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Does intelligence foster generalized trust? An empirical test using the UK birth cohort studies

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ABSTRACT

Social, or 'generalized' trust is often characterised as the 'attitudinal dimension' of social capital. It has been posited as key to a host of normatively desirable outcomes at the societal and individual levels. Yet the origins of individual variation in trust remain something of a mystery and continue to be a source of dissensus amongst researchers across and within academic disciplines. In this paper we use data from two British birth cohort studies to test the hypothesis that a propensity to express generalized trust varies systematically as a function of individual intelligence. Intelligence, we argue, fosters greater trust in one's fellow citizens because more intelligent individuals are more accurate in their assessments of the trustworthiness of others. This means that, over the life-course, their trust is less often betrayed and they are able to accrue the benefits of norms of reciprocity. Our results show that standard measures of intelligence administered when cohort members were aged 10 and 11 can explain variability in expressed trust in early middle age, net of a broad range of theoretically related covariates.

Trust is essential to the effective functioning of social, political, and financial systems. Without trust, many of the everyday activities and transactions that we take as routine and commonplace would not be possible. We trust the baby-sitter to look after our children, the scientist to develop safe technologies, and as recent events have brought prominently to our attention, we trust banks to take care of our deposits. Trust, in its broadest sense, is the belief that others will not knowingly act in a way that is detrimental to our interests, or better still, will act in a way that serves to maximise them (Barber, 1983; Hardin, 2006). So, while trust can bring many payoffs — we can be at work while someone else looks after our children, derive the benefits and efficiencies of new technologies, and accrue interest payments on our savings — it is also inherently risky in the sense that, if our trust is betrayed, we would have been better off not trusting in the first place (Fehr & Gintis, 2007; Ostrom & Walker, 2003).

The alleged benefits of trust are now well documented. At the country level, aggregate trust is correlated with economic development (Fukuyama, 1995; Knack & Keefer, 1997; Putnam, 1993), democratic governance (Inglehart, 1997), lower levels of political corruption (La Porta, Lopez-de-Silanes, Shleifer & Vishny, 1999; Rothstein & Uslaner, 2006), income equality (Uslaner, 2002), and lower rates of criminality and juvenile delinquency (Halpern, 2001; Sampson, Raudenbush & Earls, 1997). Trust also appears to be a desirable commodity for individuals as well as societies, with trusters concentrated amongst the better educated (Nie, Junn & Stehlik-Barry, 1996; Paxton, 2007; Putnam, 2000), those in professional occupations and higher income groups (Alesina & Ferrera, 2002; Li, Pickles & Savage, 2005) and least often by divorcees (Patterson, 1999), the unemployed (Brehm & Rahn, 1997), ethnic minorities with a history of discrimination (Alesina & Ferrera, 2000), and those in poorer health (Ichiro Kawachi, 1997; Kawachi, Kennedy & Glass,

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1999). As a robust indicator of being what Newton has called one of "society's winners" (Newton, 1999 p.185), the origins of generalized trust has, understandably, become a key explanandum across the social sciences.

The vast majority of this body of evidence in support of the ameliorative effects of trust on important life outcomes is derived from sample surveys conducted around the world over the past fifty or so years, in which respondents are asked some variant of what has come to be known as the Generalized Trust Question (GTQ) (see Dekker, 2003 for a discussion). The GTQ requires respondents to make a binary choice between the following alternatives: 1. 'in general, most people can be trusted', and 2. 'you can't be too careful in dealing with people'. Those selecting the first response alternative are deemed to be 'trusters' and have been found, almost without exception, to be disproportionately represented amongst the 'healthy, wealthy, and wise' (Delhey & Newton, 2003, 2005). A defining characteristic of the GTQ is that no specific referent, or 'trustee' is mentioned; the respondent is asked to make a judgement about the trustworthiness, not of specific individuals or groups, but of *people in general*. And, while some regard the notion of trust in people we do not know as inherently nonsensical (cf. Hardin, 2001), for others it is exactly this type of 'generalized' trust, as opposed to the kind of 'strategic' trust[1] that develops between acquainted individuals, that is key to solving large-scale collective-action problems. As Uslaner puts it "strategic trust can only lead to cooperation among people you have gotten to know, so it can only resolve reasonably small-scale problems" (Uslaner, 2002 p20). When we speak of generalized trust, then, we are not referring to the kind of mutually encapsulated self-interest that can develop between social actors who are known to one another but to an essentially *indiscriminate* belief in the general benevolence of one's fellow citizens.

Yet, in conceptualizing trust in this manner, we are faced with an apparent paradox; while this kind of generalized trust is known to be strongly correlated with consensual norms of socio-economic success and achievement, its essentially indiscriminate nature bears a striking similarity to notions of naivety, or gullibility. For, if we believe, *a priori*, that anyone we happen to encounter can be trusted, will we not be susceptible to repeated betrayal by assorted free-riders and con-artists? Indeed, it has even been argued that to define trust in this manner is logically inconsistent with the apparently widespread prevalence of trusters throughout the world, "because such trusters must be too gullible to prosper in most societies in which studies of trust have been done" (Hardin 2001, p35). How, then, are we to reconcile these apparently contradictory perspectives on generalized trust; that it is a driver of social and economic success, while simultaneously being the hallmark of the gullible and the credulous?

