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## ABSTRACT

### Trust, Child Care Technology Choice and Female Labor Force Participation<sup>\*</sup>

In this paper we test the effect of trust on the choice of child care technology. We estimate individual-level trust as a latent attribute using survey questions on personal attitudes by applying the econometric methodology by Spady (2007). Compared to other measures of trust, using this technique has several advantages: It makes more efficient use of information by allowing the aggregation of information from several questions and by exploiting additional information from personal and demographic characteristics. It requires very few parametric assumptions and it is conceptually cleaner and more consistent with theory than the proxies or demographic characteristics often used in previous work. Having estimated the individual attitudes to trust using data from the European Social Survey, we analyze their personal, demographic, and regional determinants. We find that trust matters for the degree of externalness of the child care technology people choose. It can therefore be a possible explanation for differences in female labor force participation across countries and across sociological groups.

JEL Classification: J13, J22, D10

Keywords: trust, child care, labor force participation, latent attitudes, item response models

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# 1 Introduction

Labor force participation differs significantly across countries, particularly for women. Prime-age women are one of the demographic groups with the lowest participation rate in Europe. This is particularly pronounced in Mediterranean countries, less so in Nordic countries (Algan and Cahuc 2005).

There is a large literature trying to understand which factors drive labor force participation of prime-age women, and what can explain differences across countries. One factor that has been proposed are differences in social policies that lead to differences in availability and cost of non-parental child care.<sup>1</sup> These papers find that social policies can help to reduce the incompatibility between labor market participation and child care, and therefore induce higher female labor participation rates. In a cross-country perspective, this type of studies implies that women in different European countries have the same preferences, but face different possibilities due to different social policies in the countries, leading to different choices.

More recent papers have considered the possibility of heterogeneity in preferences, introducing elements like culture, beliefs or the degree of religiosity in explaining women's participation and fertility decisions. Examples of this are Algan and Cahuc (2005), Fernandez, Fogli and Olivetti (2004) and Berman, Iannaccone and Ragusa (2006). Fogli (forthcoming) notes that "a theory based on purely technological differences across countries would have a hard time in explaining the large amount of heterogeneity observed in employment rates across European countries. In this respect, it is important to explore the role played by differences in preferences." Del Boca and Locatelli (2006) in their survey on the determinants of motherhood and work status conclude that while the importance of social policies is well established in the literature, the role of culture is still an open question in this field.

This paper aims to show that trust can affect the choice of child care technology and labor force participation in the sense that mothers with less trust in others may decide to stay at home with the child instead of working. In this spirit we sketch a simple model to show why this effect may be taking place, we measure trust using the European Social Survey, and we analyze

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<sup>1</sup>See e.g. Del Boca (2002) for Italy, Baizn, Billari and Michielin (2002) for Spain, Laroque and Salani (2005) for France, Del Boca and Sauer (2006) comparing France, Spain and Italy, and Del Boca and Wetzel (2007) comparing several European countries).

its influence on the choice of child care technology.

Since the main explanatory variable of our analysis is trust, it is important measure it well.<sup>2</sup> Therefore, we use Spady's (2007) methodology to measure trust. This method allows measuring trust directly as a latent attitude at the individual level, assuming that opinions of individuals about trust reflect their attitudes in this dimension. The attitudes of individuals making up a sample population can then be given probability distributions, based on their item responses and personal characteristics. Very few parametric assumptions are needed for this. The resulting measure of trust is conceptually cleaner and more consistent with theory than the distant proxies or demographic characteristics often used in previous work.

We measure trust using a series of item responses from the European Social Survey, obtaining measures of trust for married women with children younger than 12 from 24 European countries. Trust is found to significantly impact their child care choices.

The rest of the paper is structured as follows. In Section 2 we present some of the work done relating social attitudes to fertility and participation decisions, and we give a brief overview of different ways of measuring social attitudes used previously. Section 3 presents a simple theoretical model that will guide the estimation. In Section 4 we describe the methodology used to obtain the measures of trust. In Section 5 we present the data used, and we describe the questionnaire items and the personal and demographic characteristics of the respondents that play a role in the estimation of the latent attitudes. In Section 6 we obtain the measure of trust and we analyze its determinants as well as the variation of trust across countries. In Section 7 we study the relationship between the trust and child care technology choice. Finally, Section 8 concludes.

## 2 Relevance of Social Attitudes and their Measurement Problems

There has been strong interest among economists in the impact of social and cultural factors on economic or social outcomes (Knack and Keefer (1997), Guiso, Sapienza and Zingales (2004)). Concepts like trust and beliefs have been used to explain several individual and group outcomes

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<sup>2</sup>Most of the literature about social attitudes faces the critique that sometimes researchers' claims are in excess of what is justified by the statistical exercises reported (Durlauf and Fafchamps 2004).

such as health, financial development, or economic growth. Recently, individual social attitudes have been introduced in the analysis of female labor force participation and fertility; some papers have analyzed how beliefs about what should be the role of women in society can explain part of the differences in female labor force participation rates across time (Fernandez et al. (2004) and Fogli and Veldkamp (2007)) and across countries (Algan and Cahuc (2005)).

One of the main problems of the literature that studies the role of concepts related to social attitudes is the measurement of such attitudes. Clearly, concepts like trust are inherently difficult to measure. There have been different approaches to solve this measurement problem, some involving the use of proxies, others using experimental economics. The next few paragraphs give a brief overview of these approaches and critiques to them.

One of the most common approaches to measuring social attitudes and concepts like trust has been the use of “indirect” indicators. An example of this approach is the work of Putnam (1993), who analyzes the impact of social capital on economic performance using the number of readers of the local newspaper, the voter turnout in referendums, and the participation rate in political elections as proxies for social capital. Also Guiso et al. (2004) uses this approach. To study how trust affects portfolio choice decisions, he uses electoral participation and blood donation as proxies for regional levels of trust.

Fernandez and Fogli (2005) find that cultural differences have a significant effect in explaining fertility and female labor force participation. They study second generation immigrants to the US, using lagged values of the total fertility rate in the mother’s country of origin as a proxy for culture.

While this approach may allow to identify the impact of social attitudes on economic outcomes, it still does not allow for direct measurement of social attitudes. This makes it more difficult to determine the effect of which specific social attitude we are actually observing. It is also less useful for the analysis of the determinants of social attitudes, or for comparative or policy-focussed perspectives.

Other authors have studied the effect of religious participation and beliefs. Barro and McCleary (2002) study to what extent religious participation and beliefs influence economic performance and political institutions. In the same vein, Berman et al. (2006) study the effect of

changes in religiosity on fertility for European Catholic countries. These authors find that what matters are not changes in beliefs and preferences for children, but rather the decrease in the social services offered by the Catholic institutions.

Another approach used in the literature is to measure regional trust as the percentage of people in the population that claim to trust others. Usually these papers use the World Values Survey (WVS) or the European Values Survey (EVS) and their question: ‘Generally speaking, would you say that most people can be trusted or that you cannot be too careful in dealing with people?’ Individual responses are then aggregated to a macro measure.

Examples of this approach are found in Knack and Keefer (1997) and Zak and Knack (2001) who find that trust and civic norms have a strong impact on economic performance, or in Beugelsdijk and van Schaik (2004) who also find that at the regional level, trust and voluntary work are related to economic growth. Also La Porta, Lopez-de-Silanes and Shleifer (1997) and Fukuyama (1995) follow this approach to examine the effect of trust in organizations.

This approach is similar to the one used by Algan and Cahuc (2005). These authors use the WVS and the International Survey Program to obtain information about differences in family attitudes and their effect on the employment rates of different demographic groups. They find that participation in the labor market is particularly low for demographic groups whose labor market participation is discouraged by families’ perceptions. One of these are prime-age women.

