Income-related gaps in school readiness in the US and the UK: An analysis of the mediating factors

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Extended abstract

Background

A large body of work has documented the cognitive ability deficits of low-income children in previous cohorts at the start of school (e.g. Duncan and Brooks-Gunn, 1997; Taylor et al., 2004). There is mounting evidence from fields as diverse as neuroscience, economics and psychology that these early skill gaps have long-term consequences for children's educational performance and their economic and social well-being in adulthood (Knudsen et al., 2006). In the UK, concerns for intergenerational mobility have led the government to declare a "War on Child Poverty", and invest resources in an array of programs, including generous in-work and out-of-work benefits for low income families with children, and the provision of free nursery school places for all 3 and 4 year olds (Brewer and Gregg, 2001).

This paper compares the magnitudes of the income-related gaps in school readiness for two recent cohorts of British and American children. We show that substantial differences in cognitive ability are apparent in pre-school in both countries, even among cohorts born in the 21st century. If policy is to work to close these gaps, it is vital that we identify the reasons why low income children fall behind, and the areas in which interventions may be most fruitful. To illustrate, low income children differ from their more affluent counterparts along many dimensions: in terms of demographic characteristics like ethnicity and family structure; in terms of the warmth and stimulation of the home environment; in terms of health-related factors like nutrition and birth weight; and in terms of their exposure to high quality child care. Each of these factors differs in a) its association with family income, and b) the extent to which it is consequential for cognitive development. For policy to be effective in closing the gaps, it must target areas in which both of these associations are strong.

This paper conducts a decomposition of the income-related gaps in school readiness in the two countries. It uses exceptionally rich cohort data to identify the relative importance of a diverse set of factors in accounting for the observed gaps, and pays careful attention to issues of comparability between measures from the two datasets. This enables us to explore whether the factors that contribute to poorer cognitive development among low income children are common, despite the very different public policy environments in the UK and the US.

The data

Our data come from two nationally representative birth cohort studies. For the US, we use data from the Early Childhood Longitudinal Study-Birth Cohort (ECLS-B), which gathered data on over 10,000 children born in 2001, with interviews at roughly 9 months, 2 years, and 4 years post-birth. For the UK, we use data from the Millennium Cohort Study (MCS), which collected data on over 19,000 children born in 2000 and 2001, with interviews at 9 months, 3 years, and 5 years post-birth. Both surveys over-sampled some populations of interest, but when properly weighted, the data are nationally representative of all families with newborns.