For Yamagishi, the answer lies in carefully distinguishing between what he characterises as an individual's "default expectation" of the trustworthiness of others and the actual trust behaviour of that individual in specific contexts (Yamagishi, 2001). While an individual might have a generally optimistic attitude toward engaging in potentially symbiotic reciprocal transactions with strangers, her decision over whether to trust a specific 'X to do Y' will be highly contingent upon the signs and signals given off by X at the particular point at which she must make the trust decision. At this point, trust becomes far from indiscriminate. On the contrary, the truster is now carefully monitoring for indications of (un)trustworthiness, decoding subtle and often highly complex situational cues relating to the intentions of the trustee, in order to gain a strategic advantage (Gambetta, 1988). Thus, it is precisely the more *intelligent* social actors who disproportionately reap the benefits of reciprocity, by carefully endowing their trust only in those who are unlikely to betray it. This type of intelligence can thus be viewed as a benign form of Machiavellianism (Parales-Quenza, 2006), in which socially astute individuals are rewarded by exerting a high degree of control over the conditions in which they are willing to sanction trust. The counter-side to this argument, of course, is that the less socially astute are frequently betrayed in trust relations and thus progressively withdraw from potentially fruitful interactions in the future. Not only do they then pay the opportunity costs of potential gains from 'tit-for-tat' reciprocity, they also progressively come to the view that most people cannot be trusted.

From this perspective, then, trust is at heart a *problem-solving* activity, in which intelligent social actors are better able to evaluate the trustworthiness of interaction partners, endowing them with a progressive and accumulative advantage over the life-course. A key implication of what we refer to in the remainder of the paper as the intelligence–trust (I–T) hypothesis is that, through repeated exposure to gainful trust-based interactions, socially intelligent individuals develop a 'default expectation' of trust in unknown others while, by implication, the reverse is true for their less intelligent counter-parts. We test this I–T hypothesis by evaluating whether a default position of trust in adulthood is positively correlated with intelligence measured in childhood, net of a range of theoretically related covariates. To do this, we draw on unique data collected in the United Kingdom over the past fifty years, in which every child born in a single week in 1958 and 1970 respectively were interviewed at regular intervals until (at the most recent sweep) early middle-age. The paper proceeds in the following manner. We begin by reviewing existing empirical research into the relationship between intelligence and generalized trust. We then describe in detail the two data sets to be used and set out the measures upon which our analysis is based, before presenting the results of our empirical analysis. We conclude with a consideration of both the limitations and substantive significance of our findings for an understanding of the relationship between intelligence and generalized trust.

1. Intelligence and trust

What, then, does the existing empirical record tell us about the relationship between intelligence and trust? Early investigations in the social psychological literature generally found either no relationship, or a negative association

[1] The same distinction between generalized and strategic trust is also drawn by Putnam, though he contrasts what he terms 'thick' trust in known others with the 'thin' trust we have in those with whom we are not personally acquainted.

between trust and cognitive ability, variously conceived. For example, Garske (1975) found trust to be negatively correlated with intelligence and, in a separate study, 'construct complexity' (Garske, 1976). Similarly, Gurtman and Lion (1982) report that high trusters were slower than low trusters in recognizing adjectives signalling untrustworthiness that were displayed to them on a tachistoscope, while Rotter (1980) found scores on scholastic aptitude tests among a sample of college students to be unrelated to his Interpersonal Trust Scale (Rotter, 1967). And, although in his own analysis of the Interpersonal Trust Scale, Rotter emphasised that trust and gullibility are logically and empirically distinct, this can hardly be taken as supporting the expectation that generalized trust should be *higher* amongst more intelligent individuals. On the whole, then, we find little evidence in support of the Intelligence–Trust hypothesis in these early investigations. Indeed, they appear to lend considerably more weight to the opposite view, that generalized trust is coterminous with gullibility.

On closer inspection, however, all of these studies have critical limitations with regard to assessing the Intelligence–Trust hypothesis. Leaving to one side the problem of external validity deriving from their exclusive use of student samples, all of these studies employ Rotter's Interpersonal Trust Scale as the measure of trust. However, the Interpersonal Trust Scale covers not only trust of 'people in general' but also of parents, teachers, physicians, politicians, classmates, and friends. As such the Interpersonal Trust Scale cannot be considered a valid measure of generalized trust, in the sense of a default position of trust in unknown others, because the trustees denoted in the questions refer predominantly to individuals who would be well known to the respondent. The measures of cognitive ability used in these studies are also problematic in a number of ways. Garske (1975) uses a self-report measure of abstract thinking taken from Cattell's 16PF instrument (Cattell, Eber & Tatsouka, 1970), while Rotter's use of scholastic aptitude tests on a sample of college students is clearly some way from a measure of intelligence in the general population. Similarly, spotting adjectives on a tachistoscope and greater construct differentiation must be considered somewhat tangential to conventional notions of intelligence. As Yamagishi puts it, "the findings that have been used as evidence supporting the popular image of high trusters as naïve, credulous, and gullible individuals are thus mostly indirect at best and often irrelevant to the claim" (Yamagishi, 2001, p.123).

Cross-national sample surveys conducted over the past thirty years or so provide robust, though indirect, evidence in support of the Intelligence–Trust hypothesis. For perhaps the strongest and most consistent predictor of trust in such studies has been found to be education, in the vast majority of contexts in which it has been assessed (Glaeser, Laibson, Scheinkman, & Soutter, 1999; Helliwell & Putnam, 1999; Inglehart, 1999). An obvious limitation of formal qualifications as a measure of cognitive ability, though, is that attainment of educational qualifications is strongly conditioned by the socio-economic circumstances of the household into which an individual is born (Breen & Goldthorpe, 1997). Because socio-economic status is itself strongly related to trust, using education as a proxy for intelligence introduces a serious confound which cannot be easily resolved. That being said, however, the robust education effect provides, we would argue, a degree of *prima facie* evidence in support for the I–T hypothesis.

