationship between women's family lives and their formal/current marital status. The family classifications employed here do not capture many aspects of family structure as evident in the discussion on cohabitation below.

The cohabiting group includes children growing up with cohabiting parents who have not been married before (3.2 per cent as in Table 1). There are a small number of cases where parents are cohabiting but information was missing on their marital status ($N = 55$) and a smaller group where the mother was previously married but important information is missing on their current partner ($N = 31$). It appears, however, that many of this group of separated and divorced cohabiting mothers are cohabiting with the biological father of the study child ($N = 21$) but the secondary caregiver did not specify their relationship with the study child. These mothers may, therefore, be living with their previous husband or with a new partner. However, all cases where the secondary caregiver specified their relationship to the child as a step-parent have been removed from this cohabiting group. At outlined in Table 1, these cohabiting families were combined to form a cohabiting group. More generally, the cohabitees with children who appear in this study represent a minority of cohabitees as cohabitation appears more common in Ireland among younger couples without children (Lunn *et al*., 2009). It is, therefore, advisable to exhibit some caution in interpreting the results for this select cohabiting group.

V CHILD OUTCOMES

The analyses looked at the differences in child outcomes across three main domains:

Educational Development: Three measures of the child's educational development were analysed; their score in the maths test, reading test and the number of days absent from school as reported by their teacher. The Drumcondra reading and maths tests administered in the GUI study are standardised tests of achievement in mathematics and reading vocabulary, designed for pupils in Irish primary schools. There were different levels of the tests administered dependent on which class the pupil was in (which is largely

a function of the child's age).[7] School absenteeism as reported by the child's teacher was taken as the measure of school engagement given previous findings which showed that parents tended to have different estimates in this regard when compared to teachers (Smyth, 2009).

Health Outcomes: Four measures of a child's physical health were chosen for analysis; Body Mass Index, fruit in the diet, the number of nights in hospital and dental visits. The child's height and weight were directly measured by the interviewer in the course of the interview with the child and this information was used to construct the Body Mass Index (BMI). Children's dietary intake was assessed in the study via parental recall of the Study Child's eating habits in the preceding 24-hour period using a 20-item semi-quantitative food frequency questionnaire. The child's level of fresh fruit consumption was taken as an indicator of the quality of diet in the home. The primary caregiver was also asked about the number of nights which the nine-year-old had spent in hospital as an in-patient over his/her lifetime, excluding neonatal care. Public hospital care is available to the whole population (subject to an A&E fee) but the child's access to health care services is likely to be determined by the parent's resources and their engagement with the system. Finally, differences in the number of dental visits were analysed. In Ireland, dental care is available free at the point of use to all medical card holders, and for pre-school and school children attending state primary schools referred from child health service or school health service examinations. Like hospital visits, the parents' resources, knowledge and, other socio-economic and demographic factors will influence the use of this resource.

Psychological Wellbeing: The children in the study were asked to complete a detailed set of 35 questions known as the Piers-Harris Self-Concept Scale (Piers, 1984).[8] It gathered information about how children perceive themselves across six domains:

1. Behavioural Adjustment (e.g., "I am well behaved in school.' and "I do many bad things.')
2. Intellectual and School Status (e.g., "I am smart.' and "In school I am a dreamer.')
3. Physical Appearance and Attributes (e.g., "I have nice hair.' and "My classmates in school think that I have good ideas.')

[7] The math and reading scores were not adjusted to child's age/class level prior to analysis as age was included as a confounder in the initial logit models. In addition, the logit model was not weighed given that many of the factors taken into account by weighting are included in the models.

[8] The strengths and emotional difficulties (SDQ) questionnaire was also available but this data was asked of the mother and not the child.

4. Freedom from Anxiety (e.g., "I get worried when we have tests in school.' And "I am often afraid.')
5. Popularity (e.g., "My classmates make fun of me.' and "I am popular with boys/girls.')
6. Happiness and Satisfaction (e.g., "I am a happy person.' And "I am cheerful.').

On all scales, higher scores indicate a higher degree of self-esteem and self-regard and differences in the subscale scores and in the overall scale were notable across the range of family types.

