

Lergetporer, Philipp; Angerer, Silvia; Glätzle-Rützler, Daniela; Sutter, Matthias

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Children's cooperation and discrimination in a bilingual province^{*}

Silvia Angerer¹, Daniela Glätzle-Rützler¹, Philipp Lergetporer²
and Matthias Sutter^{3,4,†}

¹ Department of Public Finance, University of Innsbruck, silvia.angerer@uibk.ac.at, daniela.ruetzler@uibk.ac.at

² Center for the Economics of Education and Innovation, Ifo Institute at the University of Munich, lergetporer@ifo.de

³ Department of Economics, European University Institute, Firenze, matthias.sutter@eui.eu

⁴ Department of Economics, University of Cologne.

Abstract

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[†] Corresponding author: European University Institute, Department of Economics, Via della Piazzuola 43, I-50133 Firenze, Italy. e-mail: matthias.sutter@eui.eu

1. Introduction

In-group favoritism and out-group discrimination are, “among the most well documented and widely observed phenomenon[a] in the social sciences” (Ruffle and Sosis, 2006, p. 148). Evidence for the economic implications of intergroup discrimination is vast and spans from discrimination in labor, housing, credit or consumer markets to political conflict or even social unrest (see, for instance, Gurr, 1993; Arrow, 1998; Darity and Mason, 1998; Ladd, 1998; Yinger, 1998; Balafoutas et al., 2013). In terms of efficiency costs, discrimination undermines the provision of public goods by hampering cooperation with out-group members (Habyarimana et al., 2007). Despite the fact that discrimination and its economic implications have been studied in many different societies and based on a multitude of attributes like ethnicity, religion, gender, or language at least since Becker (1957), the development of such behavior in children is still poorly understood. This is unfortunate since a profound understanding thereof is a necessary precondition for designing effective policies which tackle discriminatory behavior before it becomes internalized (Hewstone et al., 2002; Buttelmann and Boehm, 2014). In this paper, we investigate in an experimental framework how intergroup discrimination evolves in childhood¹. To this end, we exploit an almost unique natural setting which allows us to study discrimination based on language group affiliation in Meran, a town with 38,000 inhabitants in the Northern Italian province of South Tyrol (Alto Adige). Virtually 50% of the citizens of Meran are German-speaking and 50% Italian-speaking. While citizens of both language groups are not segregated with respect to the area of residence and thus live next-door to one another, schools, as well as most other institutions in the province, are segregated by language (see Section 2 for historical and cultural background information). We present evidence from an incentivized experiment on cooperation with 826 children, aged six to eleven years (grade one to grade five) and speaking either Italian or German.

Many provinces in which significant fractions of the population speak different languages take huge efforts to avoid segregation of social life across the language-divide and to create a common identity of citizens². One of the measures taken to facilitate integration of different language groups is typically to make children learn the other (significant) language that is spoken in a particular province (Conversi, 1990)³. While this is certainly helpful for making cooperation between members of different language groups easier, the question of whether such measures are sufficient to overcome discrimination on grounds of language

¹ Our study is classified as „framed field experiment“ in Harrison and List’s (2004) taxonomy.

² For a short account on the importance of language group discrimination, see, for instance, Kinzler et al. (2007).

³ For instance, children are being taught English and French in Quebec, Catalan and Spanish in Catalonia, and Italian and German in South Tyrol.

group affiliation is still open. Since children learn the other language from first grade on in the province under investigation, we are able to assess whether this is a sufficient measure against discrimination in children.

In order to explore the development of intergroup discrimination, we employ a modified version of the simultaneous prisoner's dilemma game in which the identity of the interaction partner is varied across treatments: Treatment **INGROUP** represents an in-group condition with a partner from the subject's own school class. In treatments **OUTGROUP SAME LANGUAGE** and **OUTGROUP OTHER LANGUAGE** the partner is a child from another school. The difference between both out-group-treatments is that in the former, the decision-making child is matched with a partner from the same language group (German or Italian) whereas the partner speaks the respective other language in the latter. In addition, we elicited our subjects' first order beliefs about the choice of the partner.

Across all age groups, children cooperate significantly more with partners from their own class as compared to partners from a different school but the same language group (**CLASS** vs. **SAME**). Likewise a comparison between treatments **SAME** and **OTHER** reveals that cooperation rates are significantly higher if the partner belongs to the same language group as the decision-making child. Split up by age groups⁴, our data shows that the difference between **CLASS** and **SAME** is significant from the age of 7/8 years on. In contrast, only 9/10- and 10/11- year olds (i.e. the two oldest age groups) cooperate significantly more in treatment **SAME** than in treatment **OTHER**. These results are robust to the inclusion of a host of control variables in our regression analysis. Hence, we can pin down the developmental stages at which in-group favoritism or out-group discrimination and language group discrimination evolve.

We focus on the development of intergroup discrimination in the context of cooperation because cooperation is one of the fundamental cornerstones for the well-functioning of human societies (Axelrod, 1984; Nowak, 2006). Cooperation within groups, however, may co-evolve with out-group discrimination (Choi and Bowles, 2007; Fehr et al., 2008, 2013) which forfeits Pareto-optimal outcomes. This is particularly so when two groups with distinctly different characteristics live closely together (see, for instance, Habyarimana et al., 2007) as it is the case for the language groups in Meran.

Many studies with adult subjects have documented intergroup biases in cooperative behavior (Fershtman and Gneezy, 2001; Bernhard et al., 2006; Goette et al., 2006; Ruffle and

⁴ We define age groups in terms of primary school grades. Grades one, two, three, four and five correspond to 6/7-, 7/8-, 8/9-, 9/10- respectively 10/11-year-olds.

Sosis, 2006; Charness et al., 2007; Falk and Zehnder, 2013). Little is known, however, about the behavioral foundations of this phenomenon. By investigating the development of intergroup discrimination in children, the present study represents a complement to the previous literature on discrimination in adults. From a policy perspective, a profound understanding of the origins of such behavior is important since interventions against intergroup discrimination are particularly effective in young children (Hewstone et al., 2002).