More direct evidence linking intelligence with generalized trust can be found in a series of studies by Toshio Yamagishi and his colleagues. In an initial investigation, Kosugi and Yamagishi (1998) find high trusters, as measured by a six-item generalized trust scale, to be more sensitive than low trusters to negative contextual cues, when rating the trustworthiness of fictional characters in stylised vignettes. However, when no contextual information relating to trustworthiness was provided to participants, high trusters rated the target person as more trustworthy than did low trusters. Their results support the view that high trusters are not naïve and credulous in the sense of extending trust indiscriminately. Rather, they adopt a default position of trust in the absence of information to suggest that a specific individual or group may not be trustworthy. When contextual cues indicate a lack of trustworthiness, high trusters are more adept at detecting these signals and incorporating them into their assessments of the trustworthiness of interaction partners. A limitation of this study, however, is that there is no criterion by which to assess the accuracy of the participants' evaluations of trustworthiness. High trusters are shown to be more sensitive to the contextual information provided but, due to the static nature of the vignettes, we have no way of knowing whether this greater sensitivity results in more *accurate* assessments of trustworthiness. As a result, we cannot discount the possibility that the results might simply reflect a greater proclivity amongst high trusters to comply with (their interpretation of) the experimental hypothesis (Orne, 1962).

In a subsequent investigation, this limitation is overcome by incorporating an objective criterion of the accuracy of the ratings of trustworthiness, via a series of experimental trust games (Yamagishi, 2001; Yamagishi, Kikuchi & Kosugi, 1999; Yamagishi & Kosugi, 1999). Prior to taking part in the experiment, participants engaged in 30 min small-group discussions on the topic of garbage collection, to enable them to familiarise themselves with their potential interaction partners. The subsequent game involved 2 players choosing either to contribute (cooperate) or take money from (defect) their interaction partner. The rewards were set such that $D>C>S$, where D is the reward for defecting while the partner cooperates, C is the reward when both partners cooperate, and S is the reward for cooperating when the partner defects (see Yamagishi, 2001 for a detailed description of the design). It is, thus, a single-shot, anonymous trust game in which mutual trust is Pareto-optimal but where each player has a private incentive to defect.

The games were anonymous in the sense that each player did not know *exactly* who their interaction partner was. However, they did know that their partner was drawn from the group of people with whom they had earlier discussed garbage collection. After making their own decision about whether to defect or cooperate, participants were informed of the identity of their interaction partner. They were then asked to predict whether their partner had defected or cooperated. The results showed that high trusters were significantly more accurate in their predictions of both defection and cooperation than were low trusters. The same effect was

replicated in a number of subsequent studies, which varied the degree of pre-existing familiarity of the interaction partners (Yamagishi, 2001). In sum, then, these investigations support the idea that trusters are both more sensitive to contextual cues denoting the trustworthiness of others and more accurate in their assessments of the likelihood of cooperation and defection in cooperative situations.

Based as they are, however, on small, self-selecting samples of Japanese university students, the results of these investigations are rather limited in their generality. Additionally, none of these investigations employs an exogenous measure of intelligence; the greater acumen of the high trust participants is inferred from their behaviour in the experimental games, rather than assessed via an independent intelligence instrument. Our aim in the empirical part of this paper is to complement the experimental work of Yamagishi and his colleagues by testing the validity of the Intelligence–Trust hypothesis using large-scale, representative survey data collected in a different socio-historical context, and using an independent measure of intelligence.

2. Data

Our data comes from two birth cohort studies; the 1958 National Child Development Study (NCDS) and the 1970 British Cohort Study (BCS70). The eligible samples in the NCDS and BCS70 are every child born in Britain during a particular week in 1958 and 1970 respectively. A total of 17,415 children born in the single week in March 1958 were included in NCDS. Subsequent waves of the NCDS were conducted in 1965, 1969, 1974, 1981, 1991 and 1999. In BCS70, a total number of 17,196 children born in a single week in April 1970 were included (Chamberlain, Philipp, Howlett & Claireaux, 1975). Subsequent waves were conducted in 1975, 1980, 1986, 1996, 2000 and 2004. The analyses in this article make use of data from the four sweeps of the surveys when the cohort members were 0,[2] 10, 16 and 46 of age in NCDS and 0, 5,11 and 34 years of age in BCS70. The data were collected from the cohort member, his or her parents, and teachers using interviews, tests and questionnaires. More information on the NCDS and BCS70 can be found at http://www.cls.ioe.ac.uk/.

Over the study period sample attrition occurred: of the initial sample of 17,196 participants in BCS70 in 1970, 76% participated in the assessment at age 5 in 1975, 83% in the assessment at age 10 in 1980, and 54% in the assessment at age 34 in 2004. Of the initial sample of 17,415 participants in NCDS in 1958, 84% participated in the assessment at age 11 in 1969, 79% in the assessment at age 16 in 1974 and 52% in the assessment at age 46 in 2004. This yields 4686 cases with complete data for the BCS70 and 6180 for the NCDS. Attrition analysis indicates that nonresponse cannot be considered Missing at Random (Rubin, 1987) in either study; dropping out was more likely amongst men and those from a working class background. At school age, a lower intelligence score, more hostile and withdrawn behaviour, a tendency to tell lies and not being liked by other children were all related to drop-out.