The scope of these studies is necessarily limited when a good measure of the individual level of trust is required. Measuring individual trust using only the answer to one question would be imperfect. It is difficult to believe that this can be a good measure for such a broad concept (for a critique of this approach see Glaeser, Laibson, Sheinkman and Soutter (2000) and Glaeser, Laibson and Sacerdote (2002)). The approach we use overcomes this limitation by measuring trust using responses to more than one question. By analyzing the individual and country-level determinants of trust, it also addresses the critique of lack of cross-country comparability of the original trust-based measures aired by Fine (2001).

Experimental economics is also concerned with measuring concepts such as trust. Since Berg, Dickhaut and McCabe (1995), different authors have designed trust game experiments to explain differences in trust across individuals of specific demographical groups. An example of

that is Glaeser et al. (2000), they ask the standard question about generalized trust to a sample of Harvard undergraduates, this group of students is then asked to play the trust game. They find that the ones who claim to trust more people are not always the ones who trust more others. This may question the reliability of using survey data. The problem is of course that experiments rely in a very small and specific sample and it results difficult to make generalizations. At the same time we believe that using more questions about trust, and not only one, we can measure better trust as a latent attitude of the individuals.

The methodology for measuring trust used in the present paper represents a different view in the factor analysis and item response models; it allows not to impose inessential assumptions and the use of categorical or discrete answers to the questions used as a basis for the measurement (Spady 2007). The result of applying this methodology will be the estimation of the probability distribution at individual level, and we will then infer the relation between trust and different types of child care used by the households.

### 3 Determinants of Child Care Choice

We will sketch a simple model to show the link between individual trust and the choice of child care technology. Suppose that a mother's utility is given by  $U(I, H)$ , where  $I$  is her income and  $H$  is the well-being of her child.  $U$  increases in  $I$  and in  $H$ . Income can be obtained by working. For the mother to be able to work, someone else needs to take care of the child. Several types of child care are available, each with its cost  $C$  and expected benefit in terms of well-being of the child.

These types of child care can be ordered by their degree of "externalness"  $e$  to the family: The mother can stay at home and take care of the child herself (least external), leave the child with the grandparents or other family members (somewhat external), pay someone (e.g. a baby sitter) to take care of the child at home (more external) or bring the child to a different place (say a kindergarten) paying for the service (most external).

Benefits of child care have two components, the well-being/good treatment of the kid  $h$ , and acquisition of education and social skills  $b_i$ . Suppose that there is a probability  $p_i$  that the child is not treated well that increases with externalness. The cost of child care depends on features

specific to the country and to the family, such as pricing and availability of kindergartens, or distance to grandparents and other family members.

Trust  $T$  affects benefits of child care in two ways. It reduces the mother's assessment of the probability  $p_i$  that the child is not treated well, and it increases the assessment of the amount of social skills the child will acquire further away from the family, i.e.  $\partial p_i(e)/\partial T < 0$  and  $\partial^2 b_i/(\partial e \partial T) > 0$ . So higher trust raises the expected benefit of child care further away from the family compared to close to it.

In this setting, women are more likely to stay at home with their child when their potential wage is low, cost of external childcare is high, or they have a low level of trust. A higher potential wage makes choice of more external childcare more likely, just as higher trust. The optimal level of externalness then depends on the shape of the cost of childcare. Fundamentally, it seems reasonable to suppose that these costs rise with externalness. This can be reversed in countries where external childcare is heavily subsidized (e.g. free kindergartens) or in families that are very dispersed, so that it would be very costly to have grandparents take care of a child. So personal and demographic characteristics and a country's institutions interact in determining child care choices.

## 4 Data

To estimate the attitudes on trust we use the second wave of the European Social Survey (ESS). The ESS is a recent data set covering 25 European Countries in 2004. It provides rich information on social attitudes. In this round, the questionnaire includes, for the first time, a module on Economic morality: Trust and interactions between producers and consumers. This module is designed to investigate the normative and moral culture of markets and consumption in European countries and is useful for us because it contains some questions about the level of trust and confidence in business and state/government institutions. In addition, the ESS also contains information about some demographic variables. Corresponding to the theoretical model, some of these (described below) will also be used in the estimation. In this paper we have restricted our sample to married women with children younger than 12.

To measure the attitudes in shared trust we choose eight questions/items related to this

scale. The original wording of the questions/items we use to estimate the individual’s latent attitudes towards trust is shown in the appendix, just as the original wording of the question about different types of child care.

Summary statistics of the responses to these items are presented in table 1. Scales are recoded such that each item has three possible answers (1-3 scale).<sup>3</sup> A higher score corresponds to a higher level of trust. Even inside each scale the answering behavior varies over these items. Considering for instance the question ”Most People would try to be fair” and the question ”Can politicians be trusted?”, the means range from 2.21 to 1.55. This indicates that different items carry information on respondents’ attitudes to a varying degree. Thus, by focussing on just one or on a narrow subset of these items, valuable information might be lost. This is also indicated by the pairwise correlation coefficients for the items shown in Table 2; correlations are positive but far from perfect.

Table 3 contains summary statistics of the personal and demographic characteristics that we expect to be related to an individual’s level of social capital, as well as with the type of child care used. Whether these relationships hold in the data is an empirical question on which our analysis can shed some light.

## 5 The Measure of Trust

### 5.1 The Underlying process

In this section, we set up the model that will guide our estimation of the latent attitude that we identify as trust. Figure 1 shows a diagram of the underlying process that we have in mind. We suppose that every individual has some amount of trust. This attitude directly causes the responses to certain survey questions. It also has an effect on the behavior of agents, in this case the choice of child care technology.

Demographic and personal characteristics may also be informative about the way in which trust is distributed in a population; individual characteristics and experiences as well as community characteristics can be related to how much people trust each other. We assume that these characteristics do not affect the answers directly. If they have an effect it is through their effect

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<sup>3</sup>The recoding does not matter for our estimation.

on the attitudes we are measuring here. These characteristics can however affect the behavior of the individual (e.g. child care technology choice) directly, and this will be taken into account in the analysis.

The theoretical justification of the personal and demographic characteristics used in our estimation is the following:

**Age.** Since attitudes might change over the life cycle due to personal experience but also due to national and global developments, the age of respondents can be informative. In addition, there may be cohort effects. Since our data set is only a cross section, it is unfortunately impossible to disentangle life cycle and cohort effects.

**Political orientation (left vs right).** Information about respondents' political orientation can be informative about their attitudes. The expected sign is not immediately clear here, since on the one hand, we could think that more conservative people attach more importance to traditions and have a stronger feeling of belonging to a community. That could increase the level of trust in others. On the other hand, however, left-wing parties define themselves by their concern for the wellbeing of others, and this could affect left-leaning respondents' attitude to trust.<sup>4</sup>

**Living in a village.** As argued e.g. by La Porta et al. (1997), repeated interaction and small size of a local community can enhance trust and the sharing of norms and values of reciprocity. In particular, this could be the case for people living in villages.

**Income.** Since most determinants of income are also included as controls, the income coefficient should mainly reflect luck. Here it seems reasonable that people that faced more negative shocks have lower levels of trust and possibly also of reciprocity.

**Belonging to a group that historically felt discriminated.** Members of a group that has felt discriminated will probably not expect to be treated fairly in the future and therefore will

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<sup>4</sup>The question we will use from the EES is: "In politics people sometimes talk of "left" and "right." Where would you place yourself on this scale, where 0 means the left and 10 means the right?"

trust less. The question we will use from the EES is: "Would you describe yourself as being a member of a group that is discriminated against in this country? (yes/no)"

We also control for education and country of residence as they can influence the experiences faced during life.