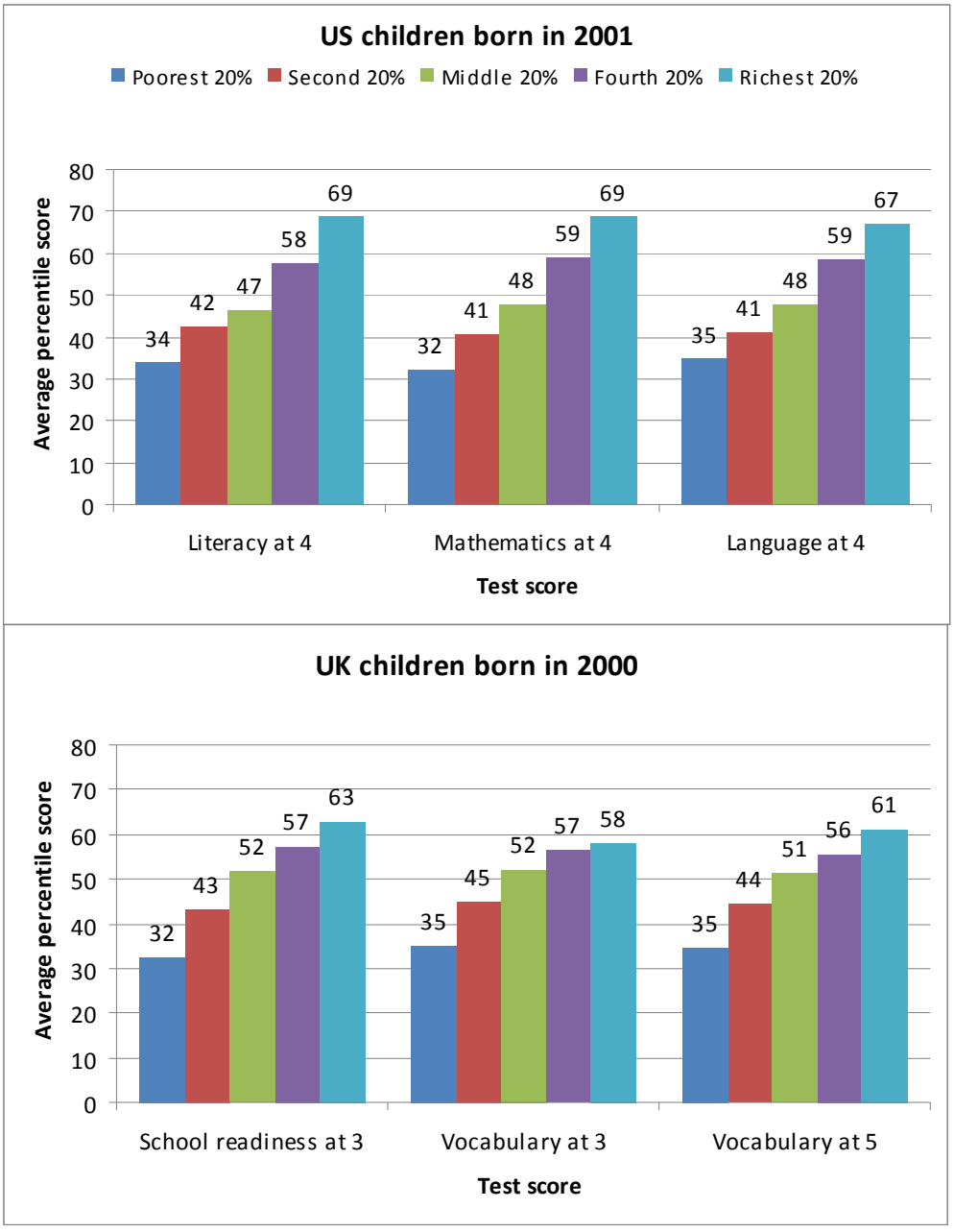
The two surveys contain a range of cognitive test scores, family income at each wave, and a wealth of potential mediating factors that we organize into the following groups: parenting style; the home learning environment; maternal health and health behaviors; child health; early child care and education; maternal education; and demographic characteristics.

The magnitude of the gaps

We divide families into quintiles on the basis of their average annual income over the life of the child, and calculate the average percentile score on a number of tests for children in each quintile. This approach recognizes that it is long-term or persistent poverty that is most strongly linked with children's deficits, and also that there may be non-linearities in the relationship between income and outcomes, such that the poorest are particularly vulnerable (Duncan and Brooks-Gunn, 1997). In addition, it allows for cross-national comparisons that are unaffected by differences in average tax rates and purchasing power. In both countries the poorest 20 percent have incomes that place them below the relevant absolute poverty line. The median income-to-needs ratio in the bottom quintile is 0.64 in the US and 0.63 in the UK.

Figure 1 reveals that there are sizeable gaps in children's cognitive school readiness – gaps that are of a comparable magnitude in the two countries. The poorest fifth of children in both countries score on average in the 32nd to 35th percentile across the tests. There are differences, however, in the relationship between income and cognitive outcomes among families higher up the income distribution. The gap between the bottom fifth and the middle fifth is smaller in the US, while the difference between the middle and the richest fifth is much larger. Hence although the UK appears relatively successful in promoting equality among children in families with incomes above some moderate threshold level, the poorest 20 percent are equally as disadvantaged, in relative terms, as the equivalent American children.