This non-random attrition means that a complete case analysis is not appropriate. To account for differential drop-out from the study over time, we used the multiple imputation procedure implemented in SPSS 17, using the fully conditioned MCMC estimator to construct 5 complete data sets. Our results present the pooled estimates across the 5 imputed data sets according to Rubin's procedure (Little & Rubin, 2002; Rubin, 1987). The pooling across multiple imputed data sets provides a correction for nonresponse bias but also incorporates an estimate of the uncertainty arising from the imputation in the estimates of the standard errors. Full details of the implemented imputation procedure are available from the corresponding author upon request.

3. Measures

Our theoretical model proposes that individuals with greater acumen in social situations develop higher levels of trust over the life-course, as a result of their ability to determine when their trust is likely or unlikely to be betrayed. We are thus invoking the notion of 'social intelligence', or as Thorndike (1920) described it 'the ability to act wisely in human relations'. Specifying our key causal variable as 'social intelligence', however, raises difficulties with respect to measurement, particularly in the context of large-scale observational studies like the BCS70 and NCDS. This is because research into the social dimension of intelligence has been dogged by problems of conceptual and empirical differentiation since its inception (Riggio, Messamer & Throckmorton, 1991). While the proposition that social intelligence is "just general intelligence applied to social situations" (Wechsler, 1958, p75) is no longer tenable (Schneider, Ackerman & Kanfer, 1996), there remain substantial barriers to valid measurement of this elusive construct. These relate primarily to the fact that social intelligence test batteries generally rely on respondent and peer self-reports, rather than on independent observations of verifiably socially intelligent behaviour, or on scores on test items with objectively right or wrong answers. Where more conventional test item batteries have been used, social intelligence has tended to be indistinguishable from general intelligence (Shanley, Walker & Foley, 1971). The consequent reliance on self-reports (and, less often, peer evaluations) makes it difficult to be confident that what is being measured by these types of instruments is actually social intelligence as opposed to some aspect of personality (Kihlstrom & Cantor, 2000), or simply response style (Riggio et al., 1991).

For these reasons, we use measures of general intelligence as proxies for social intelligence in our analyses here. This strategy has the advantage that, although indirect, our key causal variable is undoubtedly a measure of *intelligence*, rather than personality. And, although a number of studies have found social and academic intelligence to be empirically distinct, others have found moderate to high correlations between general intelligence and specific dimensions of social intelligence. For instance, Jones and Day (1997) report a correlation of 0.79 between 'crystallized social knowledge' and academic problem solving, while Riggio et al. (1991) find a correlation of 0.52 between academic intelligence and a

[2] At age 0, information relates to the parents and household characteristics of the cohort member at birth.

measure of the ability to 'understand the meaning of verbal and behavioural cues in different contexts'.[3] Our measure of general intelligence was obtained at age 10 in 1980 in the BCS70 and at age 11 in 1969 in the NCDS. The tests were selected to measure cognitive ability, broadly conceived, and are similar in content across the two studies. In the BCS70, the British Ability Scales (BAS) (Elliott, Murray & Pearson, 1978) which comprises two verbal and two non-verbal scales alongside the Friendly Maths Test were used. BAS verbal scales included word definitions (37 items) and word similarities (42 items). BAS non-verbal scales included recall of digits (34 items) and matrices (28 items). Scales were administered at the cohort member's school by their teacher. The subscales showed good internal consistency (Cronbach's alpha = 0.90 for word definitions, 0.86 for word similarities, 0.91 for recall of digits and 0.75 for matrices). The Friendly Maths Test was designed specifically for the BCS70 study. It has 72 multiple choice questions on arithmetic, number skills, fractions, measures in a variety of forms, algebra geometry and statistics. Cronbach's alpha was 0.94 indicating very high internal consistency.

A *z*-score from a principal component analysis[4] was used in our analysis to avoid problems of multicollinearity between the different subscales, which are very highly correlated with each other. In the NCDS, intelligence was measured using the General Ability Test (Douglas, 1964) with verbal and non-verbal subscales, the Reading Comprehension Test and Mathematics Test both constructed specifically for use in this study by the National Foundation for Educational Research in England and Wales. Again, a *z*-score of the principle component of these subscales was used due to excessive collinearity.[5]

Our dependent variable in the analyses that follow is a generalized trust question measured in 2004 at age 34 in the Birth Cohort Study and at age 46 in the National Child Development Study. Cohort members were administered a 4-point question which asked "How much do you trust people in your local area?" (1 = not at all, 2 = not very much, 3 = a fair amount, 4 = a lot).[6] This is somewhat more restrictive than the standard generalized trust question, in that it places an imprecise, local geographical limit on the objects of trust. Additionally, there are 4 response alternatives rather than the more usual 2 in the standard question. Despite these differences, the question nonetheless elicits ratings of trust in unspecified others and, therefore, taps the same generalized trust construct which motivates our concerns here. Given concerns regarding the confounding of trust and caution in the standard version of the Generalized Trust Question (Miller & Mitamura, 2003), this version of the question may well represent an improvement.[7]

4. Covariates

Scores on intelligence batteries such as those in the cohort studies are likely to be correlated, in some cases strongly correlated, with many of the variables that are also believed to influence trust. For instance, even at a very young age, scores on standard intelligence batteries are strongly conditioned by the socio-economic status of individual test-takers (Buck, Gregg, Stavraky & Subrahmaniam, 1973). Socio-economic disadvantage has also been shown to be a cause of (dis)trust in adulthood (Brehm & Rahn, 1997; Li, Pickles & Savage, 2005). Thus, if we are to be confident that any observed relationship between our measures of intelligence and trust is not spurious, it is important to control for such potentially confounding variables in our models.