## 5.2 Methodology and Estimation

Given the theoretical model described above, we can apply the estimation methodology developed by Spady (2006). This method allows us to obtain quantitative measures of latent attitudes without imposing specific parametric assumptions. The only assumptions needed are that (1) the expressions of agreement and disagreement on questions about trust ('item responses') reflect corresponding attitudes of the responder; (2) the 'attitudes' are enduring individual-specific attributes, given the individual's characteristics and environment. (3) We will use a series of item responses, and we will assume that this series has been determined by the attitude in trust. The attitudes of individuals making up a sample population can then be given probability distributions, based on their item responses and characteristics.

As described above, we use 8 item responses with 3 categorical responses each, stemming from 2,290 married women with children. In that case there are  $3^8 = 6561$  cells or possible combinations of responses. We assume that the item responses are determined by the individual's attitude on trust  $a$ . The probability of a particular response pattern (or cell) conditional on  $a$  is simply the product of the constituent item probabilities.<sup>5</sup> That is, we assume (for  $m$  items),

$$p(r_1, r_2, \dots, r_m|a) = p(r_1|a)p(r_2|a)\dots p(r_m|a). \quad (1)$$

To make more efficient use of the information available, we also exploit the information from personal and demographic characteristics. We assume that individual  $i$  has certain characteristics  $W_i$ , and that the distribution  $f(\cdot)$  of the latent attitude can be influenced by these characteristics  $W_i$ , that means  $f(a|W_i)$ . Concretely, as the theoretical model implies, suppose that  $W$  gives rise to social experiences, and consequently attitudes may change; the attitudes

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<sup>5</sup>We assume independence across the item responses.

are then reflected in item responses. So we have:

$$p(r_1, r_2, \dots, r_m|W) = \int p(r_1, r_2, \dots, r_m|a)f(a|W)da \quad (2)$$

$$= \int p(r_1|a)p(r_2|a)\dots p(r_m|a)f(a|W)da \quad (3)$$

Equation 3 is used to estimate simultaneously how  $W$  affects  $a$  and how  $a$  affects item responses. We specify that  $f(a|W)$  is represented by a  $N(\mu(W), 1)$ <sup>6</sup>, where

$$\mu(W) = W\beta. \quad (4)$$

So  $a$  is normal with a mean that is a linear function of the characteristics  $W$ . Equation 4 implies that  $f(a|W)$  is a  $N(0, 1)$  for the 'standardized respondent' and that the different groups of the population, characterized by different  $W$ , are also normally distributed with possibly different values of location  $\mu$ .<sup>7</sup>

Results of this estimation are illustrated in Figure 2. This figure shows the resulting item response models estimated using equations 3 to 4 for the items selected to represent the trust scale. The first box shows the probability of answering 1, 2 or 3 in item 1 as a function of an individual's attitude  $a$  (trust), where the lowest line represents the probability of answering 1, the difference between the second and the lowest one the probability of answering 2, and the difference between 1 and the second line the probability of answering 3. The other boxes show the same for the other items.

We will estimate the item response models by maximum likelihood, subject to the constraint that the distribution functions (the lines that indicate the probability of answering  $j$  in item  $k$  in figure 2) be downward sloping and not crossing. The probability densities of the item responses as a function of the attitude are approximated using exponential tilting of second degree. Subtracting the cumulative distributions corresponding to these densities from 1, we obtain downward sloping lines. The units of measurement are then transformed into  $[-\infty, \infty]$

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<sup>6</sup>Although it is methodologically possible, for simplicity we will not allow for scale variation.

<sup>7</sup>The "standardized respondent" will be a Greek married women who lives in a town or city, is 35.8 years old, has secondary education and medium income, has intensity of religion of 5.2, a value of 5.14 on a left-right scale of self-proclaimed political attitude, and who does not belong to a discriminated group(This is not the average person but the reference person.)

by the normal distribution function. To ensure that they do not cross, the lines of the boxes are constructed as products of the first lines.

The integration for the probability of a particular outcome for individual  $i$  ( $p(r_1, r_2, \dots, r_m|W) = \int p(r_1|a)p(r_2|a)\dots p(r_m|a)f(a|W)da$ ) has been carried out using a Gaussian quadrature at 200 grid points. To ensure that we can collect even the distributions with small variances, the gaussian quadrature has been applied to 5 different segments of the grid, with the one in the middle having more points.

The parameters obtained are the ones describing the distribution functions as well as the parameters associated to the personal characteristics (indicating the effect on location relative to the probability distribution of the ‘standardized respondent’). Since we use exponential tilting of second degree, we estimate two parameters per line and box for the distribution functions. The parameters associated to the personal characteristics are shown in Table 4.

### 5.3 How Personal and Demographics Characteristics relate to Trust

Table 4 shows the effect of  $W$  on the location ( $\mu$ ) of  $a$ . The effects are additive, which means that statements such as ‘more educated people have more trust in others’ must be understood in a ‘ceteris paribus’ sense (Spady (2006)). The effect of Age <sup>8</sup>, intensity of Religion and the left-right scale are shown in Figure 3.

The factors that affect trust most strongly are the level of education and belonging to a discriminated group. The signs of the coefficients are as expected: Belonging to a discriminated group has a strong negative effect on trust. Lower levels of education also affect the level of trust negatively. We do not find a significant effect for the different income levels, nor for living in a village. Age matters; younger and older mother have less trust than the middle-aged. This result is similar to the ones obtained by Putnam (2000) and by Glaeser et al. (2002). These authors find that this U-shaped profile is predicted by their model of social capital accumulation over the life cycle. In the present case, the cross-section nature of the data does not allow us to distinguish whether this pattern is due to this life cycle pattern or to cohort effects. The intensity of religion also has the expected effect, with more religious mothers trusting others

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<sup>8</sup>Notice that the variables presented in the tables are  $Age = Age - mean(Age)$  and  $Age.01 = (Age - mean(Age))^2/100$ , the same for intensity of religion and left-right scale

more. As to political orientation, what matters is more a distinction between the center and extremes than between right and left: people that identify with more extreme values have less trust in others. The level of trust decreases particularly rapidly for those that identify with the far-left. The highest value is reached in the center-right. It is important to notice that in determining a person's level of trust, these effects taken together can neutralize or reinforce each other. For instance, religiosity is positively correlated with belonging to a discriminated group, and these two effects can neutralize each other.

#### 5.4 Trust Across Countries

Country characteristics such as differences in institutions, in labor market conditions, or in income and ethnical inequality also affect trust, as captured by the country fixed effects. These coefficients, shown in 4, make it clear that European countries differ quite a lot.<sup>9</sup> The coefficient is largest for the Nordic countries, and lowest in the Eastern European countries. Since the level of trust of each country also depends on the characteristics of its inhabitants, individuals' characteristics need to be taken into account in studying the realized distribution of trust across countries, and it is not enough to look at the coefficients reported in table 4. For this reason, Table 5 reports the mean over individuals of the individuals' probability distributions for trust for each country. To make the means comparable to the coefficients we have normalized both measures so that they range from 0 to 1.