VI CONFOUNDING FACTORS

Ideally, all the variables affecting the selection process should be included in the list of confounding variables, although this is rarely the case, even with longitudinal studies. The range of factors employed is documented below.

Mothers' Characteristics: Demographic characteristics of the mother which were measured include age, height, citizenship, country of birth (classified here as Ireland versus any other) and language spoken in the home (a dummy was employed as English versus others). The mother's education was measured by the highest level of education completed and it was categorised as "none or primary level", "secondary level", "some third level", "degree", or "higher level" education. Religiosity was measured with a 5-point Likert scale of the importance of religion (ranging from "not important at all" to "very important"). Details of the mother's religious affiliation were coded into eight categories with Roman Catholic representing the mode. Both religiosity and religious affiliation are important in terms of the parent's marital status.

Risk Factors: Risk behaviours were measured with the questions of whether the mother smoked during pregnancy and drank alcohol during pregnancy. Socio-economic background was taken into account by including information on whether the mother had a chronic illness prior to childbirth and the degree of difficulty the primary caregiver recalled making ends meet when they were a child (this was a 5 category Likert scale from "extreme difficulty" to "ease"). Finally, a measure which indicated whether the mother had experienced the imprisonment of their partner was included to take account of parental background differences. All these factors relate to the circumstances of the mother prior to the child outcomes of interest was measured.

Child Characteristics: A wide range of factors which have been found to influence child development and vary across families were included here, including birth weight, birth timing, mode of delivery at birth, whether the child was placed in a NICU, the birth order of the study child and whether or not the child was breastfed. The demographic characteristics of the study child were also included (age, gender and country of birth).

VII RESULTS

Differences Across Families

Table 2 presents logit estimates from a series of models predicting family type and it shows a large number of statistically significant differences across family types in the wide-range of confounding factors. Compared to married mothers, never married lone mothers are younger, less educated and less religious, and more likely to be born abroad (Table 2). These lone mothers are also more likely to have smoked whilst pregnant, have had a chronic illness prior to the birth of the study child and have experienced the imprisonment of a partner. The children born to never married mothers tend on average to weigh less than those born to married mothers and they were more likely to be the first born child and to be born in Ireland (see Table 2).

Cohabiting mothers also tend to come from socio-economically deprived backgrounds when compared to married mothers. Cohabiting mothers are statistically significantly different from married mothers in most pre-existing observed covariates which contrast with previously married lone parents who tend to have more in common with their married counterparts given the nature of selection into marriage (Table 2). Cohabiting mothers tend to be younger, less religious/spiritual, have lower levels of education, have had a chronic illness before the child was born and are more likely to have drunk alcohol while pregnant when compared to married mothers, taking account of all the other confounding factors.

Previously married lone mothers are also less likely to report Catholicism as their main faith and more likely to have low educational attainment when compared to married mothers. In terms of risky behaviour most mothers, regardless of family type, did not report to drinking any alcoholic beverages whilst pregnant (with the exception of cohabiting mothers) whereas smoking during pregnancy has a clear gradient; 13 per cent of married mothers smoked while pregnant compared to twice that number of cohabiting or previously-married mothers while almost a third of all never married lone mothers admitted to smoking during pregnancy (weighted raw comparisons). Despite taking account of the range of confounding factors, lone-mothers are significantly more likely to smoke during pregnancy (Table 2).

Table 2: *Odds from Logit Models Predicting Family Type: Unmatched Sample (Comparison: Married Two-parent Families)*