In recent years, the research agenda of economists has extended to the economic decision making of children whereby particular attention has been devoted to the development of cooperative behavior (see, for instance, Fan, 2000; Harbaugh and Krause, 2000; Peters et al., 2004; Sally and Hill, 2006; Alencar, 2008; Cardenas et al., 2011; Lerner et al., 2014). Likewise, numerous studies in developmental psychology have investigated in-group biases in children (see, for instance, Kinzler et al., 2007; Morre, 2009; Buttelmann et al., 2013; Buttelmann and Boehm, 2014). This paper bridges both strands of the literature by employing an incentivized economic experiment for investigating the co-evolution of cooperation and discrimination in a natural setting.

The economic study which is closest to the present paper is Fehr et al. (2008). They ran a series of binary dictator games with subjects aged 3 to 8 years in order to study how social preferences and parochialism co-evolve. Implementing one in-group- and one out-group-condition (with receivers from the decision-maker's own respectively another play-school, kindergarten or school), they find that children act more prosocially towards in-group members and that this bias is most pronounced in their oldest age group of 7/8 year olds. Fehr et al. (2013) apply the same experimental design to subjects aged 8 to 17 years and find that adolescents become less spiteful (more altruistic) towards in-group members from the age of 12/13 years (14/15 years) on.

Our study differs from Fehr et al. (2008, 2013) in at least two important dimensions. First, we implement two different out-group conditions (SAME and OTHER) in addition to the in-group treatment (CLASS). This allows us to study the development of discrimination across the linguistic divide on top of mere in-group favoritism. Second, we focus on cooperative behavior instead of distributional preferences. While both dimensions are related (Andreoni, 1995), they have different implications in the context of intergroup discrimination: Discrimination in dictator games can be rationalized by the decision-maker's pure "taste for discrimination". In strategic situations like the prisoner's dilemma game, however, ethnic stereotypes are another possible source of discriminative behavior (see Fershtman and Gneezy,

2001)⁵. Since experimental evidence suggests that the mere taste for discrimination cannot account for intergroup discrimination in natural environments (see Fershtman and Gneezy, 2001; Habyarimana et al., 2008), we investigate the joint effect of both channels and discuss the role of beliefs for the decision to cooperate.

The rest of the paper is structured as follows. In the next section, we provide a brief account of the historical and cultural background of the autonomous province of South Tyrol (Italy). The experimental design and procedure is introduced in Section 3. Section 4 presents the results and Section 5 concludes the paper.

2. A brief account of historical background

Meran is the second largest city in the autonomous province of South Tyrol in the North of today's Italy. This province was part of the Austro-Hungarian Empire for centuries before it was annexed by Italy in the aftermath of World War One and became part of Italy through the treaty of Saint-Germain in 1919. Although South Tyrol had been inhabited by both German and Italian speaking citizens (and a very tiny minority of Ladin-speaking citizens) before 1919, in the interwar-period and early years after World War Two the Italian government promoted the Italianization of South Tyrol with declaring the exclusive use of Italian in public offices, the closure of the majority of German schools and the relocation of Italians from other parts of Italy to South Tyrol. This led to considerable tensions between both language groups that culminated in a series of terrorist attacks throughout the 1960s by a group called South Tyrolean Liberation Committee. Only in the early 1970s these tensions could be resolved by implementing the Autonomous Statute which guarantees equal rights and access to the public sector to citizens of both language groups (Alcock, 1970). In addition the statute grants the South Tyrolean considerable independence from the national government in Rome with autonomous legislative and executive power in most economic and social matters. The statute in addition implemented several measures in favor of the linguistic minorities such as the application of ethnic proportions in public administration and the introduction of three autonomous school boards – each responsible of its own linguistic group.

Today, of about half a million inhabitants in South Tyrol, slightly less than 70% report German and about 30% report Italian as their mother tongue. In Meran, 50.5% of the population speaks German and 49.1% Italian (with the rest speaking Ladin). It is noteworthy that within the city of Meran, there is almost no segregation along language lines with respect to the area of residence. Rather, citizens of both language groups live next to each other. Both groups are also predominantly catholic. However, social life is fairly segregated, with different media (like newspapers or TV channels), leisure activities (like different football clubs), and in particular schools that either teach in Italian or in German⁶. While the curricula of both types of schools are following the same national regulations and standards, so far there are no schools with bilingual teaching and with an equal representation of Italian- and German-speaking children. Rather, there is either a large majority of Italian-speaking or of German-

⁶ Due to the regulations offered by the Autonomous Statute to protect linguistic minorities.

speaking children attending a particular school.⁷ This segregation is prevalent from kindergarten to the completion of high school.

3. Experimental design and procedure

3.1 Design

Each subject participated in three modified one-shot prisoner's dilemma games (see Figure 1 for the payoff-matrix). In each game, a subject had a new, anonymous partner from the same grade. Both players in each game were endowed with five tokens and had to decide simultaneously how many of the tokens (if any) to send to the partner. Each token sent was doubled. This game resembles the classic binary prisoner's dilemma game since full cooperation (i.e. sending all tokens) is the socially optimal outcome. However, individual self-interest would prescribe to keep all tokens, leading to the most inefficient outcome (by minimizing the total earnings of both players together).

Figure 1 about here

The three games differed with respect to the group membership of the partner. In treatment CLASS, the partner was a randomly chosen child from the subject's own class, thus representing an in-group condition as in Fehr et al. (2013)⁸.

In treatment SAME, the partner was from another school, but spoke the same language as the decision-making child. Finally, in treatment OTHER, the partner was again from another school, but spoke the other language (either Italian, if the decision-making child spoke German, or vice versa)⁹. Through our within-subjects design, we can quantify three forms of discrimination based upon different group membership of the partner: pure language group discrimination (comparing SAME with OTHER), pure in-group favoritism (comparing

⁷ There are only seven children whose parents speak only German who attend an Italian school, and only 17 children with only Italian-speaking parents attending a German school.

