



**UCD GEARY INSTITUTE  
DISCUSSION PAPER  
SERIES**

**THE EARLY CHILDHOOD DETERMINANTS OF TIME PREFERENCES**

**Liam Delaney\***

UCD Geary Institute, UCD School of Economics, & UCD School of Public Health and  
Population Science, University College Dublin

[liam.delaney@ucd.ie](mailto:liam.delaney@ucd.ie) Tel: 00353 1 7164613, Fax: 00353 1 7161108

**Orla Doyle**

UCD Geary Institute & UCD School of Public Health and Population Science, University College  
Dublin

[orla.doyle@ucd.ie](mailto:orla.doyle@ucd.ie) Tel: 00353 1 7164637, Fax: 00353 1 7161108

December 15<sup>th</sup> 2008

**Abstract:**

Research on time preference formation and socioeconomic differences in discounting has received little attention to date. This article examines the extent to which early childhood differences emerge in measures of hyperactivity, impulsivity and persistence, all of which are good psychometric analogues to how economists conceptualise discounting. We examine the distribution of these traits measured at age three across parental social class and analyse the extent to which different mechanism plausibly generate the observed social class distribution. In addition, we control for a wide ranging of potentially mediating factors including parental investment and proxies for maternal time preferences. Our results show substantial social class variations across all measures. We find only weak evidence that this relates to differential maternal time preferences (e.g. savings behaviour, abstaining from smoking) but relatively stronger evidence that these traits are transmitted through the parents own non-cognitive skill set (self-esteem, attachment etc.) and parental time investments (e.g. time spent reading to the child and teaching the child to write, sing etc.).

---

\* Corresponding author. Address: UCD Geary Institute, University College Dublin, Belfield, Dublin 4, Ireland. Permission to use the UK Millennium Cohort Study given by the ESRC Data Archive at Essex is gratefully acknowledged.

## I. Introduction

Understanding how people discount the future at different points in their life and the factors that influence time preference formation is a key issue for the economics of human development. Time preferences measure the extent to which current gratification is delayed for later reward. The primary focus to date is on adult discounting and its impact on educational success, employment, earnings, financial decision making, and more recently, on health and criminal behaviour. Yet understanding the formation of discounting and differences in time preferences is an important task and one that has been overlooked in the literature. In particular, there has been little work examining the determinants of time preferences in terms of investments made by parents, with far more attention being paid to early differences in IQ and other cognitive skills.

Several models have examined either purely exogenous time preferences or time preferences endogenously determined by individuals as a response to external circumstances (e.g. Becker and Mulligan, 1997). According to Becker and Mulligan (1997) “*many future investments in future-orientated capital may occur during childhood and richer households have more resources to make those investments*”. They infer that the external environment may influence time preferences, and that these circumstances may matter most in childhood. They also suggest that there are socioeconomic differences in parents’ ability to invest in their children’s time preferences, however, there is no substantial empirical evidence to support these claims.

There is a wealth of evidence in the child development literature indicating that parental socioeconomic status (SES) is a major predictor of a child’s cognitive and non-cognitive development. Children from low SES backgrounds, as measured by parental

education and income, typically have lower scores on cognitive tests (Brooks-Gunn et al., 1999; Feinstein, 2003), poorer socio-emotional and behavioural skills (Doyle et al. 2007) and worse health outcomes (Petrou and Kupek, 2005; Case et al. 2002) in childhood. These socioeconomic inequalities open up very early in life and operate through a range of factors including quality of the home environment, financial resources, and parenting practices (Blau, 1999; Carneiro and Heckman, 2003; Najman et al., 2004). If we consider time preferences as a non-cognitive skill (see Heckman et al. (2008) for a discussion), then it seems intuitive that parents and early childhood factors outside the individuals control may also have an input in the formation of time preferences.

With this in mind, this article examines a number of key issues. We first examine the extent to which time preferences vary early in the life-cycle according to parental social class as measured by parental education and income. Second, we examine the extent to which child time preferences vary by parental investment, discounting, and non-cognitive skills. Third, we examine the potential channels through which this gradient is transmitted to child time preferences. The UK Millennium Cohort Study allows us to exploit a particularly rich set of information on financial, time and care investments on behalf of the parents, in addition to a set of proxies for child time preferences as measured at age three.

The article is structured as follows. Section 2 examines the literature on time preferences and the role of behavioural and psychometric outcomes and, in particular, the early development of time preferences. Section 3 outlines the data and statistical methodologies employed in this paper. Section 4 outlines the results of several models examining early influences on time preferences among children. Section 5 concludes.

## **II. Theories of the Formation of Time Preferences**

The literature on time preferences is reviewed in depth by Frederick et al (2002). Their review stresses that the assumption of exogenous, stable and stationary time preferences has become increasingly problematic and that a preponderance of evidence suggests that time preferences are path-dependent, domain specific, hyperbolic, subject to current pressures and several other features that counter standard rational choice assumptions. For example, Becker and Mulligan (1997) argue that individuals themselves can alter their time preferences by spending time taking part in activities that increase the value of future pleasures. Recent work by Heckman and colleagues (2008) has furthermore pointed to the key role of non-cognitive skills in human development and labour market outcomes and has argued for the development of psychometric analogues to economic parameters that permit estimation of key behavioural relationships.

Much work in psychology gives credence to the idea that impulsivity can have marked effects on later life outcomes and differences in impulsivity emerge early in life. For example, pioneering work by Mischel et al. (1966) examines delay of gratification in children. The aim of their work is to determine if young children can postpone immediate gratification (in the form of marshmallows) for later reward (additional marshmallows). The 'Marshmallow experiments' were conducted in the 1960's with four-year olds and the participating children were followed into adolescence. The follow-up study revealed that children who could delay gratification for longer had higher intelligent, greater academic achievement and were more socially competent, self-assertive and had higher self-esteem as adolescence (Mischel et al. 1989; Shoda et al. 1990). Similar experiments

with other rewards and on children of difference ages have since been conducted (Levy, 1976; Mauro and Harris, 2000).