Mothers' Characteristics	*One Parent*		*Two Parent*
	Never Married	*Previously Married*	*Cohabiting*
Age	–0.55***	–0.09*	–0.45***
Age-squared	0.01***	0.003*	0.01***
Height	–0.53	–0.43	–0.35
Height-squared	0.002	0.001	0.00
Religion: Ref No religious affiliation			
Christian	–0.19	0.29	–1.24*
Catholic	–0.53***	–0.51**	–0.55**
Anglican/CoI/Episcop	–0.86	–0.39	–1.24*
Other protestant	0.17	–0.32	0.46
Jewish	1.10	–	–
Muslim	–	–0.21	0.50
Other	0.65	–	0.67
Religious/spiritual (scale)	–0.12	–0.04	–0.24***
Education: Ref none/primary			
Lower Secondary	–0.58*	–0.43	–0.35
Higher secondary	–1.06*	–0.82***	–1.18***
Non-degree	–0.93**	–0.70***	–1.13***
Primary degree	–1.08*	–0.87***	–1.31***
Postgraduate	–0.85***	–0.86***	–2.09***
Native Language English: Ref. Yes	–0.89**	–0.26	–0.50
Citizen: Ref. Irish	–0.38	0.27	0.46
Born Ireland: Ref. Yes	0.55**	0.18	0.29
Risk Factors			
Smoked during pregnancy	0.26***	0.31***	0.13
Drank alcohol during pregnancy	0.13	–0.11	0.32*
History Chronic Illness	0.48**	–0.18	0.45*
As Teen deprived (scale)	–0.01	0.06	–0.09
Partner in prison: Ref. No	2.78***	2.38***	0.74
Study Child Characteristics			
Gender: Ref. Male	0.01	0.07	0.11
Age: Ref. 8			
Aged 9	–0.16	0.51	–0.96
Aged 10	–0.20	1.55	1.23
Birth weight	–0.30**	–0.04	–0.26*
Birth Time: Ref. late birth			
On time	–0.08	–0.05	–0.17
Somewhat early	0.20	0.01	–0.47*
Very early	–0.38	0.42	–1.03

Table 2: *Odds from Logit Models Predicting Family Type: Unmatched Sample (Comparison: Married Two-parent Families) (Contd.)*

Mothers' Characteristics	*One Parent*		*Two Parent*
	Never Married	*Previously Married*	*Cohabiting*
Birth mode: Ref. Normal			
Suction assisted	–0.70**	–0.62**	–0.10
Forceps assisted	–0.05	–0.15	–0.28
Elective caesarean	–0.62**	–0.19	–0.51
Emergency caesarean	–0.51**	0.09	–0.38
Other	0.86	–	0.75
In NICU: Ref. Yes	0.04	0.16	0.00
Breastfed: Ref. Yes	0.18	0.005*	0.09
Born Ireland: Ref. Yes	–0.54**	0.42**	–0.68**
Birth Order	–0.59*	0.03	–0.13
N	6,993	7,004	6,919
Log Likelihood	–1,155***	–1,598***	–1,129***

Note: *** p<0.001, ** p<0.01, and * p<0.05 (two-tailed tests).

Raw comparisons also showed that the lowest propensity to breastfeed was found among the never married cohabiting mothers and never married one-parent families (only 1 in 3 breastfed) compared to almost half (47 per cent) of married mothers and 44 per cent of previously-married lone mothers who breastfed their child. Rates of breastfeeding were, however, related to the background of these mothers and not to family type as evident in Table 2. Once the background characteristics of the mothers were taken into account, there were no differences apparent between cohabiting mothers/never-married lone mothers and married mothers in regard to breastfeeding. Differences were also apparent in mode of delivery at birth across family types but many of the differences were not significant in the logit models although never married lone mothers were significantly less likely to have their child by caesarean section.

The general picture evident in Table 2 is that compared to married mothers, unmarried mothers and cohabiting mothers tend to come from socio-economically disadvantaged populations and that while previously married mothers tended to be more like married mothers, they had significantly lower levels of educational attainment as well as being less likely to report Catholicism as their main faith. One indication of the differing socio-economic history of mothers is the higher propensity of children from lone-mother families to have experienced the traumatic event of having a parent

imprisoned, although the numbers of children experiencing this are generally low.