Figure 1: Income gaps in cognitive ability at school entry in the US and the UK



Decomposition methodology

Our decomposition analysis uses a two-step method to identify the relative importance of different factors in driving the gaps shown in Figure 1. In the first step, the outcome is regressed on the set of income

quintiles dummies (omitting the middle quintile as the reference group), plus the full set of potential mediators. In the second step, each of the mediating variables is regressed unconditionally on the income dummies. Multiplying the outcome effect coefficient from the first step by the income gradient coefficient from the second step for each variable, then summing over all variables, gives the total raw gap or gradient relative to middle income children. Hence the gradient is broken down into a series of terms, which can be summed together to give the proportion of the gap explained by a particular factor.

Formally, we estimate

$$Y_i = \sum_{q=1,2,4,5} \gamma_q \left(1 \mid INC = q\right) + \sum_j X_{ij}\beta_j + \mu_i \qquad (1)$$

$$X_{ij} = \sum_{q=1,2,4,5} \lambda_{qj} \left(1 \mid INC = q\right) + \upsilon_{ij} \qquad (2)$$

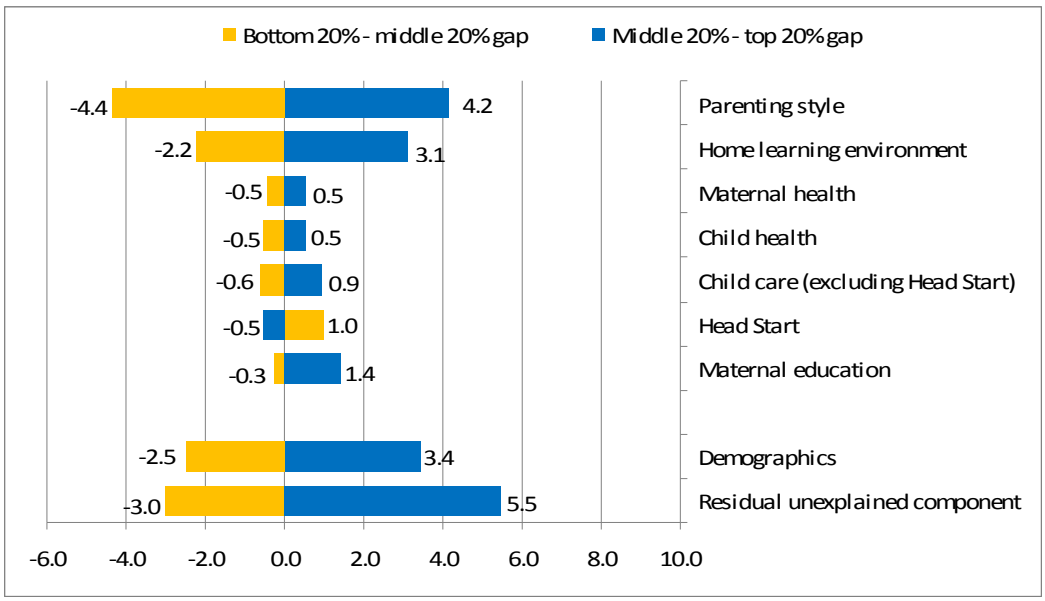
Where Y_i is the child outcome, X_{ij} is the *j*th mediating variable (e.g. number of books in the home), and $\left(1 \mid INC = q\right)$ indicates a dummy variable equal to 1 if the family falls into the *q*th income quintile, and 0 otherwise. The estimated coefficients from the two steps can be combined together to give, for example:

$$\sum_j \lambda_{1j}\beta_j + \gamma_1 \equiv \text{total raw gap in } Y_i \text{ between quintiles 1 and 3} \qquad (3)$$

Preliminary results for the US cohort

Figure 2 shows the results of our decomposition of the income-related gaps in language scores for the US cohort. As a guide to interpretation, the top bars in Figure 2 imply that in the absence of any other observed differences between low and higher income children, differences in parenting style alone (discussed below) would generate a gap of 4.4 percentile points in mathematics scores between the poorest and the middle fifths, and a gap of 8.6 points between the poorest and the richest fifths. These numbers can be compared with the actual raw bottom-middle gap of 13 points (the sum of all the yellow bars) and the raw bottom-top gap of 32 points (the sum of both the blue and yellow bars).