The majority of work on delay of gratification among children comes from the psychology literature. The only analogous study in the economics literature is by Bettinger and Slonim (2007) who examine patience among children. They find evidence of hyperbolic discounting using a field experiment in which they vary both the timing and the level of monetary compensation offered to children aged between 5 and 16. They also find that boys and younger children are more impatient than girls and older children. However, they find no relationship between private schooling, mathematical test scores and parental patience in explaining children's patience. This is inconsistent with a view that parental investments are generating children's time preferences. In addition, it is inconsistent with a view that there is even intergenerational transmission of time preferences.

The existence of intergenerational transmission of time preferences, or the correlation between parental and child attitudes, have also been examined using large representative panel studies. Dohmen et al. (2007) find that the best predictor of children's attitudes in a particular domain were parents attitudes in the same domain and point toward substantial intergenerational transmission of several economically relevant attitudes and beliefs. In this case, all the children were adults making it more difficult to argue direct transmission. In addition, a recent article by Cipriani, Giuliano and Jeanne (2007) find there is no significant correlation between maternal pro-social values and that of their children.

Bishai (2004) is one of the few papers to examine how family factors influence time preferences. Using data from the NLSY, he finds that the future is valued more highly by older people, more education people, non-whites and males. He also finds that higher IQ predicts higher future valuation. However, he also finds that early family factors, as proxied by family size and single-parent households at age 14, do not have a significant effect on future time preferences as measured by occupational fatality risk. Yet, it is clear that there are several factors in early childhood that could potentially affect time preferences that are not captured by family size and that this result should not be seen as conclusive. In addition, the family factors are measured quite late in childhood.

One approach that has not been applied in the economics literature is to examine the formation of time preferences by examining early differences in time preferences as measured by psychometric scales. Psychometric markers of impulsivity are one clear contender for a good analogue with the economic idea of time preferences. Fredrick et al.'s (2000) typology suggest that time preferences are tri-dimensional, comprising of three separate underlying psychometric motives including *Impulsivity* (the tendency to act spontaneously and without planning), *Compulsivity* (the tendency to stick with plans) and *Inhibition* (the ability to override automatic responses to urges or emotions). Few studies to date have empirically tested the early factors influencing time preference formation using such psychometric measures.

In this article, we utilise a new rich data source on longitudinal child development to examine the extent to which early differences emerge in measures of hyperactivity, impulsivity and persistence, all of which are good psychometric analogues to how economists conceptualise discounting and all of which are reliably measured in children.

We examine the distribution of these traits across parental social class and then analyse the extent to which different mechanism plausibly generate the observed social class distribution. The nature of this specification can be modelled as a simple production function where parents produce a given level of childhood time preference. In the simplest of models, parental endowments and inputs are given exogenously and have a direct causal impact on the time preference of the child.

This model allows us to test the plausibility of different functional forms of the child time preference production function with respect to parental endowments and parental inputs. The nature of the data renders precise causal identification of the coefficients untenable. However, the models estimated provide extremely strong evidence on the relative weights of different types of input in generating time preferences among children.

### **III. Data and Methodology**

#### *Sample*

Data are drawn from the Millennium Development Cohort (MCS) study, a longitudinal study of 18,819 children who were born in the UK between 2000-2002. The MCS sample was clustered geographically by electoral wards (over 400 in total) and was constructed to over-represent areas of disadvantage, communities with high concentrations of ethnic minorities (England only), and the three smaller countries of the UK. All estimations in the study therefore include weights to account for the sampling procedure. The sample was identified through Child Benefit records provided by the Department of Social Security.

There have been two waves of the study to date. Wave 1, which was carried out when the children were nine months old, involved interviews with mothers and their partners on questions relating to the pregnancy and the delivery, the child's health and development, childcare and parenting practices, and their participation in employment and education. The second wave was conducted over two years later, and contains information on the parental situation, child's health, childcare, employment and income, the nature of parenting activities. The children's cognitive and social-emotional development was also assessed and their physical measurements taken.

*Dependent Variables*

Using Fredrick's typology to guide us on the optimal measures of time preferences, we identified seven items in the MCS dataset which best captures time preferences in childhood. Respondents, typically the mother, were asked to rate their children (age 3) on a series of questions regarding temperament and personality traits. Five of the items form part of the Strengths and Difficulties Questionnaire (SDQ) which is used to assess the psychological adjustment of the children (Goodman, 1997). The SDQ comprises 25 parental reported attributes, which can be divided into 5 scales – emotional symptoms scale, conduct problems scale, hyperactivity scale, peer problems scale, and the prosocial scale, each consisting of 5 questions on a 3-point Likert scale. The SDQ has a high correlation with the traditional Achenbach and the Rutter questionnaires (Koskelainen et al. 2000) and is externally validated. See Goodman (2001) for a description of the psychometric properties and validity of the SDQ. General statements are provided and for each, mothers are asked to assess how accurately it applies to their child as “Not True, Somewhat True, Certainly True, or Can't Say”. The following five questions form part of



the hyperactivity scale: (1) *“Restless, overactive, cannot stay still for long”*; (2) *“Constantly fidgeting or squirming”*; (3) *“Easily distracted, concentration wanders”*; (4) *“Sees tasks through to the end, good attention span”*; (5) *“Can stop and think things out before acting”*. The final two items used were included in MCS as part of a set of questions which correspond to the Child Social Competence and Behaviour scale which was used as part of the Sure Start Assessment: (6) *“Is impulsive, acts without thinking”* and (7) *“Persists in the face of difficult tasks”*. Items (1), (2), and (3) best correspond to ‘Inhibition’. Items (4), (5) and (7) correspond to ‘Compulsivity’, and item (6) measures ‘Impulsivity’. All relevant responses were reverse scored such that higher values represent higher rates of time preference.