Matching Results

A covariate balance check was carried out to assess the degree to which the non-traditional families and their matched counterparts overlapped with each other. The groups were well matched, meaning that none of the pre-existing observed covariates bore statistical differences in means between the treatments groups and their matched counterparts. The matched sample achieved a significant percentage reduction in absolute bias.[9]

Table 3 presents the propensity score matching results of the effects of childbearing outside of marriage on child wellbeing. The first and second columns report the raw differences and the propensity score matching estimates, respectively, for each child outcome. The matching estimates are the simple mean probabilities or values of each outcome in the matched sample. To highlight the degree to which selection bias matters, the ratios between the matched and unmatched differences for each outcome are presented in the third column of Table 3. As presented in the last column of the table, all outcome-specific matched samples have fairly strong common support, ranging from 95.2 per cent to 99.1 per cent although common support is stronger for the cohabiting and previously married treatment groups (as in Tables 4 and 5).

With respect to the child's educational performance, the raw estimates show that children from never married one-parent families score on average 11.8 percentage points less on the maths test, 9.95 per cent less on the reading test and missed school on average 2.6 days more when compared to children in married two-parent families. The propensity score matching estimate for maths is less than half the size of this raw estimate (ATT = –4.9), for reading it's a less than a third the size (ATT = –2.9) and school absenteeism is reduced to 1.3 days which is half the size of the raw difference. The size of the differential is, therefore, substantially smaller once selection effects are taken into account but the differences appear to be still statistically significant at the 0.01 level. These standard errors are, however, based on the estimated propensity score so caution is advised in interpreting them. Instead, emphasis is given to the reduction in the size of the differentials post matching.

For health outcomes, the matching estimates did not find any negative effects of growing up in a never-married one-parent family. Comparing this to the unmatched differences implies that selection effects are particularly

[9] See Tables A1 to A3 in the on-line appendix at: www.esr.ie

important in explaining health outcomes between children with a never married lone parent versus those with married parents. In terms of BMI, for example, children living with a never married lone mother were more likely to have a high BMI compared to their married counterparts (0.52 points higher) but the matched estimate is 90 per cent smaller (ATT = 0.06). Children with a never married lone parent were also spending 2.35 days more in hospital as an in-patient compared to children with married parents. Taking account of selection bias accounted for this differential.

Table 3: *Differences in Outcomes for Children in Never Married One-parent Families Compared to their Married Counterparts*

	Outcomes	*Difference Un-matched*	*Difference ATT**	*Ratio ATT to Un-matched*	*Treatment Cases (N)*	*Control Cases (N)*	*Percentage Off Support*
Educational	Maths score	–11.82*	–4.88*	0.41	429	6,469	2.3
	Reading score	–9.95*	–2.92*	0.29	419	6,400	2.1
	Missed school (days)	2.62*	1.30*	0.49	404	6,025	3.3
Physical health	BMI	0.52*	0.06	0.11	408	6,270	2.2
	Hospital visits	2.35*	–0.09	–1.03	438	6,541	2.2
	Dental visits	0.10*	0.03	0.30	438	6,535	2.4
	Fruit in diet	0.09*	0.07	0.77	438	6,543	2.4
Piers-Harris II self-concept	Physical appearance	0.00	0.31	+0.31	400	6,197	3.6
	Popularity with peers	–0.59*	–0.28	0.47	414	6,332	4.3
	Happiness and Satisfaction	–0.25*	–0.09	0.36	408	6,279	3.0
	Freedom Anxiety	–0.66*	–0.28	0.42	407	6,274	3.1
	Behaviour Adjustment	–0.45**	–0.09	0.20	402	6,248	2.0
	Intellectual and School Status	–0.31*	–0.13	0.42	393	6,209	4.8
	Total Piers-Harris score	–1.52*	–0.02	0.01	392	6,130	2.9

Notes: ATT (average treatment effect for the treated) from PSM analysis.
Standard errors are from random effects GLS models – these do not take into account that the propensity score is estimated *** p<0.001, ** p<0.01, and * p<0.05.

In terms of a child's self-concept, the raw estimates for the Piers-Harris self-concept score showed that never married lone-parenting is associated with

negative child self-concept. The effect size was in most cases substantially reduced post-matching (in Table 3 with the exception of the scores on the "Physical Appearance" subscale). Children in never married one-parent families had a lower average score (0.66 points lower) than those in married families on the "Freedom from Anxiety" subscale, indicating that they more frequently reported feelings of anxiety than children with married parents. After taking account of selection effects, this score was almost 60 per cent smaller (ATT = –0.28). A negative effect was evident for the child's own perception of their popularity with the raw estimate 0.59 points lower on the scale compared to children from married two-parent families. The matching estimate is, however, half that of the raw estimate (ATT = –0.28).