⁸ Note that a child's primary school class constitutes her most important social group outside the family and that peer interactions in primary school classes are essential in the socialization process (Parsons, 1959). Therefore, it seems natural to define children from the same school class as in-group.

⁹ Following previous literature on intergroup discrimination, we employ a within-subject design (see, for instance, Charness et al.'s, 2007 laboratory experiment and the framed field experiment by Falk and Zehnder, 2013). Since we exploit the almost unique natural setting of Meran, the limited number of children in the town rendered the use of a between-subject design infeasible: A between-design would have reduced our observations per treatment to a number which is too low to perform reliable sub-group analyses (for instance, with respect to gender, age- and language groups).

CLASS with SAME) and the joint effect of language group discrimination and in-group favoritism (comparing CLASS with OTHER).

It is noteworthy that the partner's language was not mentioned during the instructions in order to minimize potential experimenter demand effects. Instead, we revealed only the name of the school, which is an unambiguous indication of the language that children speak in a particular school¹⁰. In their city-wide trust-game, Falk and Zehnder (2013) report that trustors exhibit less trust towards residents from low-income districts. Since children in Meran are usually assigned to the primary school which is closest to their home, the area of residence of the interaction partner (and not her language group affiliation) could potentially account for observed discrimination. To avoid this confound, we induced the two out-group-treatments by presenting a list of all German respectively Italian schools and randomly selected one of the respective schools per treatment to determine payoffs¹¹.

The three games were played in random order (see the Appendix for experimental instructions and material). After children had made their three decisions, we asked them how many tokens they expected to receive from the partner in each game (again in random order). The belief elicitation was incentivized with tokens. One randomly selected game was paid out four weeks after the experiment had taken place and tokens were exchanged for fruits, sweets and little presents¹².

3.2 Subject pool and procedure

We conducted our experiment in all fourteen elementary schools in Meran (South Tyrol, Italy) from April to May 2012. The experiment on cooperative behavior is part of a larger research study which investigates the development of economic decision making in elementary school children. Before starting the project we obtained permission from the Internal Review Board of the University of Innsbruck, the South Tyrolean State Board of Education, from the headmasters, and the parents of the involved children to run a series of three experimental sessions in all involved schools within each of the academic years 2011/12 and 2012/13. We obtained permission from 86% of parents of all primary school children in Meran to run ex-

¹⁰ As a manipulation check, we asked our participants which language they expected their partners to speak after all decisions had been made. 96 (97) percent of our subjects correctly anticipated that partners from schools with German (Italian) names actually speak German (Italian). These shares are statistically indistinguishable ($p > 0.1$, McNemar test) and do not differ with respect to age or language group affiliation.

¹¹ This design feature comes at the cost of making the treatment differences more salient and thus experimenter-demand effects more likely. As mentioned above, we argue that demand effects most likely working against the detection of treatment-effects, however.

¹² The use of non-monetary incentives is standard for experiments with children in the age groups considered here (see, for instance, Harbaugh and Krause, 2000; Benenson et al., 2007).

periments with their children during regular school hours. Participation in the experiment was voluntary, and only one child opted out. The experiment on cooperative behavior was the third experiment conducted with the children in the first year of the study (with previous experiments being unrelated to cooperation and discrimination).

Each child was fetched individually from the classroom and brought to a separate room where the experiment was explained face-to-face by one of the experimenters (with some other experimenters explaining the experiment to other children in different corners of the room). The experimenters had to memorize the instructions of the game and explain the game orally (in the mother-tongue of the child) with some visual support. Participants were assured that all choices they make are confidential. The duration of the experiment was approximately 20 minutes and it was conducted with pen and paper. In order to guarantee the understanding of the experimental instructions each child had to repeat the rules of the game until it was able to completely explain the experiment with all its consequences. In our analysis, we proceed with those 828 German- or Italian-speaking children who were able to repeat the rules of the game autonomously (see Table 1)¹³. 17 children were excluded from the analysis because they were not able to do so.

Table 1 about here

We used little presents like sweets (lollipops, small chocolates, candies), fruits (small bags of dried apple slices, nuts and raisins) and other presents (stickers, balloons, pencils, wristbands) which children could buy in exchange of their tokens in our “store”. The cost of each present was equal to one token. The children were invited to come one by one into the “store” to choose their most preferred reward. As the total earnings of each child were dependent also on the decision of the partner, it was not possible to calculate the exact earnings of the children directly at the end of the experiment. Thus children received their payment (as many pieces of their most preferred reward as they have earned tokens in the experiment) four weeks after the experiment.

¹³ A non-negligible share of children in Meran is bilingual (German and Italian). Since this paper studies the development of discrimination between language groups, we excluded 231 children who stated that they speak both languages with their parents from the subsequent analysis.

We paid close attention to maintaining anonymity in all phases of the experiment¹⁴. Therefore, the payoffs were handed over in sealed, non-transparent envelopes by a teacher who was not informed about the content of the experiment. This procedure was well known by the children. Furthermore, in the two preceding waves of the project we established the general rule that children are only allowed to open their envelopes at home. This rule was applied to this experiment as well.

Before the children were allowed to choose their most preferred reward, they were asked for their age, the number of siblings and whether they have friends from the respective other language group.

¹⁴ Lifting anonymity in cooperation experiments with children is particularly problematic, because it has been shown that children who believe that they can be sanctioned for non-cooperation significantly increase their cooperation-rates (Lergetporer et al, 2014). This observation may well extend to informal sanctioning behavior outside the laboratory setting.