To determine the degree to which the seven items are related to each other, and consequently may represent time preferences, we use factor analysis. This technique permits the identification of groups of inter-related variables and to determine how they are related to each other. Specifically, it reduces the number of variables into factors by describing the linear combinations of the variables that contain most of the information. Table 1 shows that two factors were identified and retained. The first time preference factor rates the following four variables with the strongest inter-relatedness: (1) *“Restless, overactive, cannot stay still for long”*; (2) *“Constantly fidgeting or squirming”*; (3) *“Easily distracted, concentration wanders”*; (6) *“Is impulsive, acts without thinking”*. The degree of correlation between the summative rating (Likert, 1932) of these four items and the underlying factor is good (Cronbach’s alpha is 0.75). The second factor is based on the following three variables: (4) *“Does not see tasks through to the end, good attention span”*; (5) *“Cannot stop and think before acting”*; (7)

*“Does not persist in the face of difficult tasks”* and the Cronbach alpha is 0.50. The second factor matches Fredrick’s et al (2001) ‘conformity’ dimension, while the first factor combines both the measures of ‘impulsiveness’ and ‘compulsiveness’. Our estimation includes all seven individual items, in addition to the two factors.

### **Independent Variables**

The advantage of the MCS data is that it provides a wealth of information on parental investment, family resources and parental time preferences that has been notably absent from other studies in this field. We include five sets of covariates: child characteristics, family SES factors, proxies of maternal time preferences and non-cognitive skills, and parental investment inputs.

#### *Child Characteristics*

*Child gender* indicates the sex of the child (base category is male). *Child age* measures the age of the child, in months, at the second interview. *Child birth weight* measures the birth weight of the child in kilograms. *Number of siblings* indicates the number of the siblings the child has living in the household at interview two, while *Natural Birth Order* is the child’s rank by age among his/her natural siblings. *Child ethnicity* indicates the child’s ethnic origin. The predominant ethnic group is Whites, followed by Pakistani or Bangladeshi and Blacks. The base category is Whites.

#### *Family SES characteristics*

Family SES is measured by maternal education and household income. *Household income* measures the total annual household income at the time of the second interview. As the income data are given in brackets, we use midpoints to approximate total household income. *Mother's education* is measured by the highest education level obtained. The education categories include higher and first degrees, diplomas in higher education, a/as/s levels, and gcse grades (a-c) and (d-g). The base category is gcse grades d-g.

#### *Maternal Time Preferences & Non-cognitive skills*

We include four items which best approximate maternal time preferences. These include *mother saves*, which is a binary variable indicating whether the mother regular saves money; *number of cigarettes smoked* indicates the number of cigarettes the mother smoked per day when pregnant; *young mother* is a binary variable indicating if the mother was under the age of 21 when she had her first child; and *duration breastfed* indicates the length for which the cohort member was breastfeed (nonexclusively, in weeks). We also include three psychometric measures that capture maternal non-cognitive skills when the child was nine months old. These include *mother malaise* which measures the stress experienced by the mothers (higher scores indicate more stress) and is adopted from 9 of the original 23 items in the Malaise Inventory questionnaire (Rutter et al., 1970); *maternal attachment* which assesses postnatal mother-to-child attachment using six questions of the original Condon Maternal Attachment Scale (Condon and Corkindale, 1998) where higher scores indicate greater attachment; and finally *maternal self-esteem*, which measures the mothers self-esteem using a short-form of the Rosenberg

self-esteem scale (Rosenberg, 1965). We also include two additional maternal characteristics including the *mother's age*, in years, at the time of the child's birth and *mother single at birth* which is a dummy to indicate whether the mother was single at the time he/she was born.

#### *Parental Investment Inputs*

We include three instruments to capture parental investment in their child's development. These include the amount of time and the types of activities the parents engage in with their child, a measure of the quality of the home environment and a measure of parental discipline. The measure of *parental time inputs* includes 7 items related to the how often someone in the home teaches the child to learn the alphabet, count, sing, draw, play sport, and how often someone reads to the child and takes them to the library. Principal component factor analysis, conducted with the 7 items, revealed two independent factors, the first consisting of the first 5 items and the second consisting of the remaining 2.

The *HOME* score is the household's score on a short-form version of the Home Observation Measurement of the Environment scale (Cadwell and Bradley, 1984), which assesses the quality and quantity of stimulation and support available to a child in the home.

Finally we include a measure of *parental discipline* to control for the impact of discipline style on time preference formation. While several measures of parenting style are available in MCS, the item that best intuitively influences time preferences is the following: "*How often do you bribe [CHILD] with sweets or treats when he is naughty?*" Responses are reported on a 5-point scale ranging from never to daily.

Note, as there were a high number of missing values for three of the variables included in the analysis (maternal self-esteem, maternal attachment, HOME score), we include three dummy variables indicating the missing values in the three instruments to capture potential biases, rather than simply excluding these observations for which there are no data.

## **V. Results**

Table 2 displays the results of nine separate regression models of markers of discounting regressed on several measures of socio-economic status and parental investment behaviours. As the dependent variables in the first seven models are categorical, ordered logit models are estimated. OLS is used in the remaining two factor models.

Of the five dimensions examined in the analysis – many child characteristics have the least impact on time preferences. Even at this young age, females score lower than males on all markers of impulsivity and time preferences. Yet none of the remaining child characteristics display such a consistent pattern across all measures of time preferences. Age of the child, number of siblings, and ethnicity play a minor role in time preference formation while low birth weight is associated being easy distracted, restless and seeing tasks through. Younger siblings have higher time preferences in terms of impulsivity and inhibition than younger siblings. Racial/cultural differences in measures of impulsivity are inconsistent across measures.