Taking account of selection bias therefore helped us understand differences in the child's own perception; after taking account of selection bias the total score on the Piers Harris scale was 99 per cent smaller than the raw estimate (ATT = –0.02). In all cases, except for physical image, the children from never married one-parent families had a lower average score than their married counterparts, pre and post-matching in relation to this scale (Table 3).

Table 4 presents the effects of growing up in a previously-married one-parent family on child outcomes. The last column in Table 4 indicates that the propensity score matching method succeeds in locating almost all previously married women who share similar pre-existing observed characteristics with married mothers. In other words, this model achieved strong common support (98.4 to 98.9 per cent).[10]

With respect to the child's educational attainment, children from divorced, separated or widowed families score on average 6 percentage points less in the maths test, 4.8 less in reading and miss school on average 2.6 days more compared to children in married two-parent families. The matching estimates are substantially smaller than these raw differences. Selection bias accounted for 63 per cent of the difference in reading scores (ATT = –1.77), 42 per cent of the difference in maths scores (ATT = -3.54) and 17 per cent of the differences in school attendance rates (ATT = –1.69).

For health outcomes, the matching estimates were smaller in all regards but to varying degrees. Children growing up in a previously-married one-parent family were on average 0.42 points higher on BMI but the matching estimate (ATT) was 0.29 higher when compared to their married counterparts (Table 4). The matching estimate for hospital visits was 70 per cent smaller than the raw estimate with children from previously-married one-parent

[10] One implication of using multiple treatment groups is that the matching exercise can work better for one group compared to another – Table 4 has stronger common support when compared to the percentage of off-support cases in Table 3.

families spending 0.31 days longer in hospital as an in-patient post-matching. Children with previously married parents were also slightly more likely to visit the dentist pre and post-matching (Table 4).

Table 4: *Differences in Outcomes for Children in Previously Married One-Parent Families Compared to their Married Counterparts*

	Outcomes	*Difference Un-matched*	*Difference ATT**	*Ratio ATT to Un-matched*	*Treatment Cases (N)*	*Control Cases (N)*	*Percentage Off Support*
Educational	Maths score	–6.08*	–3.54*	.58	437	6,476	1.3
	Reading score	–4.82*	–1.77	.37	435	6,406	1.1
	Missed school (days)	2.03*	1.69*	.83	421	6,034	0.9
Physical health	BMI	0.42*	0.29	.69	413	6,275	1.6
	Hospital visits	1.05	0.31	.29	447	6,548	1.3
	Dental visits	0.15*	0.13*	.87	446	6,543	1.3
	Fruit in diet	0.03	0.00	–	446	6,550	1.3
Piers-Harris II self-concept	Physical appearance	–0.06	0.01	1.16	423	6200	1.1
	Popularity with peers	–0.35*	–0.17	.48	430	6336	1.1
	Happiness and Satisfaction	–0.32*	–0.25*	.78	427	6283	1.2
	Freedom Anxiety	–0.36*	–0.18	.50	426	6278	1.1
	Behaviour Adjustment	–0.30**	–0.19	.63	427	6252	1.1
	Intellectual and School Status	–0.26	–0.09	.35	423	6221	1.1
	Total Piers-Harris score	–1.18**	–0.66	*.56*	415	6134	1.1*

Notes: ATT (average treatment effect for the treated) from PSM analysis.
Standard errors are from random effects GLS models – these do not take into account that the propensity score is estimated *** p<0.001, ** p<0.01, and * p<0.05.

The matching estimates for the child's self-concept scores show that selection effects also account for much of the difference in estimates. Children with a previously married mother had a lower average score (0.32 point lower) than their married counterparts on the "Happiness and Satisfaction" subscale, indicating they reported more negative attitudes about their happiness. This effect was 0.25 points lower after taking account of selection effects. After taking account of selection bias the total score on the Piers Harris scale was

44 per cent smaller than the raw estimate (ATT = –0.66). Comparing the effects noted in both Tables 3 and 4, it appears that the effects of growing up in a one-parent family matter most in terms of a child's educational development, particularly in relation to the maths and reading scores of children in never married one-parent families.