4. Results

4.1 Descriptive analysis

Figure 2 shows in panel (A) the number of tokens sent to the partner, separated by age and treatment. The level of cooperation is increasing with age ($p < 0.01$ in each treatment, Cuzick's Wilcoxon-type tests for trend), yet there is a clear and consistent ordering across games within each age group. Cooperative behavior is most pronounced in CLASS, intermediate in SAME, and worst in OTHER. Across age groups, these differences are highly significant ($p < 0.01$ in each pairwise comparison, Wilcoxon signed rank tests). The gap between cooperation with in-group- and out-group members is, in general, widening with age, rather than getting smaller.

Figure 2 about here

This gap and its size in each age group is shown in Figure 3. The largest differences are found between CLASS and OTHER, a comparison that captures the joint effect of differences in language group discrimination and in-group favoritism, the latter also denoted as parochialism. This difference is significant in each age group ($p = 0.05$ for 6/7-year olds and $p = 0.00$ from age 7/8 on, Wilcoxon signed rank tests). The pure effect of parochialism (CLASS vs. SAME) is somewhat lower for each single age group and it is significant for all but the youngest age cohort¹⁵. The differences between SAME and OTHER are smaller and reach statistical significance only in children aged 9/10 years and 10/11 years ($p = 0.02$ and $p = 0.00$, respectively; Wilcoxon signed rank tests). In sum, we see that discrimination towards the other language-group becomes more pronounced with age. There is a positive and significant age trend in the differences between SAME and OTHER ($p = 0.07$, Cuzick's Wilcoxon-type test for trend) and between CLASS and OTHER ($p = 0.03$, Cuzick's Wilcoxon-type test for trend). However, no such trend is detected in the gap between CLASS and SAME ($p = 0.147$, Cuzick's Wilcoxon-type test for trend).

Figure 3 about here

Figure 2 shows in panel (B) the development of beliefs across the five grades of primary school. Strikingly, the number of tokens expected from the partner is always considera-

¹⁵ The p-values of Wilcoxon signed rank tests are 0.18 (6/7-year olds), 0.02 (7/8-year olds), 0.00 (8/9-year olds), 0.01 (9/10-year olds) and 0.00 (10/11-year olds).

bly higher than the actual amounts sent to the partner (displayed in panel (A)) in each age group and game ($p < 0.01$ in each case; Wilcoxon signed rank tests). This highlights the fact that a substantial fraction of children have (i) unrealistic beliefs about the behavior of their partner and (ii) are somewhat freeriding on the expected behavior of their partner. Yet, there is a positive correlation between tokens sent and tokens expected from the partner ($p < 0.05$ in treatment OTHER for 6/7-year olds and $p < 0.01$ in all other treatment-cohort combinations; Spearman rank correlations), indicating that children act conditionally cooperative (Fischbacher, Gächter and Fehr, 2001).

Comparing panel (A) and (B) in Figure 2, there is a clear downward trend in the difference between cooperation rates and beliefs with respect to age ($p = 0.00$ in each treatment, Cuzick's Wilcoxon-type test for trend). This means that, as children grow older, (i) expectations are getting more realistic and more closely aligned with actual decisions and (ii) less freeriding on the partner's expected contribution can be observed. It is noteworthy that the order of cooperation across games observed in panel (A) of Figure 2 also holds for beliefs in panel (B). Across all age groups, children expect to receive on average the largest number of tokens from a partner who attends the same class (CLASS), followed by a partner from another school, but within the same language group (SAME), and they expect to receive the least from someone from the other language group (OTHER) ($p < 0.05$ in each pairwise comparison, Wilcoxon signed rank tests)¹⁶.

Given that children seem to condition their level of cooperation on their expectations about the partner's choice, this implies that the differences between games observed in panel (A) are, at least partly, driven by expectations.

4.2 Regression analysis

The patterns of results shown in the previous section are confirmed by our regression analysis. In Table 2, we present OLS regressions¹⁷ with the number of tokens sent as the dependent variable, clustered on individual level. Specification (1) demonstrates that for each treatment cooperation increases significantly with age. Girls send more tokens than boys and so do German-speaking children as compared to their Italian counterparts. The Wald-tests

¹⁶ The differences in beliefs between SAME and OTHER are only significant in the two oldest age cohorts ($p = 0.01$ in both age groups, Wilcoxon signed rank tests). In-group favoritism in beliefs (CLASS vs. SAME) is found to be significant from 8/9-year olds on ($p = 0.03$, $p = 0.10$ and $p = 0.01$ for children aged 8/9, 9/10 and 10/11 years, respectively, Wilcoxon signed rank tests).

¹⁷ While applied economists disagree on whether models with discrete dependent variables should be estimated with OLS or non-linear approaches, we follow Angrist and Pischke (2008) and estimate our coefficients with OLS. Apart from offering the most efficient estimator and easing interpretation, OLS is preferable when incorporating interaction terms (Ai and Norton, 2003)

beneath Table 2 show a significant degree of intergroup discrimination and are in line with our non-parametric analysis above: Across all age groups, cooperation is significantly higher in CLASS than in OTHER, indicating a pronounced joint effect of language group discrimination and in-group favoritism. Furthermore, the pure effect of in-group favoritism (CLASS vs. SAME) as well as the net effect of language group discrimination (SAME vs. OTHER) is highly significant ($p < 0.01$ in each age group for CLASS vs. SAME; $p < 0.1$ for 7/8 year olds and $p < 0.01$ from 8/9 years on for SAME vs. OTHER). Interestingly, whether or not the decision-maker has friends from the respective other language group has no influence on cooperation rates.

In specifications (2) we find highly significant positive correlations between beliefs and cooperation, with an estimation of 0.39 tokens sent more if a child expects the partner to contribute one token more. Adding beliefs does not change sign or significance of any parameter in Table 2. Note, however, that some caution is warranted when interpreting models which include our belief-measure: First, since beliefs were elicited in an incentivized way after decisions in the cooperation game were made, it is possible that hedging concerns or conformity biases influence the stated beliefs. Second, and more importantly, belief-differences which are induced by our treatments are likely to constitute an important mechanism through which our treatments impact cooperation rates. Given that, beliefs are part of the mechanism through which our treatments alter cooperative behavior and thus an outcome variable of our treatments. Including such variables on the right hand side gives rise to “bad control problems” and renders the interpretation of the treatment effects on cooperation unclear. Since disentangling the exact channels through which cooperative behavior towards different interaction partners differs is beyond the scope of the present paper, we do not include beliefs in our further analysis.