The order of the ranking varies only slightly between the two different measures. This indicates that the country dummies explain quite a lot of the differences in levels of trust. This result fits with those obtained in experimental frameworks. Henrich, Boyd, Bowles, Camerer, Fehr, Gintis, McElreath, Alvard, Barr, Ensminger, Henrich, Hill, Gil-White, Gurven, Marlowe, Patton and Tracer (2005) provide evidence that individuals from different cultures behave differently in ultimatum games and public good games, and Bornhorst, Ichino, Schlag and Winter (2005) find that there are significant differences between Southern and Northern Europeans in terms of trust in a trust game experiment with PhD students from different European countries. As Holm and Danielson (2005) say, all this evidence may be an indication that "trust operates differently in different cultures, even in relatively homogeneous groups."

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<sup>9</sup>Note that the reference country is Greece.

This is also clear from the map in Figure 5 which shows the pattern of the levels of trust across countries. Countries have been grouped according to their value of the indices reported in table 5. The changes in the rankings when using the two different indices do not affect which countries are included in each group, underlining again that it is mainly country-specific, not individual-specific, factors that matter for cross-country differences.

## 5.5 Getting the Individual Level of Trust

One of the advantages of the methodology that we are using is that we can calculate the distribution of estimated trust for each individual. Applying Bayes' Law, the distribution of the attitude  $a$  for an individual person, given his answers and personal characteristics is:

$$f(a|W, r) = \frac{f(a, r|W)}{p(r|W)} = \frac{p(r|a, W)f(a|W)}{p(r|W)} = \frac{p(r|a)f(a|W)}{p(r|W)} \quad (5)$$

The elements of this expression have all been estimated previously;  $p(r|W)$  is given as  $\int p(r|a)f(a|W)da$  in equation 3.

It is interesting to notice that in estimating  $f(a|W, r)$  we use all the information we have; the personal characteristics and the item responses. One could think that thanks to the exercise performed up to now, it would be sufficient to use only the personal characteristics to know the distribution of  $a$  for each respondent. In that case we would be saying that it is enough to compute  $f(a|W)$ . The problem is that if someone gives surprising answers, then it might be that  $f(a|W, r)$  will have higher dispersion than  $f(a|W)$  and also its estimated location can be moved. Therefore it seems reasonable to think that  $f(a|W, r)$  will be the most informative measure we can get.

As an example consider the four respondents represented in Figure 4. The left panel shows the probability distribution of trust for two women who gave the same responses ( the answers where [1, 1, 1, 1, 1, 1, 1, 1]) but with different personal characteristics. Respondent A is a Spanish mother, she is 34, has high income, tertiary studies, lives in a city and does not belong to a discriminated group. On the intensity of religion scale (0-10) she situates herself at level 0 and on the left-right scale she situates herself as 7. Respondent B is an Ukrainian mother, she is 28, has secondary education, low income, lives in a village and does not belong to a discriminated group. On the intensity of religion scale (0-10) she situates herself at level 5 and on the left-right

scale she situates herself as 9. The figure shows that while the two give the same responses, the probability distribution of trust for respondent A lies further to the right. This is because despite the fact that they give the same answers, Respondent A’s personal characteristics are associated with higher levels of trust than those of Respondent B.

The right panel of Figure 4 shows the probability distribution of two Greek women, with very similar personal characteristics (they are between 30 and 35 years old, live in a city, have medium income and secondary studies and do not belong to a discriminated group. On the intensity of religion scale (0-10) they situate themselves at level 6 or 7 and on the left-right scale they situate themselves as 5) but they give very different responses to the items (Respondent C answers [1, 1, 1, 3, 2, 1, 1, 1], and Respondent D answers [3, 3, 3, 2, 3, 1, 1, 1].) Here, clearly the item responses drive the estimates of trust.

## 6 Testing the Relationship between Trust and Child Care Technology Choice

In this section we test if the level of trust has a positive and significant effect on the degree of externalness of the type of child care used. The coding of the question used for this purpose is: “Thinking about the youngest child in the household, I would like to ask you about his/her usual childcare, not counting lessons in school. By childcare I mean care carried out by anyone other than yourself or your current husband/wife/partner. Using this card, what is the main type of childcare that the youngest child receives? Please select only one.”

Just as in Section 3, we consider four different types of child care technology that can be ordered by their degree of “externalness”  $e$  to the family: The mother can stay at home and take care of the child herself (type 1, least external), leave the child with the grandparents or other family members (type 2, somewhat external), pay someone (e.g. a baby sitter) to take care of the child at home (type 3, more external) or bring the child to a different place (say a kindergarten) paying for the service (type 4, most external).<sup>10</sup>

The theoretical model implies that there is an underlying latent variable “desired exter-

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<sup>10</sup>In the data, we define child care to be of type 1 if the mother’s main activity is house work and taking care of children and the answer to the question is ‘no child care needed’, type 2 when the answer is ‘grandparents or other family members,’ type 3 when the answer is ‘Paid child care, looked after at carer’s or own home’ and type 4 if the answer is ‘Paid nursery or child care, looked after somewhere other than home.’

nalness.” Let this be  $e^*$ . There is a match from the latent variable,  $e_i^*$ , to the observed one,  $e_i = 1, 2, 3, 4$ , representing the four different types of child care defined above. According to our model, desired externalness will be a function of social benefits of child care, probability of failure, the costs of child care and the expected wage in the labor market:

$$e_i^* = f(SB, PF, CC, W) + \varepsilon_i \quad (6)$$

$$e_i = j \text{ if } \gamma_{j-1} < e_i^* \leq \gamma_j \quad (7)$$

for unknowns  $\gamma_j$  with  $\gamma_0 = -\infty$ ,  $\gamma_1 = 0$  and  $\gamma_4 = \infty$ . The probability that technology  $j$  is chosen is the probability that the latent variable  $e_i^*$  is between two boundaries  $\gamma_{j-1}$  and  $\gamma_j$ . We assume that  $\varepsilon_i$  is i.i.d. standard normal, so we will estimate an ordered probit model.

The components that influence mothers’ decisions will be proxied by the following explanatory variables:

**Expected Wage in the Labor Market (W).** The expected wage influences the decision to participate in the labor market, and therefore the choice of child care. This is important not only for the effect on the decision of working or not (and therefore the choice between child care technology 1 and the others), but also because a higher wage in the labor market makes the use of more expensive child care more affordable. We will proxy the expected wage with **mother’s education**. The marginal utility derived from consumption made possible by the wife’s income also depends on the **husband’s income**. If this is higher, the benefit from female participation is lower.

**Costs of Child Care (CC).** These can differ across individuals because of personal and family circumstances, and across countries because of different social policies. While in some countries child care is free for almost the whole population, in others the availability of public child care is very restricted and it is basically reserved to people who have economic problems. Since a measure of these costs is not easily available and since these social policies are usually quite homogenous at country level, we will capture them by including **country fixed effects** in the regressions. We also allow for the possibility that in cities the availability of formal child care can be higher, so we include a dummy that takes value 1 if the household lives in a

**city**. The effect of these costs will also be different for families with different incomes. For that reason, we control for the **income of the household**. More specifically, we use the **husband's income** since the entire households' income includes the mothers' income, so using it would induce problems of endogeneity.<sup>11</sup>

**Probability of Failure (PF)**. Mothers assume that the probability of failure or of misbehavior of the person taking care of the child rises with externalness. From the model, however, we expect that mothers with more **trust** will attach a lower probability to misbehavior of the person taking care of the child. We also include a dummy that is 1 if the **grandmother was working** when the mother was 14. Following the idea of Fernandez and Fogli (2005), we think that personal experiences can influence mothers' beliefs about how much harm can come from leaving the children with strangers. Therefore we expect these variables to have a negative effect on the expected probability of failure, and a positive effect on the desired degree of externalness.