There is very strong evidence for a socio-economic gradient across all measures of time preferences that persists once one controls for several different types of parental inputs. Higher levels of maternal education are associated with lower child time

preferences. The impact is greatest for higher levels of education, particularly for mothers with a third-level degree. The result is consistent across all measures except ‘constantly fidgets/squirms’. Household income, on the other hand, has a greater effect on factor 1 (measures of impulsivity and inhibition) than factor 2 (compulsivity). Children living in households with greater levels of family income are less likely to be impulsive than children from lower income families. Therefore there is evidence of a strong social gradient in time preferences which open up by age 3.

With respect to the extent to which parental inputs affect time preferences, we find evidence that such effects are significant, but they explain very little of the socio-economic status coefficients. Parental discipline plays the strongest role - children whose parents bribe them with treats when they are naughty are more likely to display higher rates of time preferences – this effect is consistent across all seven individual items and the two factor models. Parental time investments also play a role, albeit a less consistent one. In terms of the parental reading/library factor – children who are read to more frequently and brought to the library have lower levels of impulsivity and greater levels of inhibition and compulsivity. The parental teaching factor shows that children whose parents spend more time teaching them basic activities such as the alphabet, drawing, singings, sports etc. are less likely to have high time preferences, although it has no statistical impact on impulsiveness or fidgets. Finally, the quality of the home environment is also associated with improved children’s time preference orientations, however the effect is not consistent across all measures.

A unique feature of MCS is that it allows us to control for a wide-range of maternal time preference proxies as measured by both behavioural outcomes and

psychometric tests. Overall we find that the behavioural indicators have less of an impact on child time preferences than the mother's latent factors, which are indicative of non-cognitive traits. Maternal depression, maternal attachment and maternal self-esteem are all strongly associated with the seven measures of time preferences, with fidgets again being the exception. Lower levels of maternal depression and higher levels of maternal self-esteem and attachment are associated with less impulsiveness and more compulsiveness. While our closest behavioural measure of time preferences - the mother's savings behaviour - has little effect. In addition, maternal smoking during pregnancy, being a very young mother or a single mother, do not have a great impact on child time preferences. The only behavioural proxy of time preference that plays a role is breastfeeding duration. Children who are breastfed for longer periods are typically less impulsive, less easily distracted and restless, and are better able to persist at tasks.

In sum, we find a strong socio-economic gradient to children's time preferences that emerges very early in life. We find that this relationship persists even controlling for a number of parental investment dimensions and proxies for maternal time preferences. We find evidence that the external environment and the amount of investments made by the family into the child's development can explain these socio-economic differences. In addition, the traditional adult measures of time preferences typically used in this field, such as savings behaviour and smoking, play a far smaller role than the more psychometric measures of time preferences, which may represent the underlying non-cognitive skills of the mother and her ability to parent.

Table 1 displays rotated factor matrix loadings for the main SDQ items analysed above. As discussed, the items group on to two main factors with the first corresponding

to the impulsivity and inhibition items from the Frederick et al. article and the second corresponding to their compulsivity item. The final two columns in Table 2 examine the extent to which scores on these two factors are predicted by the variables included in the analysis. We find that the impulsivity and inhibition factor is generally better predicted by the variables employed in the analysis, than the compulsivity factor. In particular, home inputs far better predict impulsivity and inhibition than compulsivity, as does household income.

Our strategy of choosing the time preference items on the basis of face validity and a theoretical taxonomy can be seen in the light of other ways of reducing the large amount of items that could potentially be used. Table 3 displays the factor loadings from a wider analysis incorporating all elements of the SDQ as well as the two additional items selected for the analysis. As can be clearly seen, Factor 1 corresponds very closely to the impulsivity factor emerging from the original analysis. Furthermore, the main compulsivity items load strongly together in Factor 2. Interestingly, a number of items relating to prosocial behaviour also load strongly on this factor suggesting a strong link between persistence and pro-social behaviour, something that has been examined in a number of recent papers (e.g. Curry et al. 2008). When we isolate the hyperactivity scale of the SDQ, which is clearly most relevant scale a priori, and combine this with the two items chosen, it is once again clear that the original items chosen on the basis of face validity are also those that load most strongly together in the factor analysis.

## **6. Conclusions**



This paper demonstrates substantial socioeconomic gradients in a strong set of proxies for time discounting in children under the age of three. These gradients are poorly explained by parental inputs, aspects of the home environment, psychological characteristics of parents, health behaviour of parents, ethnicity and family structure. Our results provide evidence that differences in parental investment do not wholly underpin socioeconomic gradients in preference formation, though such inputs directly predict preferences to a significant extent. The size and representativeness of the data used in the analysis, combined with the wide range of inputs that were included, make these results more compelling.

A puzzle emerging from these results is the low value associated with a very wide range of parental and home characteristics in explaining the social gradient in children's time preferences. There are clearly potential unobserved family factors, such as genetics, that may explain this remaining gap. Similarly, the analysis does not include measures of neighborhood or regional-level cultural and environmental variables that might underpin the socioeconomic gradient. The low value of parental inputs in mediating the role between social class and preferences is inconsistent with a deterministic view of the role parent's behaviour plays in shaping social gradients. It is possible that parental inputs react to evolving child preferences such that children with strong levels of persistence may not need nor receive as much attention and inputs from their parents. Such simultaneity may underestimate the role of these inputs and their explanatory powers in terms of explaining socioeconomic gradients.

Evidence emerging from early intervention in parental and home environments provides compelling evidence on the extent to which preferences and traits are altered by environmental characteristics early in life. Furthermore, it may be possible that differential reporting by socioeconomic group are leading to an overstating of differences. If this were the case, we would need to assume that parents from lower socioeconomic groups adopted a stricter standard for rating their children's persistence and so forth. While we cannot assess this, it seems unlikely to be the case and perhaps the opposite may be true, which would mean that socioeconomic differences were being understated.