With some minor differences, we were able to include the same set of control variables in the NCDS and BCS70. Covariates were selected to represent of the primary causes of trust that have been identified in the existing literature and that might also be correlated with intelligence. These are: social class position in childhood and adulthood (Delhey & Newton, 2003, 2005; Whiteley, 1999), health status (Kawachi et al., 1999), educational attainment (Helliwell & Putnam, 1999; Sturgis, Patulny & Allum, 2007), extent of television watching, associational membership, and volunteering in childhood and adulthood (Putnam, 1996; Stolle & Hooghe, 2004; Uslaner, 2002), and degree of civic and political engagement as an adult (Paxton, 2007; Putnam, 1993, 2000).

In addition, we include a measure of life satisfaction in adulthood, because this is also likely to be influenced by intelligence and is argued by influential social trust theorists to be the key driver of generalized trust (Uslaner, 2002). We also include two indicators of neighbourhood characteristics: whether the cohort member has been a victim of a) theft or b) violence in the neighbourhood. We include these neighbourhood indicators because neighbourhoods are postulated to be key to understanding individual level social capital and, therefore, trust (Putnam, 2000, 2007) and also because selection into neighbourhoods could plausibly be directly and indirectly influenced by individual intelligence.

5. Analysis and results

We begin by considering the univariate marginal distributions of the generalized trust question in each cohort. Fig. 1 presents these as box plots.

We can see from Fig. 1 that levels of trust are quite different across the 2 cohorts. Those born in 1958 are substantially more trusting that those born in 1970, with 83% of the National Child Development Study reporting that they trust people in their local area either 'a lot', or 'a fair amount', compared with 66% in the British Cohort Study. As we have just 2 cohorts measured at a single point in time, it is not possible to determine whether this difference is a life-

[3] As both these studies were based on student samples, it is likely that they under-estimate the strength of the relationship in the general population because the full ability distribution is censored at the top end but also because correlations between cognitive ability dimensions have been shown to be lower in high ability groups (Detterman & Daniel, 1989).

[4] The loadings were 0.84 for the Friendly Maths Test, 0.81 for word definitions, 0.79 for word similarities, 0.55 for recall of digits, and 0.74 for matrices to the principal component.

[5] The loadings of the tests to the principal component were 0.90 for the maths test, 0.85 for the reading test, 0.92 for the verbal scale, and 0.87 to the non-verbal scale in General Ability Test.

[6] The original coding in the data sets runs in descending order. We re-coded these items so that higher scores indicate more trust.

[7] The 2008 waves of the National Child Development Study and British Cohort Study included the standard generalized trust question, so it will be possible to replicate our analyses once this data becomes available.

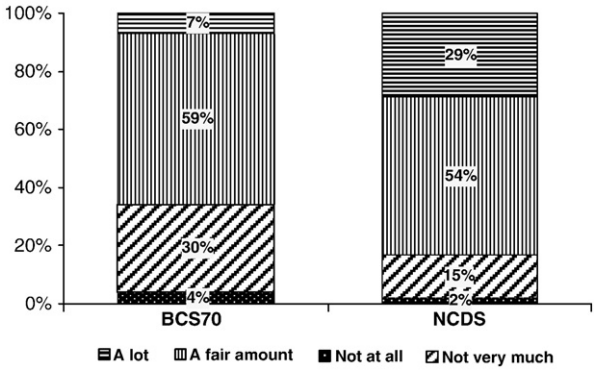

Fig. 1. Univariate marginal distributions for trust in BSC70 and NCDS.

cycle or generational effect. It will only be possible to address this question (and even then only to a limited degree), when both cohorts have responded to the same item in later sweeps of the surveys. Whatever its cause, the wide variation in trust across the 2 cohorts presents an interesting test-bed for the Intelligence–Trust hypothesis, in the sense that there are clearly rather different influences operating on trust across the 2 cohorts at the same point in time. The large inter-cohort difference also reinforces the point that intelligence will only ever be a partial explanation of variability in generalized trust. As we would not expect any substantial change in the distribution of intelligence over this 12 year period,[8] the causes of the wide variability across cohorts must clearly be found elsewhere.

It is also worth noting that these estimates of trust are substantially higher than those generally obtained from the more conventional binary generalized trust question (GTQ). Although there is a degree of variability over time and across surveys, in Britain the binary GTQ generally elicits around 4 in 10 people choosing the 'most people can be trusted' alternative. The combined estimate of the proportion of trusters across the 2 cohorts is more than double this figure. This difference can partly be explained by the fact that both cohort studies exclude older and younger people in the general population, who tend to be less trusting. The higher trust estimate may also derive from the reference to 'people in your local area' rather than 'most people' in the standard GTQ. To the extent that people are able to exercise choice over the area in which they live, they may choose to settle in areas in which they feel, whether correctly or not, that people are more trustworthy than in the general population. The difference could also be a function of the larger number of response alternatives on offer in the cohort studies' version of the question. By forcing respondents to choose between the apparent extremes of trust and distrust, the binary GTQ may push some potential trusters into the precautious position of 'not being too careful'. Such individuals are able to select the more nuanced alternative of 'a fair amount' in the cohort studies question, resulting in higher estimates of trust.