**Social Benefits (SB)**. More external child care can yield social benefits in the form of education the child can receive from a well-trained person taking care of the child, and in the form of social skills the child can gain from interaction with other children. It is possible that parents with higher education will tend to give more importance to this type of benefits. Therefore, we include in the ordered probit the **education of the parents**. As described in the theoretical model, we also expect **trust** to affect expected social benefits positively.

The measure of trust that we use for this exercise will be the mean of the estimated individual probability distribution of trust. Table 7 shows the results of the estimated ordered probit. The model is estimated for three different samples, the first consisting of all the countries, the second of all the countries except the Nordic countries, and the third of the Nordic Countries only.

In the full sample, we observe that trust has a non-linear, significantly positive effect on the externalness of child care, i.e. higher trust increases the probability of leaving the child with a more external type of child care. If this transition is from child care by the mother to child care by someone else, this means that more trust can encourage labor market participation. At

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<sup>11</sup>We know if the percentage of the family income generated by the respondent (the mother) is none, very small, under a half, about a half, over a half, very large, all. We attribute the rest to the husband.

high levels of trust, increments in trust cease to have an effect, as captured by the non-linearity. When we separate the sample, we observe that the effect of trust is linear for the non-Nordic countries. As average trust is significantly lower in these countries, the non-linearity, which occurs for high levels of trust, cannot be identified here. In the Nordic countries, in contrast, trust has no effect on the degree of externalness of child care. Several factors could be driving this result. First, the effect of trust on externalness can only be identified if a change in the type of child care can occur. However, in practice, the menu of child care choices is limited; if trust in the Nordic countries is generally high and as a consequence most people choose the most external type of child care (as shown in Table 6), people who would prefer even more external child care do not have such an option. Secondly, it could be that social policies are such that the cost of child care is so low that the most external choice is dominant for most people independently of trust. A low gender wage gap could have a similar effect. This suggests that cost is not the only factor leading to choice of high levels of externalness (and related to this, high female labor market participation) in the Nordic countries compared to the rest of Europe, trust can also be an important explanatory factor.

The rest of variables take the expected sign. The coefficient on grandmother's labor market participation is positive and significant even for the Nordic countries. The husband's income is negatively associated to the degree of externalness, so the effect on the marginal utility of consumption outweighs that on the affordability of child care. This is similar to findings in the literature that male wages are positively related to fertility and negatively to women's participation.<sup>12</sup> Education has a positive effect on externalness; this is true both for a higher degree held by the mother (though not for a secondary degree) and for a secondary or higher degree held by the partner.

Most of the country dummies included in the regressions are also significant. Hence, factors other than trust and the other controls also matter in explaining child care choices; data on the cost of child care in different countries would help to shed more light on this.

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<sup>12</sup>For evidence for various countries, see Carliner, Robinson and Tomes (1980) on Canada, Ermisch (1989) on the UK, Colombino and Di Tommaso (1996) on Italy, Di Tommaso (1999) on Italy again, and Hotz and Miller (1988) on the US.

## 7 Conclusion

The evidence presented in this paper suggests that trust affects child care technology choices and in extension, it may also affect the decision of females to participate in the labor market. Since we observed strong differences of trust across countries, trust could be another possible explanation for the differences in the use of formal child care and in female participation rates across countries.

Although it would be desirable to formally take into account additional factors such as policies affecting the cost of child care or gender discrimination in the labor market, we think that our paper raises the issue that the level of confidence of citizens with their institutions and with other citizens may have important implications.

Results are obtained using a new methodology for measuring individuals' attitudes on trust. This methodology is conceptually cleaner than previously used methods since it allows estimating trust directly (and not a proxy) as a latent attitude, using a simple theoretical model, and without imposing parametric assumptions. In line with the idea that generalized trust is a broad idea, the model allows to build the individual measure using different dimension of trust, avoiding problems of other papers that use more partial measures.

In measuring the individual level of trust, we exploit information on agents' attitudes contained in survey responses, and information from personal and demographic characteristics. This allows to see the probability distribution of the latent attitude, conditional on these characteristics. In particular, education, age, intensity of religion, political orientation, and being from a discriminated group can explain part of the distribution of trust. Regional characteristics, on the other hand, are also very important in explaining differences of trust across Europe.

Our findings imply that social policies affecting the cost and availability of child care are not the only factor that facilitates the use of formal child care and promotes labor market participation of mothers; trust and any policies affecting it also matter. Enhancing trust may also make social policies more effective, particularly in countries with low levels of trust such as the Eastern European countries. This could be achieved by increasing trust in institutions, but also by raising levels of education, and by reducing discrimination.

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## 8 Appendix

Original wording of the questions/items we use to estimate the individual's latent attitudes towards trust:

- Generally speaking, would you say that most people can be trusted, or that you can't be too careful in dealing with people?<sup>13</sup> (Score of 0 to 10, where 0 means you can't be too careful and 10 means most people can be trusted.)
- Do you think that most people would try to take advantage of you if they got the chance, or would they try to be fair?<sup>14</sup> (Score of 0 to 10, where 0 means most people would try to take advantage of me and 10 means most people would try to be fair.)
- Would you say that most of the time people try to be helpful or that they are mostly looking out for themselves?<sup>15</sup> (Score of 0 to 10, where 0 means people mostly look out for themselves and 10 means people mostly try to be helpful.)
- Please tell me how much you personally trust each of the institutions I read out. (Score of 0 to 10, where 0 means you do not trust an institution at all, and 10 means you have complete trust.)
  - the legal system
  - politicians
- How much would you trust the following groups to deal honestly with people like you? (Score of 1 to 5, where 1 means you distrust and 5 means you trust a lot.)
  - plumbers, builders, car mechanics and other repair people<sup>16</sup>
  - financial companies such as banks or insurers.
  - public officials<sup>17</sup>

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<sup>13</sup>Can't be too careful: need to be wary or always somewhat suspicious.

<sup>14</sup>Take advantage: exploit or cheat; fair: in the sense of treat appropriately and straightforwardly.

<sup>15</sup>The intended contrast is between self-interest and altruistic helpfulness.

<sup>16</sup>Builders include all kinds of tradespeople who work on building sites.

<sup>17</sup>Public officials refers to both government officials, such as custom officers and to local officials, such as housing/building regulators etc.

Table 1: Descriptive Statistics of the items used to estimate the Trust Scale.

| Variable               | Mean   | Std. Dev. | Min | Max |
|------------------------|--------|-----------|-----|-----|
| Most People Trusted    | 2.0388 | 0.8322    | 1   | 3   |
| Most People Fair       | 2.2441 | 0.7944    | 1   | 3   |
| Most People Helpful    | 1.9270 | 0.7994    | 1   | 3   |
| Trust Legal System     | 2.0720 | 0.8274    | 1   | 3   |
| Trust Politicians      | 1.5580 | 0.6984    | 1   | 3   |
| Trust Repair People    | 2.1650 | 0.8264    | 1   | 3   |
| Trust Banks            | 2.1502 | 0.82031   | 1   | 3   |
| Trust Public Officials | 2.2489 | 0.7536    | 1   | 3   |

Table 2: Pairwise Correlation Coefficients for the items used to build the two scales.

| Question         | Trust People | People Fair   | People Help | Legal System     |
|------------------|--------------|---------------|-------------|------------------|
| Trust People     | 1.0000       |               |             |                  |
| People Fair      | 0.5301       | 1.0000        |             |                  |
| People Help      | 0.4232       | 0.4291        | 1.0000      |                  |
| Legal System     | 0.2897       | 0.2524        | 0.2530      | 1.0000           |
| Politicians      | 0.2760       | 0.2213        | 0.2286      | 0.4603           |
| Repair Things    | 0.1329       | 0.1442        | 0.1313      | 0.1193           |
| Banks            | 0.1341       | 0.1515        | 0.1160      | 0.1643           |
| Public Officials | 0.1726       | 0.2013        | 0.1375      | 0.2592           |
| Question         | Politicians  | Repair Things | Banks       | Public Officials |
| Politicians      | 1.0000       |               |             |                  |
| Repair Things    | 0.1188       | 1.0000        |             |                  |
| Banks            | 0.1723       | 0.3687        | 1.0000      |                  |
| Public Officials | 0.2124       | 0.2987        | 0.4292      | 1.0000           |