The extent to which psychometric measures such as those used in this article are truly analogous to economic concepts of discounting is a topic for significant further debate. There are a number of ways of conceptualizing this. In one sense, they are simply imperfect proxies for time discounting and perhaps the only types of measures suitable for collection in very young children. In another sense, such measures can be viewed directly as the psychological foundations of economic preferences. Traits such as persistence and basic processing of consequences may provide an adequate account of the psychological capacities needed to regulate intertemporal tradeoffs faced by younger children. With older children and adolescents, we may add such capacities as numeracy, advanced emotional control processes, and capacity to imagine the future and elaborate upon outcomes. Such capacities allow older children and adolescents to navigate the core tasks that they face which involve scarcity and inter-temporal trade-offs and underpin such decisions as schooling and health decisions. Future research arising from this study will enable the examination of the development of these capacities throughout the life

cycle including, as in the Heckman framework, examining how later and higher order capacities depend causally on the development of these earlier ones.

Much of the current literature on behavioural interventions with adults has focused on incentive mechanisms which enable people to overcome problems associated with hyperbolic discounting and time-inconsistent decisions. Yet, there is also a clear need to examine the extent to which time preferences are formed in early years and the extent to which the initial conditions can be influenced with well-tailored interventions. Evidence found in this paper suggest that preferences are formed early in life and that the quality and nature of parental investment and the early environment may have a subsequent effect on preference formation.

## References

- BECKER, G.S. & MULLIGAN, C.B. (1997), “The endogenous determination of time preference”, *The Quarterly Journal of Economics*, 112(3): 729-758
- BETTINGER, E. & SLONIM, R. (2007), “Patience among children”, *Journal of Public Economics*, 91: 343–363.
- BISHAI, D.M. (2004), “Does Time Preference Change With Age?”, *Journal of Population Economics*, 17: 583-602
- BLAU, D. (1999), “The effect of income on child development”, *The Review of Economics and Statistics*, 81(2): 261–276
- BROOKS-GUNN J., BRITTO P.R., & BRADY, C. (1999), “Struggling to make ends meet: Poverty and child development”. In: Lamb, M.E. (ed.). *Parenting and Child Development in “Nontraditional” Families* (pp. 279-304) Mahwah, NJ: Lawrence Erlbaum Associates.
- CADWELL, B.M. & BRADLEY, R.H. (1984), *Home observation for measurement of the home environment* (Rev, ed). Littlerock: University of Arkansas.
- CARNEIRO, P. & HECKMAN, J.J. (2003). “Human Capital Policy”. In Heckman, J. & Krueger, A. (Eds). *Inequality in America: What Role for Human Capital Policy?* (pp. 77–240). MIT Press.
- CASE, A., LUBOTSKY, D. & PAXSON C. (2002). “Economic status and health in childhood: The origins of the gradient”, *American Economic Review*, 92(5); 1308-1334.
- CIPRIANI, M., GIULIANO, P., & JEANNE, O. (2007), “Like Mother Like Son? Experimental Evidence on the Transmission of Values from Parents to Children”. IZA Discussion Paper No. 2768.
- CONDON, J.T., & CORKINDALE, C.J. (1998). “The assessment of parent-to-infant attachment: Development of a self-report questionnaire”. *Journal of Reproductive and Infant Psychology*, 16, 57-76.
- CURRY, O.S., PRICE, M.E., PRICE, J.G. (2008). “Patience is a virtue: Cooperative people have lower discount rates”. *Personality and Individual Differences*, 44: 778–783.
- DOYLE, O., HARMON, C. HECKMAN, J.J., & TREMBLAY, R. (2007) “Early Childhood Intervention: Rationale, Timing and Efficacy”. Technical report No. 200705, Geary Institute, University College Dublin.

DOHMEN, T.F., FALK, A., HUFFMAN, D. & SUNDE, U. (2006), "The Intergenerational Transmission of Risk and Trust Attitudes", IZA Discussion Paper No. 2380, October 2006.

FEHR, E. (2002), "The economics of impatience", *Behavioural Science*, 415: 269-272

FEINSTEIN, L. (2003). "Inequality in the early cognitive development of British children in the 1970 cohort", *Economica*, 70, 73-98.

FREDERICK, S., LOWENSTEIN, G. & O'DONOGHUE, T. (2002), "Time discounting and time preference: a critical review", *Journal of Economic Literature*, 40: 351-401

GOODMAN, R. (1997). "The Strengths and Difficulties Questionnaire: A Research Note", *Journal of Child Psychology and Psychiatry*, 38(5): 581-586.

GOODMAN, R. (2001). "Psychometric properties of the Strengths and Difficulties Questionnaire". *Journal of the American Academy of Child and Adolescent Psychiatry*, 40(11):

HECKMAN, J.J., BORGHANS, L., DUCKWORTH, A.L., & TER WEEL, B. (2008) "The Economics and Psychology of Personality Traits," forthcoming *Journal of Human Resources*.

KING, J.A., TENNEY, J., ROSSI, V., COLAMUSSI, L., & BURDICK, S. (2003). "Neural substrates underlying impulsivity". *Annals of the New York Academy of Sciences*, 1008, 160-169

KOSKELAINEN, M., SOURANDER, A., KALJONEN, A. (2000), "The Strengths and Difficulties Questionnaire among Finnish school-aged children and adolescents." *Eur Child Adolesc Psychiatry* 9:277-284.

LEVY, M. (1976), "Deferred Gratification and Social Class", *Journal of Social Psychology*, 100: 123-135.