Next we estimate ordinal logit models to predict trust in adulthood as a function of intelligence at age 10 (BCS70) and 11 ((NCDS). We use the logit link function because the ordinal nature of the trust measure and its skewed empirical distribution make it unsuitable for Ordinary Least Squares regression. The ordered logit model treats the observed 4-point outcome variable, trust, as a set of ordered categories imposed on an underlying continuum (Agresti, 1986; McCullagh, 1980). Two models are estimated for each cohort. Model 1a includes only intelligence as an independent variable. In Model 1b, covariates from the child and adult sweeps of the surveys are incorporated. Estimated coefficients for both models are presented for the BCS70 in Table 1. The coefficients in Table 1 are logits which indicate the change in the log of the odds that an individual is in a specific category of the ordinal outcome, or one higher, for a unit change in the covariate. Diagnostic statistics indicate no problems with multicollinearity for these models, with tolerances all above 0.2.

The bivariate effect of intelligence on trust, with a logit coefficient of 0.33, is large and significant. Before any covariates are included in the model, a one standard deviation unit change in intelligence results in a 40% increase in the odds of moving to a higher response category on the trust variable. The overall explanatory power of this model is low, however, with a pseudo *R* squared of just 0.03. Covariates are added in Model 1b and generally conform to theoretical expectations and previous empirical investigations; trust is higher amongst women, those in better health, with higher educational qualifications, more interest in politics, greater life satisfaction, and those with more associational memberships (in both childhood and adulthood). Trust is lower amongst the widowed and divorced, victims of property and violent crime. Counter to Putnam's contention that watching television reduces trust, our measure of the extent to which the cohort member watched television at age 10 was non-significant. Father's social class also had no direct effect on adult trust, after conditioning on the adult characteristics of cohort members.

Incorporating covariates in Model 1b serves to diminish the magnitude of the intelligence coefficient by around two thirds, with the logit dropping to 0.14, although it remains significant at the 99% level of confidence. However, although the direct effect of intelligence at age 10 on trust aged 34, is substantially reduced in Model 2, it nonetheless exerts a robust and not insubstantial direct effect on the cohort members' expressed trust at age 34, net of a large number of potentially confounding variables. The explanatory power of Model 2a is also higher, though still comparatively weak, with a pseudo *R* squared of 0.1.

Table 2 presents the same coefficients for the equivalent models fitted to the NCDS data. In general, the pattern of coefficients is the same as that found in the British Cohort Study analysis, although with several notable differences. The magnitude of the coefficient for intelligence is somewhat larger, at 0.39 in Model 2a than in Model 1a. Parental social class is a significant predictor of adult trust using the NCDS data, while marital status is not. The difference with regard to paternal social class might plausibly be explained by generational changes in the British class structure during this period (Blanden & Gregg, 2004) and, for marital status, by the different ages at which trust was measured across the two cohorts. There is no equivalent variable measuring attendance of clubs during childhood in the NCDS but the nearest

[8] The linear increase in IQ scores during the 20th century known as the 'Flynn effect' amounts to around 3 points per decade (Flynn, 2007).

Table 1
Multivariate ordinal regression on trust in British Cohort Study ($n = 17{,}196$).

Age variable measured	Variable	Model 1a estimate (SE)	Model 1b estimate (SE)
	Thresholds for trust		
34	Not at all vs not very much	−3.344 (0.066)***	−2.947 (0.288)***
	Not very much vs a fair amount	−0.681 (0.021)***	−0.179 (0.265)
	A fair amount vs a lot	2.659 (0.050)***	3.327 (0.293)***
	Intelligence	0.329 (0.023)***	0.166 (0.028)***
1	Male		−0.141 (0.037)***
10	Social class of father (ref = unskilled)		
	Professional		0.107 (0.159)
	Managerial/technical		0.160 (0.131)
	Skilled non-manual		−0.004 (0.130)
	Skilled manual		−0.010 (0.131)
	Partly skilled		−0.015 (0.131)
10	How often watches TV (ref = often),		
	Never or hardly ever		−0.149 (0.252)
	Sometimes		−0.010 (0.056)
10	How often attends clubs (ref = often)		
	Never or hardly ever		−0.110 (0.051)*
	Sometimes		−0.069 (0.051)
34	Marital status (ref = separated/divorced/widowed)		
	Married/cohabiting		0.341 (0.057)***
	Single		0.156 (0.071)*
34	Highest qualification (ref = higher degree)		
	None		−0.436 (0.277)
	CSEs2-5/other Scottish equals		−0.262 (0.111)*
	GCE A–C/good O levels/Scottish standards		−0.172 (0.092)
	AS levels/1 A level 2+ A levels/Scottish higher/6th		−0.195 (0.098)*
	Degree/PGCE/other degree level equal		−0.108 (0.091)
34	Self-rated health		−0.113 (0.029)**
34	Interest in politics		−0.133 (0.030)***
34	Political activity (yes)		−0.051 (0.045)
34	Victim of theft (yes)		−0.305 (0.063)***
34	Victim of violence (yes)		−0.408 (0.125)**
34	Number of memberships		0.098 (0.021)***
34	Satisfaction with life		0.176 (0.013)***
	Pseudo-R^2 (Cox and Snell)	0.026	0.097

Estimates are pooled logit coefficients from 5 multiply imputed data sets.
* $p<0.05$.
** $p<0.01$.
*** $p<0.001$.

available equivalent, extent of volunteering, is not significantly associated with trust in Model 2b. Introducing covariates measured in childhood and adulthood in Model 2b reduces the magnitude of the intelligence coefficient by around a half, although as with the BCS70 this is still significantly different from zero at the 99.9% level of confidence.