There is very little known about the nature of cohabitation in Ireland and the ability to distinguish between cohabitation families and other family types in the GUI study is an important development. In the 2006 Census, 5 per cent of all children were living with a cohabiting couple (CSO, 2007). The only Irish research to focus exclusively on cohabiting couples found that within seven years, three-quarters of cohabiting couples had either separated or married (O'Donoghue and Halpin, 2005). In other words, the cohabitees with children who appear in this study represent a select minority of cohabitees (Lunn *et al.,* 2009) and step-families/re-constituted families are excluded. In addition, many of the married control group may have been cohabiting at the time of birth of the study child but because information was not collected on the date of marriage, it was not possible to identify those married couples who had started out cohabiting. Bearing this in mind, caution is advised in making any generalisation based on the nature of cohabitation in Ireland based on the results displayed in Table 5.

Compared to their married counterparts, children with cohabiting parents scored 10 percentage points less in the maths test, 11 per cent less in reading and missed school on average 2.35 days more. The size of the differential is reduced once selection bias is taken into consideration; the propensity score estimate for reading is almost a third that of the raw estimates and is 40 per cent smaller for maths (ATT in Table 5). For health outcomes, the matching estimates reveal a positive effect of cohabitation with these children less likely to spend time in hospital compared to their married counterparts (ATT = –0.45 days). In addition, selection effects account for most of the initial difference in BMI (ATT = 0.18).

In terms of self-concept, children with cohabiting parents had, for example, a lower average score on the "Behavioural Adjustment" subscale (0.27 points lower post-matching) than their married counterparts, indicating that they more frequently endorsed negative statements about their behaviour. These children also reported a lower average score (0.15 point lower) than their married counterparts on the "Happiness and Satisfaction" subscale and 0.24 points lower on the "Intellectual and School Status" subscale, indicating they reported more negative attitudes about their happiness levels and intellectual image. These matched estimates are in all cases significantly smaller (40 per cent and 44 per cent respectively). In terms of the total Piers-Harris score, the matched estimate was 80 per cent smaller

than the raw difference in total score (Table 5). It is apparent that selection effects matter across the range of child outcomes to varying degrees regardless of family structure.

Table 5: *Differences in Outcomes for Children in Cohabiting Families Compared to their Married Counterparts*

	Outcomes	*Difference Un-matched*	*Difference ATT**	*Ratio ATT to Un-matched*	*Treatment Cases (N)*	*Control Cases (N)*	*Percentage Off Support*
Educational	Maths score	–10.15*	–3.53*	.35	331	6,499	2.1
	Reading score	–11.01 *	–4.46*	.40	327	6,429	1.8
	Missed school (days)	2.35*	1.36*	.58	303	6,057	1.9
Physical health	BMI	0.49*	0.18	.37	299	6,297	2.3
	Hospital visits	1.24	–.45	1.36	337	6,527	2.0
	Dental visits	0.10	0.10	–	337	6,566	2.0
	Fruit in diet	–0.02	–0.05	2.5	337	6,574	2.0
Piers-Harris II self-concept	Physical appearance	0.02	0.18	9	311	6224	2.5
	Popularity with peers	–0.28*	–0.13	.46	321	6,360	2.1
	Happiness and Satisfaction	–0.25*	–0.15	.60	318	6,307	2.1
	Freedom Anxiety	–0.40*	0.08	1.2	319	6,302	2.1
	Behaviour Adjustment	–0.51*	–0.27	.53	314	6,276	2.2
	Intellectual and School Status	–0.43	–0.24	.56	315	6,235	2.2
	Total Piers-Harris score	–1.36*	–.26	*.19*	305	6,157	2.2*

Notes: ATT (average treatment effect for the treated) from PSM analysis.

Standard errors are from random effects GLS models – these do not take into account that the propensity score is estimated *** p<0.001, ** p<0.01, and * p<0.05.