Table 3: Descriptive Statistics for the Personal and Demographic Characteristics.

| Variable                 | Mean     | Std. Dev. |
|--------------------------|----------|-----------|
| Age                      | 35.831   | 6.2436    |
| Primary Degree           | 0.0657   | 0.2478    |
| Secondary Degree         | 0.5306   | 0.4992    |
| Higher Degree            | 0.3993   | 0.4899    |
| City                     | 0.3028   | 0.4596    |
| Intensity Religion       | 5.2790   | 2.7894    |
| Left-Right               | 5.1498   | 1.9399    |
| Discriminated Group      | 0.0586   | 0.2350    |
| Average Income           | 36357.25 | 29360.60  |
| Husband's Income         | 24172.15 | 21792.37  |
| Partner Secondary Degree | 0.4456   | 0.4971    |
| Partner Secondary Degree | 0.4456   | 0.4971    |
| Partner High Degree      | 0.2874   | 0.4526    |
| Grandma Working          | 0.6051   | 0.4889    |

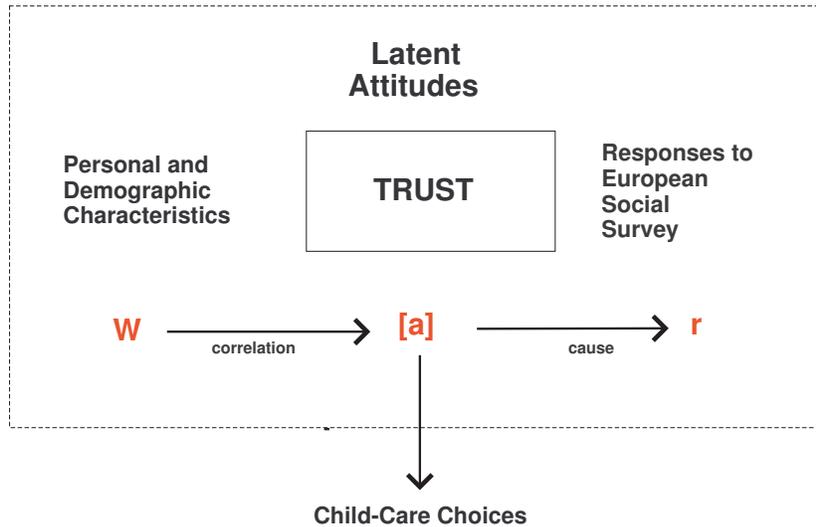


Figure 1: Diagram of the underlying process.

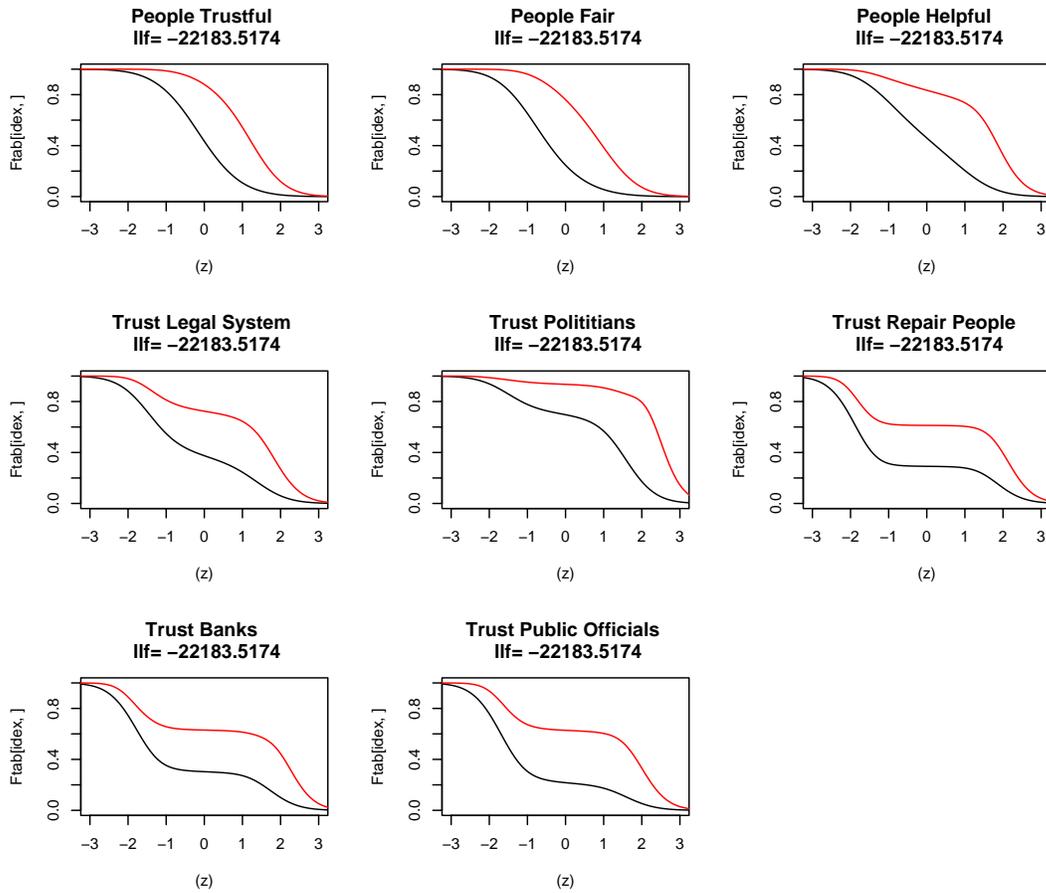


Figure 2: Estimates of the item response model for the items constituting a scale on shared trust.

Table 4: Estimated Coefficients for Personal and Demographic Characteristics in Trust Scale.