LOWENSTEIN, G.A., O'DONOGHUE, T. & RABIN, M. (2003), "Projection Bias in Predicting Future Utility", *The Quarterly Journal of Economics*, 118(4): 1169-1208

MAURO, C.F. & HARRIS, Y.R. (2000), "The influence of maternal child-rearing attitudes and teaching behaviours on preschoolers' delay of gratification", *Journal of Genetic Psychology*, 161(3): 292-306.

McCLURE, S., LAIBSON, D., LOWENSTEIN, G. & COHEN, J. (2004), "Separate Neural Systems Value Immediate and Delayed Rewards", *Science*, 306(5695): 503-507

MISCHEL, W. (1966), "Progress in Experimental and Personality Research", in Maher, R., Ed. (Academic Press, San Diego, CA 1966, vol. 3, pp. 85-132.

MISCHEL, W., SHODA, Y. & RODRIQUEZ, M.L. (1989), "Delay of gratification in children", *Science*, 244(4907): 933–938.

NAJMAN J.M., AIRD, R., BOR, W., O'CALLAGHAN M., WILLIAMS, G.M., SHUTTLEWOOD, G.J. (2004). The generational transmission of socioeconomic inequalities in child cognitive development and emotional health. *Social Science and Medicine*, 58, 1147–1158.

PETROU S., & KUPEK E. (2005) "Socioeconomic differences in childhood hospital inpatient service utilisation and costs: prospective cohort study", *J Epidemiol Community Health*, 59(7): 591–597

ROSENBERG, M. (1965). *Society and the adolescent self-image*. Princeton, NJ: Princeton University Press.

RUTTER, M., TIZARD, J., & WHITMORE, K. (1970). *Education, Health and Behaviour*, London: Longmans.

SHODA, Y., MISCHEL, W., PEAKE P.K. (1990). "Predicting adolescent cognitive and self-regulatory competencies from preschool delay of gratification: identifying diagnostic conditions". *Developmental Psychology*, 26 (6): 978–986.

**Table 1 Principal-component factors - rotated factor loadings: Child Time preferences at age 3**

	<b>Factor1</b>	<b>Factor2</b>	<b>Uniqueness</b>
Restless, overactive, cannot stay still long	<b>0.8171</b>	0.0482	0.3301
Constantly fidgeting	<b>0.7773</b>	0.0142	0.3957
Easily distracted	<b>0.7315</b>	0.2678	0.3932
Cannot stop and think before acting	0.1225	<b>0.6591</b>	0.5505
Does not see tasks through to the end	0.4198	<b>0.6287</b>	0.4285
Does not persists in the face of difficult tasks	-0.0636	<b>0.7615</b>	0.4161
Acts impulsively	<b>0.6372</b>	0.0669	0.5896