Figure 2. Language of US children at age 4: Gaps associated with income-related differences in particular factors



It is clear from Figure 2 that differences in the parenting received by low and higher income children appear to be one of the key drivers behind the income-related gaps in language. Together the two parenting constructs of parenting style and the home learning environment can account for half of the gaps between the poorest and middle income children (6.6 points of the total 13 point gap). A particularly important factor included in the parenting style domain is maternal sensitivity and responsiveness (what is sometimes called nurturance), which was measured via video-tapes of mother-child interactions that were then scored by trained raters. The home learning environment includes measures of parents' teaching behaviors in the home as well as their provision of learning materials and activities, including books and CDs, computer access, TV watching, library visits, and classes. These factors are strongly related to income and predictive of early cognitive ability.

Differences in maternal health, maternal health behaviours and child health between rich and poor also seem to affect their children's relative development. However these types of factors – birth weight, smoking, breastfeeding, prenatal care, depression, obesity, and overall health – appear to be of secondary importance in accounting for the cognitive outcome gaps when compared with parenting behaviours.

The results also suggest a relatively modest role for differential childcare and preschool experiences among poorer and better off children. This is perhaps unsurprising, as the largely private US childcare market is associated with a situation in which high quality school and centre-based care is far from universal, even amongst the most affluent. We do find evidence, however, that participation in Head Start serves to boost the performance of the most disadvantaged children and so reduce the gaps somewhat compared with what they would otherwise have been.

Although our data allow us to identify many of the factors that influence children's cognitive development, it is clear that we cannot account for all of the income-related gaps. The role of unobserved differences in children's environments that are related to maternal education and demographic characteristics like single parenthood and family size are important, and would generate gaps even if incomes were equalised across all families. Taking these characteristics into account, we are left with a residual component of around a quarter to a third of the overall gap that is associated with income itself, but not with any of the other factors we are able to measure. We can only speculate as to what is driving this residual association, but inherited differences in cognitive ability, parental attitudes towards learning and aspirations, and conditions of material deprivation and the associated parental stress are all possibilities.

Discussion

We have conducted similar analyses for the literacy and mathematics scores of the American children, and find that the broad patterns shown in Figure 2 are common across outcomes, although the relative importance of some factors does vary somewhat. Whether or not these patterns also hold for the British cohort is our current topic of enquiry.

We have identified poor parenting behaviours as a key factor behind the deficits in school readiness of low income children in the United States. This raises the possibility that programs designed to improve parenting skills will be a particularly cost-effective option for reducing the cognitive outcome gaps. We discuss the evidence on interventions of this kind (such as Nurse-Family Partnerships) in the full version of the paper. We also note that although the role played by child care in accounting for the current gaps is small, the targeted expansion of high quality early education could still reduce the income gaps significantly. Our estimates suggest that if all low income children were enrolled in Head Start and pre-kindergarten, with the current arrangements of better-off families left unchanged, the middle-bottom cognitive gap would be reduced by 20 to 50 percent.

References

Brewer and Gregg (2001) 'Eradicating Child Poverty in Britain: Welfare Reform and Children Since 1997', Institute of Fiscal Studies Working Paper No. WP01/08, London

Duncan and Brooks-Gunn (1997) *Consequences of growing up poor.* New York.: Russell-Sage Foundation

Knudsen, Heckman, Cameron and Shonkoff (2006) "Economic, Neurobiological, and Behavioral Perspectives on Building America's Future Workforce," *PNAS,* 103, 10155-10162

Taylor, Dearing and McCartney (2004) "Incomes and Outcomes in Early Childhood," *Journal of Human Resources*, 39, 980-1007.