The coefficient for intelligence in Model 2 is of very similar magnitude to the equivalent model for the BCS70, as is the explanatory power of the model, with a pseudo *R* squared of 0.11. Again, despite the inclusion of a large number of potential confounding variables measured at different points across the life-course, the effect of intelligence when cohort members were aged 11 on their expressed trust at age 46 is also significant in the NCDS.

The pseudo *R* squared values in MODELs 1 and 2 imply that the effect of intelligence, though reliably different from zero, is rather weak in terms of overall explanatory power. It is well known, however, that pseudo *R* squared statistics have a number of important limitations (Veall & Zimmerman, 1996). A more illuminating way of considering the 'importance' of the effect of a predictor in an ordinal regression is to plot the model predicted probability for each response alternative, as a function of the predictor in question. For the sake of parsimony and clarity of exposition, Fig. 2 takes predicted probabilities from a model which combines the 'a fair amount' and 'a lot' into a single 'trusting' category and the 'not very much' and 'not at all' into a single 'not trusting' category.[9] This is done in Fig. 2 for the BCS70, using the coefficients from Model 2a in Table 2. Even after conditioning on the full range of covariates, it is clear that intelligence measured in childhood exerts a considerable influence on trust in middle-age. In assessing the strength of the influence of intelligence on trust, it should be noted that, given the potentially large amount of random error in our single indicator of trust, our models are likely to *under-estimate* the magnitude of the true relationship.

6. Discussion

Our aim in this paper has been to test — on nationally representative survey data and in a different substantive context — Yamagishi's social interactional model of the

[9] A graph for the full 4 category model is available from the corresponding author upon request.

Table 2
Multivariate ordinal regression on trust in National Child Development Study ($n = 17{,}415$).

Age variable measured	Variable	Model 2a estimate (SE)	Model 2b estimate (SE)
	Thresholds for trust		
46	Not at all vs not very much	−4.05 (0.095)***	−1.87 (0.342)***
	Not very much vs a fair amount	−1.61 (0.043)***	.626 (0.336)
	A fair amount vs a lot	0.93 (0.028)***	3.31 (0.337)***
11	Intelligence	0.39 (0.027)***	0.21 (0.036)***
1	Male		−0.11 (0.041)*
11	Social class of father (ref = unskilled)		
	Professional		0.324 (0.106)**
	Managerial/technical		0.316(0.099)*
	Skilled non-manual		0.323 (0.114)
	Skilled manual		0.122 (0.085)
	Partly skilled		0.024 (0.100)
16	How often watches TV (ref = often)		
	Sometimes		0.008 (0.102)
	Never or hardly ever		0.011 (0.099)
16	How often does voluntary work (ref = often)		
	Sometimes		−0.036 (0.073)
	Never or hardly ever		0.009 (0.046)
46	Marital status (ref = separated/divorced/widowed)		
	Married/cohabiting		0.135 (0.068)
	Single		−0.082 (0.072)
46	Highest qualification (ref = higher degree)		
	None		−0.596 (0.230)*
	CSEs2-5/other Scottish equals		−0.350 (0.130)*
	GCE A–C/good O levels/Scottish standards		−0.259 (0.115)*
	AS levels/1 A level/2+ A levels/Scottish Higher/6th		−0.419 (0.113)*
	Degree/PGCE/other degree level equal		0.035 (0.118)
46	Self-rated health		0.181 (0.02)***
46	Interest in politics		0.170 (0.032)***
46	Political activity (yes)		−0.051 (0.068)
46	Victim of theft (yes)		0.505 (0.063)***
46	Victim of violence (yes)		0.302 (0.138)*
46	Number of memberships		0.095 (0.019)***
46	Satisfaction with life		0.218 (0.017)***
	Pseudo-R^2 (Cox and Snell)	0.04	0.108

Estimates are pooled logit coefficients from 5 multiply imputed data sets.
* $p<0.05$.
** $p<0.01$.
*** $p<0.001$.

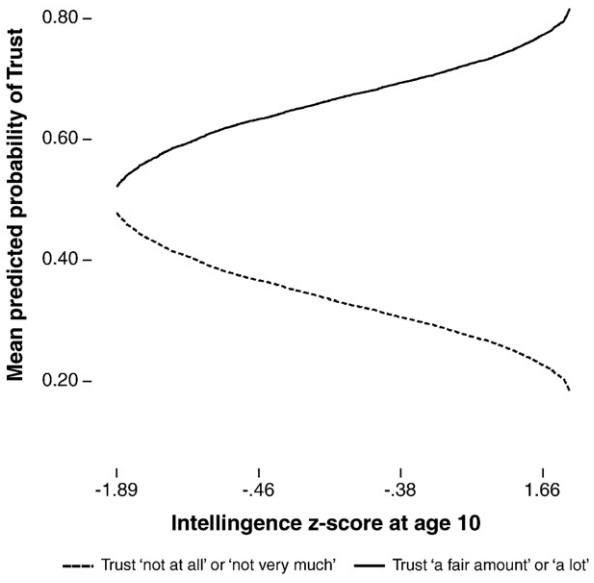

Fig. 2. Predicted probabilities of trust by cognitive ability at age 10 for the BCS70 data.