Table 2 about here

In order to investigate the determinants of intergroup discrimination, we regress differences in the levels of cooperation on a host of control variables (see Table 3). The age-effects are modeled in a flexible way by including a dummy variable for each age group¹⁸. Our findings are largely in line with our previous analysis: The difference between CLASS and OTHER is significant in all age groups while the difference between SAME and OTHER

¹⁸ Since we estimated the models without constants, the coefficients of the age group dummies can be interpreted directly as age group effects.

is significant in our two oldest age groups. In this regression analysis, we find that in addition to the age effect from 7/8 years onwards also our youngest age group discriminates between CLASS and SAME ($p=0.093$). Furthermore, we find that German-speaking children discriminate more between CLASS and SAME respectively CLASS and OTHER than Italian-speaking participants do. Finally, a subjects number of siblings is negatively correlated with discrimination rates between CLASS and OTHER.

Table 3 about here

5. Conclusion

This paper studies how cooperation and intergroup discrimination co-evolve in childhood. We exploit the almost unique setting of Meran, a medium-sized town in the autonomous province of South Tyrol (Italy) in which about half of the citizens are German-speaking and the other half is Italian-speaking. We present evidence on the development of parochialism and language-group discrimination from an incentivized experiment with 828 children aged from 6/7 to 10/11 years. Varying the identity of the interaction partner across treatments in a modified prisoner's dilemma game, we find that children have a marked inclination for in-group favoritism and language group discrimination. With respect to age dynamics, we report two main findings: First, independent of the group membership of the interaction partner, cooperation increases with age. Since cooperation reaps efficiency gains, this is welcome. Second, intergroup discrimination evolves in the age cohorts under consideration. While in-group favoritism (i.e. cooperating more with children from the own school class) is significant from the age of 7/8 years on, language group discrimination (i.e. higher cooperation rates among children from the same language group) is present only in our two oldest age cohorts.

The driving forces behind discriminatory behavior have been subject to investigation in the recent literature (see, for instance, Fershtman and Gneezy, 2001; Habyarimana et al., 2007). As noted above, the analysis of our subjects' beliefs needs to be taken with a grain of salt. Nevertheless, our subjects' beliefs about their partners' choices hint to possible reasons for discrimination. Since treatment differences in cooperation rates across all age groups remain significant after controlling for beliefs, it is likely that our results are partially driven by a pure "taste for discrimination". Furthermore, two facts give rise to the supposition that ethnic stereotypes also play an important role: First, beliefs, while overshooting actual cooperation rates in each age group, follow the same discrimination pattern as the decisions to cooperate. Second, belief-discrimination is significantly and positively correlated with discrimination in cooperation rates. Thus, we conclude that both channels contribute to the intergroup discrimination which we observe in our participants. In addition to these findings, we show that girls exhibit higher cooperation rates than boys and that German-speaking children cooperate and discriminate more than Italian-speaking children.

Despite the fact that children in Meran learn the other significant language in school, language group discrimination gets more pronounced with age. This is somewhat counterintuitive since learning the other language is likely to foster openness towards the other group and thus should lead to less discrimination. One possible explanation for this result is certainly the

fact that the school system in South Tyrol is practically segregating German- from Italian-speaking children by having schools that either teach in German or Italian (except for language classes), but none that teach bilingually. While the latter might have more desirable effects in terms of closing the gap in cooperation rates based on language group discrimination, our results show that learning (and speaking) the same language as the partner does not suffice for overcoming discriminative tendencies.

Based on the evidence presented here, we see several interesting avenues for future research. First, investigating the development of discrimination in children in other natural settings would help to assess whether the age effects reported can be considered as universal or context-specific. Second, a deeper investigation of the developmental and social origins of the finding that children discriminate more as they age would be most valuable. This information then could be used for designing and evaluating policy interventions which aim to decrease discrimination. Finally, extending the investigation of discrimination in children to other behavioral domains like reciprocity or trust would be a straightforward and interesting exercise.

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Figure 1. Payoff-matrix of the modified one-shot prisoner's dilemma game.

		Player 2						
		Tokens sent	0	1	2	3	4	5
Player 1	0	5, 5	7, 4	9, 3	11, 2	13, 1	15, 0	
	1	4, 7	6, 6	8, 5	10, 4	12, 3	14, 2	
	2	3, 9	5, 8	7, 7	9, 6	11, 5	13, 4	
	3	2, 11	4, 10	6, 9	8, 8	10, 7	12, 6	
	4	1, 13	3, 12	5, 11	7, 10	9, 9	11, 8	
	5	0, 15	2, 14	4, 13	6, 12	8, 11	10, 10	

Figure 2: (A) Average tokens sent by age and game. (B) Average beliefs on the tokens received from the partner by age and game. ($N = 828$ subjects)