| Variable            | Standard Errors |               |         |              |
|---------------------|-----------------|---------------|---------|--------------|
|                     | Coefficient     | Outer Product | Hessian | White Robust |
| Age                 | 0.0134          | 0.0036        | 0.0034  | 0.0034       |
| Agesq.01            | -0.0677         | 0.0274        | 0.0281  | 0.0315       |
| Low Income          | -0.0821         | 0.0809        | 0.0756  | 0.0753       |
| High Income         | 0.0089          | 0.0620        | 0.0573  | 0.0547       |
| Primary Degree      | -0.2725         | 0.0976        | 0.0939  | 0.0934       |
| Higher Degree       | 0.2627          | 0.0545        | 0.0499  | 0.0496       |
| Village             | -0.0403         | 0.0499        | 0.0455  | 0.0430       |
| Intensity Religion  | 0.0200          | 0.0092        | 0.0087  | 0.0084       |
| IntRelig.01         | 0.0458          | 0.2793        | 0.2584  | 0.2452       |
| Discriminated Group | -0.5328         | 0.1083        | 0.0952  | 0.0856       |
| Left-Right          | 0.0264          | 0.0116        | 0.0113  | 0.0114       |
| Left-Right.01       | -0.8710         | 0.3487        | 0.3561  | 0.3749       |
| Austria             | 0.8939          | 0.1142        | 0.1220  | 0.1653       |
| Belgium             | 0.4467          | 0.1439        | 0.1380  | 0.1706       |
| Switzerland         | 1.0611          | 0.1126        | 0.1215  | 0.1661       |
| Chez Republic       | 0.0902          | 0.1218        | 0.1240  | 0.1664       |
| Germany             | 0.4410          | 0.1011        | 0.1140  | 0.1650       |
| Denmark             | 1.8043          | 0.1439        | 0.1263  | 0.1608       |
| Estonia             | 0.4353          | 0.1566        | 0.1636  | 0.1956       |
| Spain               | 0.3210          | 0.1464        | 0.1312  | 0.1576       |
| Finland             | 1.3566          | 0.1100        | 0.1207  | 0.1756       |
| France              | 0.2701          | 0.1379        | 0.1254  | 0.1547       |
| United Kingdom      | 0.4258          | 0.1251        | 0.1329  | 0.1834       |
| Hungary             | -0.0720         | 0.1482        | 0.1425  | 0.1598       |
| Ireland             | 0.6209          | 0.1086        | 0.1107  | 0.1402       |
| Iceland             | 1.2348          | 0.2005        | 0.1767  | 0.2041       |
| Luxembourg          | 0.4683          | 0.1368        | 0.1401  | 0.1701       |
| Netherlands         | 0.9013          | 0.1182        | 0.1190  | 0.1698       |
| Norway              | 1.4198          | 0.1370        | 0.1249  | 0.1546       |
| Poland              | -0.2478         | 0.1539        | 0.1317  | 0.1499       |
| Portugal            | -0.1950         | 0.1407        | 0.1365  | 0.1666       |
| Sweden              | 0.8966          | 0.1255        | 0.1445  | 0.2037       |
| Slovenia            | 0.2006          | 0.8427        | 0.8344  | 0.8343       |
| Slovakia            | -0.1326         | 0.1625        | 0.1399  | 0.1628       |
| Ukraine             | -0.2725         | 0.1587        | 0.1522  | 0.1763       |

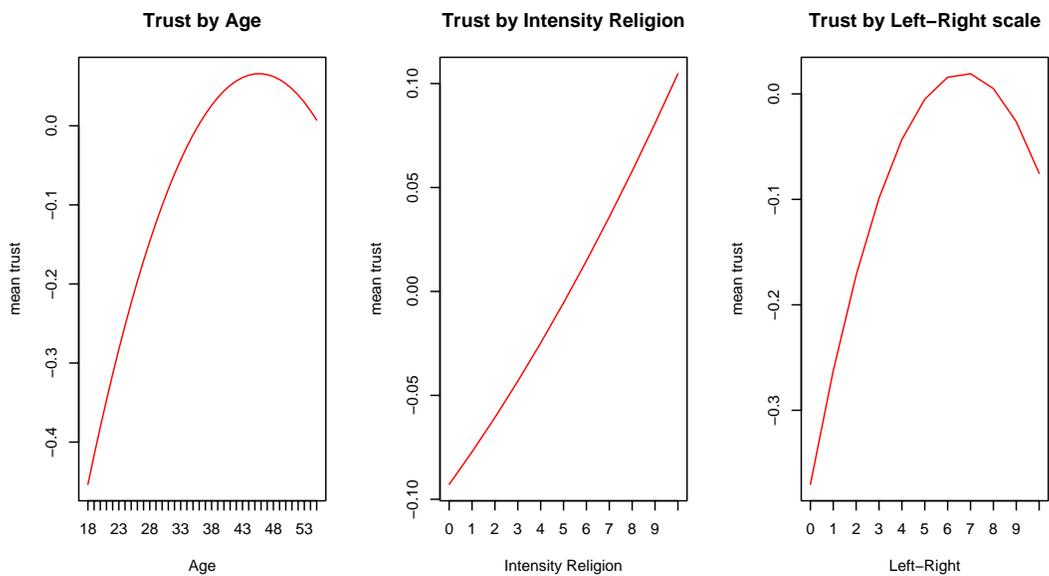


Figure 3: The effect of the three continuous demographic variables: Age, Intensity of Religion, Left-Right Scale.

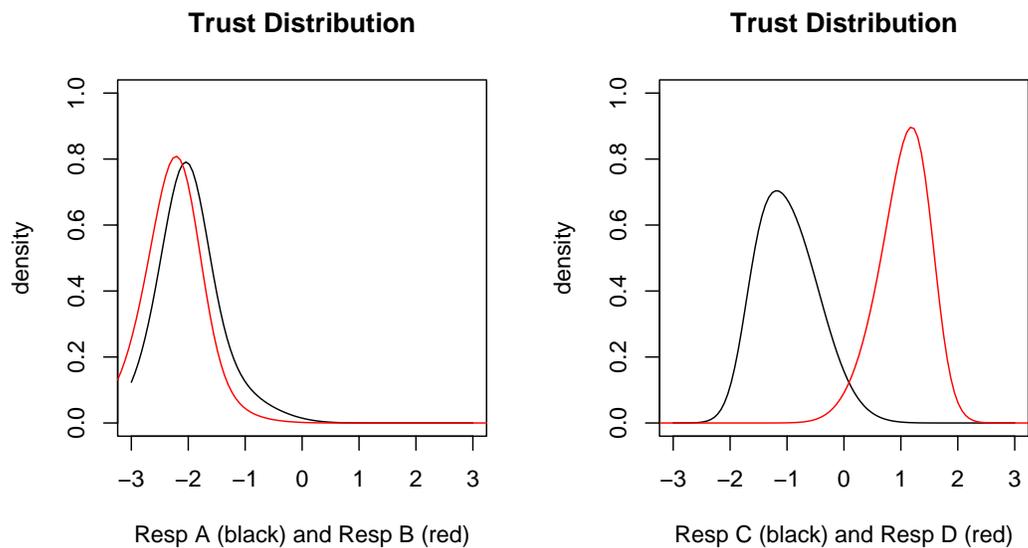


Figure 4: Probability density distribution of the latent attitudes for different respondents.

Table 5: Differences in trust levels across countries.

| Region         | Regional Coefficient<br>(normalized:0-1) | Trust Index<br>(normalized: 0-1) |
|----------------|--|----------------------------------|
| Austria        | 0.5616                                   | 0.5453                           |
| Belgium        | 0.3463                                   | 0.3943                           |
| Czech Republic | 0.1312                                   | 0.1714                           |
| Denmark        | 1.0000                                   | 1.0000                           |
| Estonia        | 0.3408                                   | 0.3852                           |
| Finland        | 0.7844                                   | 0.7934                           |
| France         | 0.2613                                   | 0.3056                           |
| Germany        | 0.3436                                   | 0.3815                           |
| Greece         | 0.1312                                   | 0.0000                           |
| Hungary        | 0.1312                                   | 0.1190                           |
| Iceland        | 0.7258                                   | 0.7389                           |
| Ireland        | 0.4302                                   | 0.4906                           |
| Luxembourg     | 0.3567                                   | 0.3613                           |
| Netherlands    | 0.5652                                   | 0.5737                           |
| Norway         | 0.8149                                   | 0.8073                           |
| Poland         | 0.0119                                   | 0.0352                           |
| Portugal       | 0.1312                                   | 0.0016                           |
| Slovakia       | 0.1312                                   | 0.0706                           |
| Slovenia       | 0.1312                                   | 0.1644                           |
| Spain          | 0.2858                                   | 0.2892                           |
| Sweden         | 0.5629                                   | 0.5810                           |
| Switzerland    | 0.6421                                   | 0.6334                           |
| Ukraine        | 0.0000                                   | 0.0687                           |
| United Kingdom | 0.3362                                   | 0.3361                           |