It is important to remember that the child cohort data employed here are representative of nine-year old children and therefore they are not meant to be representative of families, in particular the data is not representative of cohabiting families. This cohabiting group does not include step-families so that the effects of cohabitation per se are isolated rather than the effects on children of adjusting to a new parent. Fahey *et al*. (2013) provided some analyses on the effects of cohabitation and step-families on four measures of

child wellbeing. Similar to the results presented here, they found that after controlling for confounding factors, family type was not a strong influence; differences on four indicators of child wellbeing between children of two-parent married families, cohabiting families, step-families and lone parent families were slight or completely absent (Fahey, Keilthy and Polek, 2013).

Overall, the propensity score matching results show that selection effects play an important role in explaining differences across families in child outcomes. Children from one-parent families and cohabiting families have lower levels of educational development, poorer health and lower self-concept scores *but* much of these negative effects result non-trivially from their pre-existing disadvantages; and yet, there remain some modest differences between children particularly in relation to educational development. Growing up in a non-traditional family has relatively smaller effects on health outcomes and psychological wellbeing when compared to the differences in educational scores across family types.

In general, the matching results suggest that even when faced with similarly adverse conditions when growing up, children with married parents fare better than those in other family types. This is not surprising since the models could not include some important confounders which were not collected in the GUI study such as income/employment prior to the birth of the child and information on social class background.[11] The aim of this paper was to take account of selection bias by taking into consideration a range of socio-economic background factors but differences in the current resources of families are likely to explain much of the remaining differences in child outcomes noted post-matching. A sensitivity analysis using the Rosenbaum bounds method to address the role of unobserved heterogeneity – hidden bias – found that the estimates reported are upwardly biased.[12] It is expected that as more data from the GUI study are collected, more robust models will be developed which document the power of sophisticated statistical techniques such as propensity score matching.

VIII CONCLUSIONS

Studies of childbearing outside of marriage or marital breakdown and their socio-economic consequences have been concerned about possible omitted variables and selection biases that are critical to estimate the "true" effect on

[11] Current social class was available but this was not used as a confounding variable since it did not relate to class background of the study child's mother.
[12] Available from the authors on request.

children of growing up in a non-traditional family. The propensity score matching analysis employed here is designed to shed new light onto this line of research; first by providing a more accurate assessment of the effects on children of growing up in non-traditional families in Ireland and secondly, by looking at a range of family structures. The main finding is that the socio-economic disadvantages inherent in childbearing outside of marriage account for a non-trivial proportion of the effects of family type, meaning that the selection bias problem results in an over-estimation of the negative effects of lone-parenthood in models which do not take account of background factors.

When children in non-traditional families are compared to their matched counterparts who are similar in every observed pre-existing characteristic except family type, lone-parenthood and cohabitation have some negative effects on early child outcomes, in particular, educational outcomes. Endogeneity of family structure was not, however ,fully accounted for in the models presented here. Despite this limitation, it is interesting to note the differential power of selection effects dependent on the child outcomes of interest. Maths scores, for example, are prone to selection bias but modest differences in these scores remain across families post-matching. In future waves of the data, it will be important to assess the longer-term implications of family type on child outcomes, particularly in relation to the child's educational development which was found to be particularly adversely affected despite matching.

In addition, much of the residual family structure "effects" noted here will include pathways working through current economic circumstances, such as current income. Income effects were not included in our models although they are to some extent captured in the range of confounding factors, such as educational level and family background. Income differences across families are, therefore, viewed as a consequence of antecedent factors rather than taken as the main explanation of the relationship between child outcomes and family structure.

Other important factors missing include current neighbourhood and schools factors which will be particularly relevant in understanding differences in the child's educational development. Although school level clustering was taken into account, school level factors such as school type, school size and neighbourhood location were not. Finally, it was not possible to capture the sequence of decisions relating to family formation. This was particularly problematic given that date of marriage was not asked of the control group. More generally, given that a single wave of data was available, it was difficult to adhere strictly to the requirement of propensity score matching that only covariates measured prior to the treatment taking place were included.

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