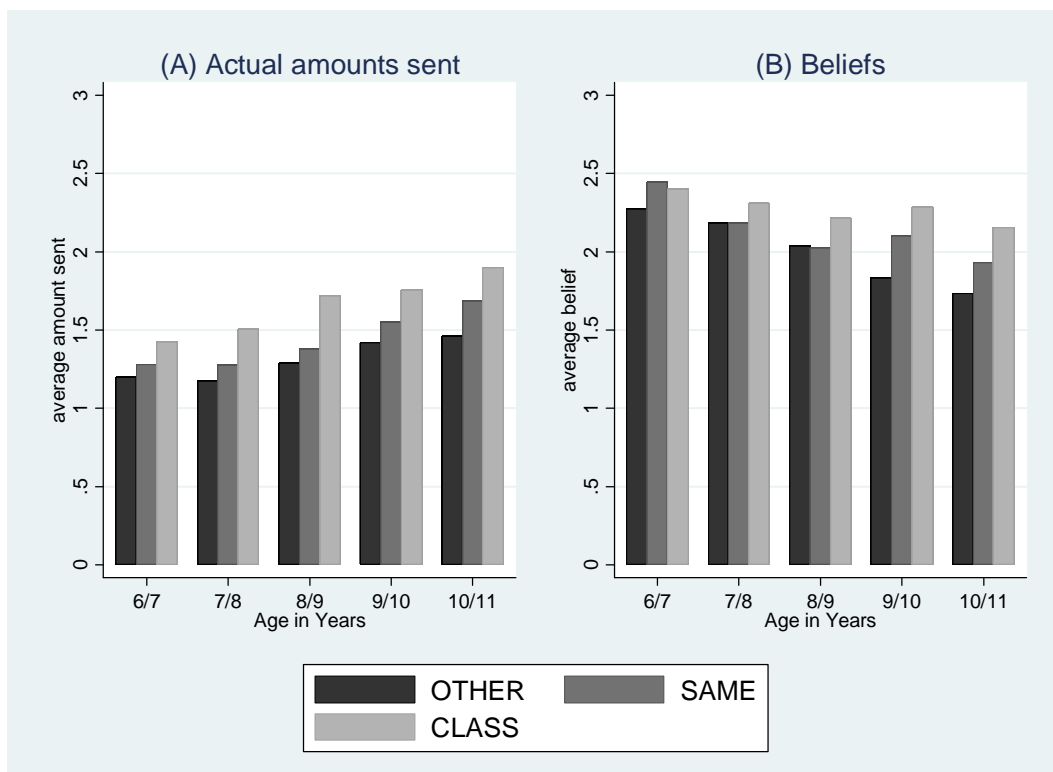


Figure 3: Average discrimination by age ($N = 828$ subjects).

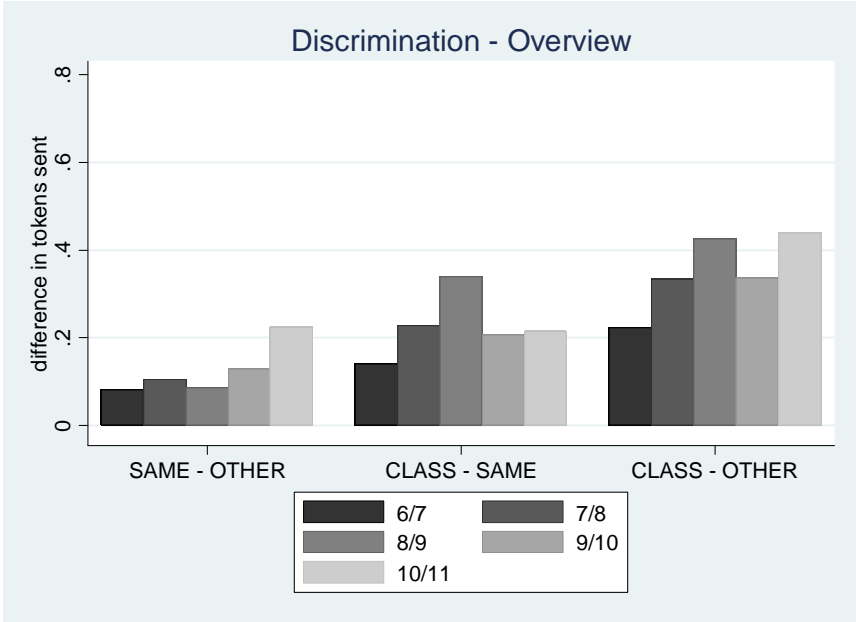


Table 1. Number of monolingual subjects participating in the experiment, by age, language and gender (number of male participants in parenthesis)

Age (in years)	Italian	German	Total
6/7 years	73 (40)	62 (39)	135 (79)
7/8 years	88 (55)	92 (51)	180 (106)
8/9 years	82 (50)	80 (37)	162 (87)
9/10 years	88 (45)	67 (41)	155 (86)
10/11 years	86 (39)	110 (54)	196 (93)
ALL	417 (229)	411 (221)	828 (451)

Each subject was asked to repeat the instructions in own words in order to check for understanding. 17 subjects were not able to do so properly, and we exclude them from the analysis. Moreover, 231 bilingual children (German and Italian) were excluded.

Table 2: OLS Regressions of the number of tokens sent in each of the three treatments.