Table 6: Percentage of mothers using different types of technology (differences across samples).

|               | All countries | Non Nordic | Nordic |
|---------------|---------------|------------|--------|
| Mother Home   | 37.56         | 42.51      | 19.38  |
| Family Member | 38.61         | 40.02      | 33.41  |
| Baby-Sitter   | 7.01          | 7.03       | 6.9    |
| Kindergarten  | 16.83         | 10.43      | 40.31  |
| Sample size   | 2,098         | 1,649      | 449    |

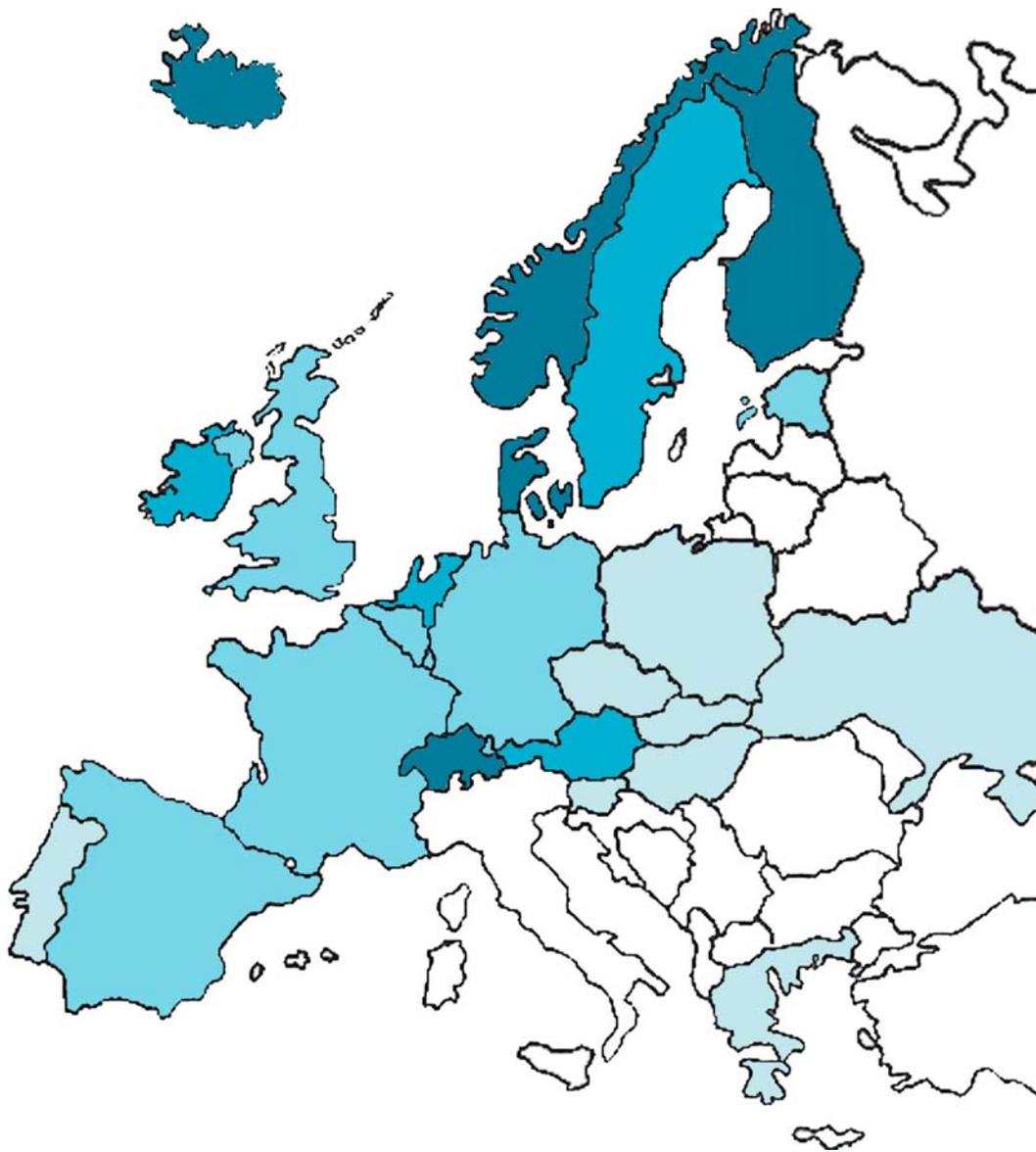


Figure 5: Trust across Europe: from dark (more trust) to light (less trust)

Table 7: Ordered Probit Estimation for Child Care Technology Choice.

| Child Care Type               | All countries        | Non Nordic Countries | Nordic Countries   | All countries        | Non Nordic Countries | Nordic Countries  |
|-------------------------------|----------------------|----------------------|--------------------|----------------------|----------------------|-------------------|
| Trust                         | 0.081**<br>(0.038)   | 0.083**<br>(0.040)   | 0.088<br>(0.149)   | 0.086**<br>(0.038)   | 0.087**<br>(0.040)   | 0.089<br>(0.149)  |
| Trust2                        | -0.046**<br>(0.021)  | -0.043<br>(0.028)    | -0.045<br>(0.054)  | -0.052**<br>(0.021)  | -0.055**<br>(0.027)  | -0.047<br>(0.054) |
| Income Husband /1000          | -0.008***<br>(0.001) | -0.011***<br>(0.002) | -0.001<br>(0.003)  |                      |                      |                   |
| Income Household /1000        |                      |                      |                    | 0.003 ***<br>(0.001) | 0.003**<br>(0.001)   | 0.003<br>(0.002)  |
| Age                           | 0.016***<br>(0.004)  | 0.015***<br>(0.005)  | 0.018**<br>(0.009) | 0.013***<br>(0.004)  | 0.012**<br>(0.005)   | 0.016*<br>(0.009) |
| City                          | 0.114<br>(0.070)     | 0.090<br>(0.078)     | 0.169<br>(0.163)   | 0.101<br>(0.070)     | 0.088<br>(0.078)     | 0.147<br>(0.163)  |
| Secondary Degree              | 0.046<br>(0.109)     | 0.037<br>(0.115)     | -0.163<br>(0.384)  | 0.063<br>(0.109)     | 0.074<br>(0.115)     | -0.170<br>(0.383) |
| Higher Degree                 | 0.431***<br>(0.116)  | 0.476***<br>(0.124)  | 0.117<br>(0.381)   | 0.426***<br>(0.116)  | 0.474***<br>(0.124)  | 0.107<br>(0.380)  |
| Partner Secondary             | 0.158**<br>(0.069)   | 0.200***<br>(0.075)  | 0.009<br>(0.172)   | 0.117*<br>(0.068)    | 0.139*<br>(0.075)    | 0.001<br>(0.172)  |
| Partner Higher                | 0.172**<br>(0.079)   | 0.210**<br>(0.089)   | 0.015<br>(0.183)   | 0.041<br>(0.078)     | 0.052<br>(0.089)     | -0.043<br>(0.182) |
| Grandma worked when mother 14 | 0.227***<br>(0.057)  | 0.231***<br>(0.063)  | 0.254*<br>(0.139)  | 0.211***<br>(0.057)  | 0.202***<br>(0.063)  | 0.262*<br>(0.139) |
| LR-Chi2                       | 520.57               | 263.74               | 73.10              | 500.28               | 230.72               | 75.21             |
| Pseudo-R2                     | 0.1016               | 0.0694               | 0.0659             | 0.0976               | 0.0607               | 0.0678            |
| N                             | 2098                 | 1649                 | 449                | 2098                 | 1649                 | 449               |