**T**



Table 2: Child Time Preferences Results

	Factor 1 – Impulsivity & Inhibition				Factor 2 - Compulsivity			Scores Factor 1	Scores Factor 2
	Is impulsive, acts without thinking	Easily distracted, concentrati on wanders	Constantly fidgeting or squirming	Restless, overactive, cannot stay still for long	Does not persist in the face of difficult tasks	Cannot see tasks through to the end	Cannot stop and think before acting		
<b>Family SES factors</b>									
<i>Maternal Education</i>									
O level/GCSE grades A-C	-0.100 [0.071]	-0.129** [0.065]	-0.110* [0.064]	-0.248*** [0.067]	-0.197*** [0.071]	-0.024 [0.064]	-0.131** [0.066]	-0.099*** [0.038]	-0.071** [0.034]
A/ AS/ S Levels	-0.259*** [0.092]	-0.325*** [0.089]	-0.131 [0.089]	-0.484*** [0.086]	-0.358*** [0.090]	-0.113 [0.096]	-0.146 [0.095]	-0.177*** [0.047]	-0.120*** [0.044]
Diplomas in Higher Education	-0.211** [0.092]	-0.295*** [0.087]	-0.092 [0.099]	-0.469*** [0.093]	-0.296*** [0.088]	-0.114 [0.094]	-0.011 [0.093]	-0.161*** [0.051]	-0.098** [0.042]
First Degree	-0.438*** [0.100]	-0.589*** [0.089]	-0.235** [0.093]	-0.730*** [0.089]	-0.285*** [0.093]	-0.494*** [0.087]	-0.361*** [0.093]	-0.305*** [0.046]	-0.216*** [0.042]
Higher Degree	-0.510*** [0.124]	-0.601*** [0.128]	-0.091 [0.142]	-0.563*** [0.135]	-0.446*** [0.147]	-0.695*** [0.139]	-0.598*** [0.132]	-0.255*** [0.066]	-0.292*** [0.064]
<i>Household Income</i>	-4.097*** [1.339]	-2.460* [1.292]	-5.364*** [1.511]	-7.059*** [1.389]	-1.160 [1.606]	-1.826 [1.463]	-2.473* [1.421]	-2.546*** [0.638]	-0.827 [0.707]
<b>Parental Inputs</b>									
Parental time investment 1	0.013 [0.026]	-0.114*** [0.026]	-0.027 [0.023]	-0.079*** [0.023]	-0.156*** [0.024]	-0.247*** [0.026]	-0.172*** [0.024]	-0.019 [0.012]	-0.124*** [0.013]
Parental time investment 2	-0.069** [0.029]	-0.161*** [0.030]	-0.115*** [0.029]	-0.203*** [0.028]	-0.044* [0.025]	-0.163*** [0.029]	-0.074** [0.029]	-0.086*** [0.014]	-0.042*** [0.014]
HOME Scale Total	-0.026 [0.021]	-0.054*** [0.018]	-0.050*** [0.018]	-0.105*** [0.019]	0.006 [0.020]	-0.058*** [0.022]	-0.032* [0.018]	-0.040*** [0.010]	-0.007 [0.009]
HOME Scale Total Dummy	-0.243 [0.279]	-0.598** [0.248]	-0.618*** [0.232]	-1.275*** [0.250]	-0.091 [0.262]	-0.846*** [0.296]	-0.386* [0.231]	-0.455*** [0.136]	-0.165 [0.122]
Bribes	0.126*** [0.018]	0.188*** [0.019]	0.155*** [0.020]	0.160*** [0.021]	0.073*** [0.019]	0.169*** [0.021]	0.049*** [0.019]	0.096*** [0.011]	0.048*** [0.009]
<b>Maternal Time Preferences</b>									
Mom regularly saves	-0.073 [0.048]	-0.064 [0.041]	-0.044 [0.041]	-0.102** [0.041]	-0.096** [0.048]	-0.072 [0.048]	-0.098* [0.055]	-0.050** [0.022]	-0.046* [0.026]
Smoked when pregnant	0.128** [0.054]	0.141** [0.061]	0.096 [0.059]	0.138*** [0.052]	-0.106* [0.058]	0.023 [0.064]	-0.023 [0.053]	0.098*** [0.029]	-0.060** [0.027]
Duration Breast Fed	-0.006*** [0.002]	-0.007*** [0.002]	-0.003* [0.002]	-0.011*** [0.002]	0.002 [0.002]	-0.006*** [0.002]	-0.003 [0.002]	-0.004*** [0.001]	0.000 [0.001]
Young mom (<21)	-0.008 [0.083]	0.074 [0.104]	-0.066 [0.089]	0.104 [0.094]	-0.126 [0.101]	-0.047 [0.104]	0.039 [0.096]	0.027 [0.047]	-0.033 [0.047]
Mom's age at birth	-0.022*** [0.005]	-0.011* [0.006]	-0.014** [0.006]	0.001 [0.006]	-0.002 [0.007]	-0.001 [0.006]	-0.006 [0.006]	-0.007** [0.003]	-0.001 [0.003]
Mom single at birth	0.043 [0.096]	0.077 [0.090]	0.211*** [0.078]	0.093 [0.088]	0.013 [0.099]	-0.149 [0.096]	0.008 [0.098]	0.033 [0.051]	-0.027 [0.050]
Mom Malaise Inventory Score	0.035** [0.015]	0.071*** [0.016]	0.118*** [0.014]	0.100*** [0.014]	-0.058*** [0.017]	0.018 [0.017]	0.004 [0.018]	0.062*** [0.008]	-0.023*** [0.008]
Mom's Attachment Score	-0.031*** [0.011]	-0.026** [0.011]	-0.044*** [0.012]	-0.012 [0.012]	-0.074*** [0.011]	-0.039*** [0.012]	-0.027*** [0.010]	-0.014** [0.006]	-0.030*** [0.006]
Mom's Attachment Score Dummy	-0.811*** [0.273]	-0.676** [0.283]	-1.077*** [0.301]	-0.370 [0.293]	-1.765*** [0.288]	-1.030*** [0.292]	-0.728*** [0.255]	-0.396*** [0.149]	-0.730*** [0.146]
Mom's Self Esteem	-0.028*** [0.009]	-0.032*** [0.010]	-0.013 [0.010]	-0.025** [0.011]	-0.032*** [0.010]	-0.056*** [0.010]	-0.041*** [0.011]	-0.010** [0.005]	-0.027*** [0.005]
Mom's Self Esteem Dummy	-0.568*** [0.190]	-0.565*** [0.196]	-0.164 [0.200]	-0.384* [0.203]	-0.481** [0.190]	-1.027*** [0.193]	-0.809*** [0.209]	-0.159 [0.104]	-0.500*** [0.103]
<b>Child characteristics</b>									

Female	-0.261***	-0.438***	-0.208***	-0.343***	-0.165***	-0.438***	-0.232***	-0.197***	-0.159***
	[0.043]	[0.053]	[0.049]	[0.047]	[0.047]	[0.048]	[0.048]	[0.021]	[0.023]
Age	-0.011	0.010	0.002	-0.004	0.011	-0.020*	-0.023**	0.000	-0.002
	[0.010]	[0.009]	[0.011]	[0.011]	[0.010]	[0.010]	[0.010]	[0.005]	[0.005]
Birth weight in kilos	-0.051	-0.147***	-0.074	-0.145***	-0.032	-0.135***	-0.066	-0.074***	-0.033
	[0.039]	[0.040]	[0.045]	[0.042]	[0.040]	[0.041]	[0.043]	[0.020]	[0.022]
Birth order	-0.097**	-0.172***	-0.032	-0.113***	-0.141***	-0.047	-0.008	-0.033	-0.047*
	[0.048]	[0.041]	[0.043]	[0.041]	[0.045]	[0.045]	[0.057]	[0.021]	[0.025]
No. of siblings	0.097**	-0.003	-0.088**	-0.011	0.062	0.035	0.094*	-0.017	0.047*
	[0.048]	[0.043]	[0.043]	[0.037]	[0.043]	[0.045]	[0.052]	[0.022]	[0.025]
Ethnicity: Mixed	-0.200	0.029	-0.004	0.102	0.027	0.292**	0.122	0.012	0.106
	[0.141]	[0.169]	[0.156]	[0.156]	[0.145]	[0.142]	[0.191]	[0.081]	[0.078]
Ethnicity: Indian	-0.328*	-0.120	-0.130	0.371*	0.315**	-0.175	0.073	-0.042	0.103
	[0.182]	[0.193]	[0.195]	[0.207]	[0.153]	[0.184]	[0.270]	[0.102]	[0.092]
Ethnicity: Pakistani/Banglad.	-0.501***	0.530***	0.198	0.363***	0.328*	-0.058	-0.426**	0.082	0.032
	[0.174]	[0.171]	[0.147]	[0.150]	[0.168]	[0.166]	[0.175]	[0.082]	[0.105]
Ethnicity: Black	-0.680***	0.093	-0.298*	0.191	-0.357*	-0.098	-0.268	-0.095	-0.118
	[0.173]	[0.172]	[0.170]	[0.129]	[0.191]	[0.194]	[0.274]	[0.082]	[0.097]
Ethnicity: Chinese or Other	-0.628*	-0.323	0.099	0.015	-0.102	-0.200	-0.119	-0.058	-0.289*
	[0.333]	[0.349]	[0.283]	[0.284]	[0.431]	[0.305]	[0.281]	[0.193]	[0.147]
Constant								1.580***	1.792***
								[0.293]	[0.308]
Observations	10132	10360	10406	10507	10222	10252	9811	8757	8757