	(1)		(2)	
Age in years	0.111***	(0.031)	0.126***	(0.029)
Female (=1)	0.252***	(0.076)	0.234***	(0.067)
German school (=1)	0.162**	(0.076)	0.121*	(0.066)
Other [§] (=1)	-0.0915	(0.245)	-0.234	(0.243)
Same [§] (=1)	-0.200	(0.218)	-0.348	(0.227)
Age*Other	-0.030	(0.027)	-0.002	(0.027)
Age*Same	-0.003	(0.024)	0.020	(0.025)
Number of siblings	0.007	(0.041)	-0.016	(0.037)
Friends other language too [§] (=1)	0.0180	(0.086)	0.0104	(0.074)
Belief			0.386***	(0.027)
Constant	0.476*	(0.283)	-0.476*	(0.262)
# Observations	2,484		2,484	
R-squared	0.043		0.194	
<i>Wald tests (p-values)</i>				
H ₀ : No age effect for ...				
... other ($\beta_{age} + \beta_{age*other} = 0$)		0.005		0.000
... own ($\beta_{age} + \beta_{age*own} = 0$)		0.000		0.000
H ₀ : no discrimination effect between other and class for ...				
... 6.5-year-olds ($\beta_{other} + \beta_{age*other} * 6.5 = 0$)		0.000		0.001
... 7.5-year-olds ($\beta_{other} + \beta_{age*other} * 7.5 = 0$)		0.000		0.000
... 8.5-year-olds ($\beta_{other} + \beta_{age*other} * 8.5 = 0$)		0.000		0.000
... 9.5-year-olds ($\beta_{other} + \beta_{age*other} * 9.5 = 0$)		0.000		0.000
... 10.5-year-olds ($\beta_{other} + \beta_{age*other} * 10.5 = 0$)		0.000		0.000
H ₀ : no discrimination effect between own and class for ...				
... 6.5-year-olds ($\beta_{own} + \beta_{age*own} * 6.5 = 0$)		0.002		0.002
... 7.5-year-olds ($\beta_{own} + \beta_{age*own} * 7.5 = 0$)		0.000		0.000
... 8.5-year-olds ($\beta_{own} + \beta_{age*own} * 8.5 = 0$)		0.000		0.000
... 9.5-year-olds ($\beta_{own} + \beta_{age*own} * 9.5 = 0$)		0.000		0.000
... 10.5-year-olds ($\beta_{own} + \beta_{age*own} * 10.5 = 0$)		0.000		0.010
H ₀ : no discrimination effect between other and own for ...				
... 6.5-year-olds ($\beta_{other} + \beta_{age*other} * 6.5 = \beta_{own} + \beta_{age*own} * 6.5$)		0.352		0.675
... 7.5-year-olds ($\beta_{other} + \beta_{age*other} * 7.5 = \beta_{own} + \beta_{age*own} * 7.5$)		0.069		0.313
... 8.5-year-olds ($\beta_{other} + \beta_{age*other} * 8.5 = \beta_{own} + \beta_{age*own} * 8.5$)		0.001		0.053
... 9.5-year-olds ($\beta_{other} + \beta_{age*other} * 9.5 = \beta_{own} + \beta_{age*own} * 9.5$)		0.000		0.014
... 10.5-year-olds ($\beta_{other} + \beta_{age*other} * 10.5 = \beta_{own} + \beta_{age*own} * 10.5$)		0.001		0.026

Notes.

***, **, * denote significance at the 1%, 5%, 10% level, robust standard errors in parentheses. Clustered on the level of individual subjects (828 clusters).

§ The reference category is "Class".

§ This variable is equal to one if the child has at least one friend which speaks also the language of the other language group.

Table 3: OLS regressions of the difference of tokens sent between treatments

	(1) CLASS-SAME	(2) CLASS-OTHER	(3) SAME-OTHER
6/7 years old (=1)	0.160* (0.0944)	0.274** (0.119)	0.114 (0.102)
7/8 years old (=1)	0.250** (0.107)	0.392*** (0.131)	0.142 (0.109)
8/9 years old (=1)	0.360*** (0.104)	0.487*** (0.123)	0.127 (0.115)
9/10 years old (=1)	0.235** (0.112)	0.420*** (0.133)	0.185* (0.104)
10/11 years old (=1)	0.246** (0.0989)	0.514*** (0.116)	0.268** (0.111)
Female (=1)	-0.0200 (0.0646)	-0.0877 (0.0765)	-0.0677 (0.0725)
German school (=1)	0.115* (0.0623)	0.226*** (0.0795)	0.111 (0.0703)
Number of siblings	-0.0524 (0.0499)	-0.0819** (0.0409)	-0.0295 (0.0403)
Friends other language too [§] (=1)	-0.0191 (0.0771)	-0.133 (0.0876)	-0.114 (0.0953)
Observations	826	826	826
R-squared	0.055	0.101	0.025

Notes.

***, **, * denote significance at the 1%, 5%, 10% level, robust standard errors in parentheses. Clustered on class level (121 clusters). Regressions are estimated without constant.

§ This variable is equal to one if the child has at least one friend which speaks also the language of the other language group.

Appendix:

Experimental Instructions

Instructions are translated from German, respectively Italian, into English. Instructions were explained individually to each child in his/her mother tongue by one of the experimenters.

General instructions for the assistant are italicized

Hello, my name is XY. The participation in this game is voluntary. Do you want to participate? *(write down the answer: if child wants to participate go on with the instructions; if child does not want to participate then bring the child back to the classroom)*. In this game you can earn tokens. With these tokens you can buy little presents in our shop. Today all presents cost 1 token. At the end of the game you can choose your favorite present and you will get as many pieces of your favorite present as you earned tokens in the game. Could you please repeat what I have told you so far in your own words? *(The following points have to be repeated: (i) the child can earn tokens and exchange them for presents (ii) all presents cost 1 token (iii) the child can choose the favorite present and get as many pieces of the favorite present as tokens earned in the game)*.

In this game you can send tokens to another child. Here you can see 4 meeples: a yellow meeple, a green meeple, a blue meeple and a red meeple. *(meeples are placed in front of the participant)* You are the yellow meeple *(point at the yellow meeple)*. The green, blue and red meeple represent your partners in this game and are randomly selected children. It may be a girl or a boy. The green partner is a child who attends the same grade like you but goes to one of these schools here in Meran *(place green meeple on the green school-card with German school names on it)*, but not to your own school. *(This needs to be adapted in Italian schools.)* Could you please read the names of the schools your partner could be selected from? *(let the child read the school names)* The blue partner is a child who attends the same grade like you but goes to one of these schools here in Meran *(place blue meeple on the blue school-card with Italian school names on it)*. Could you please read the names of the schools your partner could be selected from? *(let the child read the school names)* The red partner is a child from your class *(place red meeple on red card)*. You don't know who exactly you are playing with. This is a secret. The only thing you know is that the green and the blue partner are in the same grade as you, that they go to one of these schools here in Meran and that your red partner is in the same class as you. Your partners do not know who exactly you are. Could you please re-

peat what I have told you so far in your own words? (*The following points have to be repeated: (i) the participant is the yellow meeple (ii) the participant plays with 3 partners (iii) the partner with the green meeple attends one of the schools listed on the green school-card; the child should repeat some of the names on the card (iv) the partner with the blue meeple attends one of the schools listed on the blue school-card; the child should repeat some of the names on the card (v) the partner with the red meeple attends the same class as the participant (vi) all partners are of the same age as the participant (vii) the partners can be male or female (viii) the participant receives no other information on the partners (ix) the partners do not know the identity of the child; if the participant does not repeat all the points alone, then ask questions*).