development of generalized trust as a function of individual differences in intelligence (Kosugi & Yamagishi, 1998; Yamagishi, 2001; Yamagishi et al., 1999; Yamagishi & Kosugi, 1999). In this account, the proposed mechanism linking intelligence to the development of 'thin', or generalized trust is that socially astute individuals are better able to accurately detect signs of (un)trustworthiness in social and economic interactions. This means that, through the life-course, they do not suffer the costs of betrayal so frequently, as they are less inclined to place their trust in those who are unlikely to honour it. By the same token, those with less acumen in social interactions are frequently betrayed in trust relations. This results in a vicious cycle of distrust, as frequent experience of misplaced trust leads to a progressive withdrawal from potentially gainful interactions in the future. Not only do the less socially intelligent then progressively forgo the benefits of norms of reciprocity, they also come to develop unfavourable evaluations of the trustworthiness of their fellow citizens.

To test the Intelligence–Trust hypothesis we have drawn upon unique British cohort data, which tracks the lives of thousands of individuals over six decades. Our results show that, after controlling for a number of potentially confounding

variables, intelligence measured in childhood is a robust predictor of generalized trust, when cohort members were 34 and 46 years of age, respectively. These results cannot, of themselves, be taken as a direct test of the Intelligence–Trust hypothesis, because these survey measures of trust do not provide any leverage on the question of how *accurate* the respondents' assessments of the trustworthiness of people in their local areas actually are. It is possible, for instance, that more intelligent people simply hold more benign views of the benevolence of others, irrespective of their actual lived experiences of having their trust honoured and betrayed over time.

In interpreting the substantive implications of our findings, however, it is crucial to consider them alongside the experimental evidence of Yamagishi and colleagues, rather than in isolation. That is to say, Yamagishi's experimental games provide strong evidence that high trusters *are* more accurate in their assessments of the trustworthiness of interaction partners but their external validity is weak as a result of their reliance on small, non-representative samples and their lack of an exogenous measure of intelligence. Our survey evidence, in contrast, does not speak directly to the question of accuracy of trust assessments but does show a substantial and robust relationship between an independent measure of childhood intelligence and generalized trust in adulthood on two large random samples drawn from the general population of Great Britain. Taken in conjunction, we contend that these contrasting lines of evidence provide strong support for the Intelligence–Trust hypothesis.

We anticipate that a primary objection to this conclusion will relate to the measures of intelligence we have used in our analyses. For, although our hypothesised mechanism specifies intelligence in *social* contexts as the driver of trust, we use standard IQ type measures of latent cognitive ability in our models. Although it would certainly be preferable to have a direct measure of our key construct, we believe that our use of general cognitive ability as a proxy for social intelligence is justified. For, as we noted in the earlier discussion of our key measures, the instruments that have been developed to measure social intelligence to date, and in particular those that would be suitable for administration in a survey, have been based on behavioural self-reports and attitude-type questions (Hendricks, Guilford & Hoepfner, 1969; Silvera, Martinussen & Dahl, 2001). If a correlation between this type of measure and trust were observed it would be open to the charge that we are merely tapping into the same underlying dimension of *personality*; people who trust are simply more likely to report that they behave in certain ways in social situations, with 'intelligence' playing no part. Indeed, a number of scholars have pointed out that factor analytic studies which claim to demonstrate empirical differentiation of social from academic intelligence might, in fact, only be detecting differences in measurement protocols, with academic intelligence measured using test items and social intelligence measured with behavioural self-reports (Kihlstrom & Cantor, 2000; Riggio et al., 1991).

Nonetheless, our use of general intelligence as a proxy for social intelligence suggests a number of potentially fruitful directions for future research. First, it is now generally accepted that, like academic intelligence, social intelligence is a multi-dimensional construct (Jones & Day, 1997; Riggio et al., 1991). Schneider et al. (1996), for instance, identify three distinct domains: social insight; social memory; and social knowledge, each of which might be differentially influential in the development of generalized trust. Thus, it will be important for future research to establish which dimensions of social intelligence are important in fostering interpersonal trust and which, if any, are not. Second, for those who remain sceptical about IQ as a valid proxy for social intelligence, we hope that our findings will act as a stimulus to establish why the robust correlation between general intelligence and trust that we have observed does, in fact, come about. As for our key independent variable, there will also be concerns about the measure of social trust available to us in the cohort studies. Because there is only a single indicator of trust in each data set, we must acknowledge the likelihood that these measures are contaminated by both random and systematic errors, with the consequent implications for downward bias in our estimates of causal effects (Bollen, 1989). Future research could usefully strengthen the robustness of our conclusions here, by making use of a multiple-item measure of generalized trust.

While it is important to acknowledge the potential limitations in our research design and analysis, none of them, we feel, are sufficient, either collectively or in isolation, to reject our primary substantive finding; that intelligence in childhood has a robust, independent effect on trust in early middle-age. Following Yamagishi, we interpret this effect as emerging from the accrual of advantage over the life-course to intelligent individuals who are able to carefully control the conditions under which they sanction trust. This, in turn, enables a resolution of the apparent paradox with which this article began; counter to commonsense intuition, a generalized propensity to trust people we have never even met should not be taken as a sign of gullibility but, on the contrary, of being an astute social operator.

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