**Table 3 Principal-component factors - rotated factor loadings: SDQ + and 2 other items**

	Factor1	Factor2	Factor3	Factor4	Factor5	Uniqueness
<b>Emotional Scale</b>						
Complains of headaches/stomach-aches/sickness	0.1231	0.076	0.2113	<b>0.3758</b>	0.0046	0.7932
Often seems worried	0.0436	0.0401	0.1031	<b>0.5847</b>	0.1525	0.6207
Often unhappy	0.0534	-0.0157	0.2895	<b>0.5379</b>	0.086	0.6164
Nervous or clingy in new situations	0.1324	-0.0849	0.0218	<b>0.5253</b>	0.0983	0.6892
Many fears, easily scared	0.0898	0.0024	0.0601	<b>0.6209</b>	0.1178	0.5889
<b>Conduct problems Scale</b>						
Often has temper tantrums	0.4009	-0.0806	<b>0.5297</b>	0.0573	-0.0341	0.5478
Generally obedient	0.3072	<b>-0.4535</b>	<b>0.3293</b>	-0.0668	-0.0192	0.5867
Fights with or bullies other children	0.1642	-0.1363	<b>0.6037</b>	0.1757	0.0757	0.5534
Can be spiteful to others	0.142	-0.1372	<b>0.6261</b>	0.1896	0.0452	0.531
Often argumentative with adults	0.3357	-0.0498	<b>0.5965</b>	0.0541	0.0405	0.5244
<b>Hyperactivity Scale</b>						
Restless, overactive, cannot stay still long	<b>0.7400</b>	0.0057	0.213	-0.0091	0.154	0.3832
Constantly fidgeting	<b>0.6826</b>	0.0337	0.198	0.0832	0.1484	0.4647
Easily distracted	<b>0.7528</b>	-0.067	0.0861	0.141	0.0411	0.3998
Cannot stop and think before acting	0.3204	<b>-0.439</b>	-0.1148	0.0855	-0.1573	0.6595
Cannot see tasks through to the end	<b>0.6063</b>	-0.398	-0.1588	0.0435	-0.0832	0.4399
<b>Peer Problems Scale</b>						
Tends to play alone	0.1524	-0.0227	0.0241	0.3003	<b>0.5866</b>	0.5414
Has at least one good friend	0.0384	-0.3906	-0.0767	-0.0868	<b>0.5109</b>	0.5715
Generally liked by other children	0.0161	-0.4945	0.0568	-0.0042	<b>0.4136</b>	0.5809
Picked on or bullied by other children	0.0209	0.0206	0.1553	<b>0.4251</b>	0.1747	0.7638
Gets on better with adults	0.141	0.0555	0.0933	0.1693	<b>0.6793</b>	0.4782
<b>Prosocial Scale</b>						
Considerate of others' feelings	-0.1195	<b>0.5894</b>	-0.2391	0.0153	0.0546	0.578
Shares readily with others	0.0087	<b>0.531</b>	-0.2507	0.0349	-0.1202	0.6395
Helpful if someone is hurt, upset or ill	0.0125	<b>0.6439</b>	-0.0357	-0.0265	-0.0363	0.5819
Kind to younger children	0.011	<b>0.578</b>	-0.1985	0.0459	-0.1857	0.5898
Often volunteers to help others	-0.0921	<b>0.6141</b>	0.0481	-0.059	0.0471	0.6064
<b>Other non-SDQ items</b>						
Does not persists in the face of difficult tasks	0.2274	<b>-0.3702</b>	-0.3173	0.2967	-0.177	0.5912
Acts impulsively	<b>0.5655</b>	-0.0294	0.2589	-0.0154	-0.0125	0.612

**Table 4 Principal-component factors - rotated factor loadings: SDQ Hyper Scale + and 10 other items**

	<b>Factor1</b>	<b>Factor2</b>	<b>Uniqueness</b>
<b>Hyperactivity Scale</b>			
Restless, overactive, cannot stay still long	<b>0.7508</b>	-0.0666	0.4318
Constantly fidgeting	<b>0.6805</b>	-0.0565	0.5337
Easily distracted	<b>0.6825</b>	-0.2284	0.482
Cannot stop and think before acting	0.2334	<b>-0.421</b>	0.7683
Does not see tasks through to the end	0.4369	<b>-0.5043</b>	0.5548
<b>Others</b>			
Does not persists in the face of difficult tasks	0.048	<b>-0.6338</b>	0.596
Acts impulsively	<b>0.6367</b>	0.0024	0.5946
Likes to work things out for self	0.0442	<b>0.548</b>	0.6977
Shows mood swings	<b>0.5885</b>	0.0787	0.6475
Does not need much help with tasks	0.0048	<b>0.5476</b>	0.7002
Gets over excited	<b>0.6592</b>	0.0784	0.5594
Chooses activities on their own	0.0324	<b>0.5271</b>	0.7211
Easily frustrated	<b>0.6415</b>	-0.0633	0.5845
Gets over being upset quickly	-0.0767	<b>0.3017</b>	0.9031
Move to new activity after finishing task	-0.0937	<b>0.5763</b>	0.6591