The game works as follows:

(The order of presentation of the green/blue/red partner is randomly assigned to each child. Decision sheet with green partner is placed in front of the child; yellow and green meeples with school cards are placed at the right and the left hand side of the decision sheet respectively; blue and red meeples are layed aside.) As you know, you are the yellow meeple. On this decision sheet you can see also a green meeple (*point to the green meeple*). This means that you are now playing with your green partner. Each of you gets five tokens at the beginning (*five tokens are placed in front of the yellow and green meeple*) and each of you has to decide how many tokens you want to take for yourself and how many tokens you want to send to your partner. It is very important that the child who you can send tokens to can also send tokens to you. Look, I have tokens too (*tokens are placed in front of the assistant*). For each token sent, I will add another token. I will do this for each token you send to your partner, but also for each token that your partner sends to you. On this decision sheet you have to decide, whether you would like to send ZERO, ONE, TWO, THREE, FOUR or FIVE of your tokens to your green partner (*when listing the possibilities of decision making point at the respective box*). If you want to send for example TWO tokens, than you have to tick the box here (*point at the box*). In that case you send two tokens away (*two tokens from the yellow meeple are pushed away*), I will add two more tokens (*two tokens are added to the other two tokens*) and your green partner gets four tokens in addition (*four tokens are placed next to the tokens of the green partner*). Can you tell me which box you have to tick if you would like to send FOUR tokens to your partner? (*reallocate the tokens to get the original allocation*). And what happens if you send FOUR tokens? (*the participant has to explain: (i) participant sends four tokens away (ii) assistant adds four more tokens; (iii) partner gets eight tokens additionally*) And what happens if you send nothing? (*the participant has to explain: (i) participant sends*

no tokens away (ii) assistant adds nothing; (iii) partner gets nothing in addition) The green partner has exactly the same decision to make: he also has to decide whether to send ZERO, ONE, TWO, THREE, FOUR or FIVE tokens to you. Can you tell me, what happens if your partner sends THREE tokens to you? *(the participant has to explain: (i) partner sends three tokens away (ii) assistant adds three more tokens; (iii) participant gets six tokens in addition).* Do you know how many tokens your green partner sends to you? *(Answer: No)* The same is true for your green partner; he also does not know how many tokens you sent to him when he is upon to decide.

Could you please repeat the rules concerning the tokens in your own words? *(participant has to repeat: (i) the participant can send between zero and five tokens to the partner (ii) the tokens are doubled (iii) the partner has to make the same decision and the tokens sent by the partner are also doubled (iv) at the time of the decision no one knows how many tokens the partner sent)*

You know you have three partners, a green partner, a blue partner and a red partner. On this decision sheet *(decision sheet with blue partner is placed onto the green decision sheet)* you can see a blue meeple *(point at the blue meeple)*. This means that you are now playing with your blue partner. The game works exactly the same as with your green partner. The only difference is that now you play with your blue partner. When you are playing with your red partner *(decision sheet with red partner is placed onto the blue decision sheet)*, the game works exactly the same as with your green and blue partner. The only difference is that now you play with your red partner.

At the end of the game you will not receive the tokens for all three decision sheets but only for a single decision sheet. This means that only one out of the three decision sheets is played and paid out for real. Which decision sheet is played and paid out will be drawn by lot.

This works exactly as follows.

I will mingle the three decision sheets under the table and then you can draw one decision sheet. The drawn decision sheet is the one that is played at the end and you will get only the tokens of this decision sheet; the other two decision sheets are no longer valid.

We don't know yet how many tokens you earn in this game. You receive the tokens that you keep for yourself and the tokens that your partner sends to you. Since we don't know yet how many tokens your partner will send to you, you will receive the presents not today, but in four weeks.

Your partner really exists and just like you your partner also can buy presents with the tokens he earns. Can you please repeat the part concerning which sheet is implemented for payment

and how you get your presents in your own words? (*Participant has to repeat: (i) only one decision sheet is played and paid out; (ii) the participant gets the presents in four weeks from now; (iii) the partner can also buy presents with the tokens earned*).

It is very important that your decisions are secret. The other children will never know how many tokens you sent. This is your secret.

Now you can make your decisions. Please start with your green partner – your green partner attends one of these schools in Meran (*point at the green school card with German school names and at the green decision sheet lying to the left from the participant's perspective*).

Then fill in the decision sheet with your blue partner – your blue partner attends one of these schools here in Meran (*point at the school card with Italian school names and the blue decision sheet lying centered*). And then fill in the decision sheet with your red partner – your red partner is a child from your class (*point at the red decision sheet lying to the right hand side from the participant's perspective*). Please take as much time as you need for your decisions. I will turn around in the meantime so that you are not disturbed. Call me when you are ready (*give the participant the pen and turn around; when participant calls, turn towards the participant*).

(After the decisions the assistant has to check the decision sheets for completeness. If something is incomplete, ask participant to take the missing decision).

Thank you for your decisions. Now I have some questions. How many tokens do you think does your green, blue and red partner send to you? If in the drawn part your guess is correct you will get a bonus token. If your guess is not correct, you don't get a bonus token. How many tokens do you think does your green partner send to you? (*note down*) How many tokens do you think does your blue partner send to you? (*note down*) How many tokens do you think does your red partner send to you? (*note down*)

What do we have to do next? Exactly, we have to decide which of the three decision sheets is played and paid out. I mingle the three decision sheets under the table and now you can draw one sheet. (*Mingle the decision sheets and let the child draw one decision sheet*) You have drawn the {color} sheet, meaning that this sheet is paid out and that you play with your {color} partner. You will learn in four weeks when you get the envelope with your presents how many presents you get in total.

Photos



Decision sheet

0	1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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