



Paper to be presented at the

35th DRUID Celebration Conference 2013, Barcelona, Spain, June 17-19

## **Ethnic diversity and team performance: a field experiment**

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### **Abstract**

Abstract One of the most salient and relevant dimensions of team heterogeneity is ethnicity. We measure the impact of ethnic diversity on the performance of business teams using a field experiment. We follow 550 students who set up 45 real companies as part of their curriculum in an international business program in the Netherlands. We exploit the fact that companies are set up in realistic though similar circumstances and that we, as outside researchers, had the unique opportunity to exogenously vary the ethnic composition of otherwise randomly composed teams. The student population consists of 55% students with a non-Dutch ethnicity from 53 different countries of origin. We find that a moderate level of ethnic diversity has no effect on team performance in terms of business outcomes (sales, profits and profits per share). However, if at least the majority of team members is ethnically diverse then more ethnic diversity has a positive impact on the performance of teams. In line with theoretical predictions, our data suggest that this positive effect could be related to the more diverse pool of relevant knowledge facilitating (mutual) learning within ethnically diverse teams.

# Ethnic diversity and team performance: a field experiment

## **Abstract**

One of the most salient and relevant dimensions of team heterogeneity is ethnicity. We measure the impact of ethnic diversity on the performance of business teams using a field experiment. We follow 550 students who set up 45 real companies as part of their curriculum in an international business program in the Netherlands. We exploit the fact that companies are set up in realistic though similar circumstances and that we, as outside researchers, had the unique opportunity to exogenously vary the ethnic composition of otherwise randomly composed teams. The student population consists of 55% students with a non-Dutch ethnicity from 53 different countries of origin. We find that a moderate level of ethnic diversity has no effect on team performance in terms of business outcomes (sales, profits and profits per share). However, if at least the majority of team members is ethnically diverse then more ethnic diversity has a positive impact on the performance of teams. In line with theoretical predictions, our data suggest that this positive effect could be related to the more diverse pool of relevant knowledge facilitating (mutual) learning within ethnically diverse teams.

JEL-codes: J15, L25, C93, L26, M13, D83

Keywords: Ethnic diversity, team performance, field experiment, entrepreneurship, (mutual) learning

## 1 Introduction

It is impossible to pick up a business publication these days without reading about the wonders of teamwork. [...] Once teamwork is accepted as a basic business principle, it is not much of a stretch to think about teams that are comprised of diverse individuals, coming from different countries and cultures (Lazear, 1999, p. 15).

We measure the causal effect of ethnic diversity on the performance of business teams using a field experiment. The choice for this topic and approach are easily motivated. Teams have become increasingly important as decision making bodies. This is the case in many sorts of organizations, varying from judges in collegial courts or academic researchers to business start-ups (Hamilton et al., 2003). Consequently, the effective composition or diversity of teams has become an interesting topic of research (Hoogendoorn et al., 2013; Prat, 2002).

One of the most salient dimensions of team heterogeneity is ethnicity (Alesina and La Ferrara, 2005). Ethnic diversity implies heterogeneity in (mother) languages, religions, races and cultures (Alesina and La Ferrara, 2005). It is commonly measured based on country of birth, of the individual or of his/her parents. Ethnic diversity also coincides with a variety of norms, information sets, knowledge and ability levels (Lazear, 1999; Morgan and Vardy, 2009). This variety affects the formation and performance of teams. Ethnic diversity would benefit team performance due to a more diverse pool of skills and knowledge that leads to complementarities and (mutual) learning. For example, due to complementarities and learning opportunities, ethnically diverse teams are associated with more creativity and innovation (Alesina and La Ferrara, 2005; Lee and Nathan, 2011; Ozgen et al., 2011b). On the other hand, the costs associated with more ethnic diversity would be related to more difficult communication and coordination (Lazear, 1999; Morgan and Vardy, 2009).<sup>1</sup> All in all, ethnic diversity is an influential source of heterogeneity.

Ethnic diversity is highly relevant in an increasingly globalized world. Multinational firms often staff teams internationally and local populations - especially in big cities - become more mixed and multicultural. Ethnic diversity is a current fact of life and the share of ethnic minorities in Western populations is increasing sharply (Alesina and La Ferrara, 2005; Lazear, 1999; Ozgen et al., 2011b). In the United States, for example, the share of minorities is expected to rise from about one-third nowadays to roughly the majority in 2042 (Bernstein and Edwards, 2008). As a consequence, it is likely that any team will become more and more diverse in terms of ethnicity, even if the optimal team formation would indicate otherwise.

The relevance and potential impact of ethnic diversity in teams motivate our choice for the topic of this study. Our approach of a field experiment among business teams that

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<sup>1</sup>Ethnic diversity may also affect group formation and performance through its influence on the group culture (Earley and Mosakowski, 2000; Richard et al., 2004) and the strategic behavior of group members (Alesina and La Ferrara, 2005).

start up in identical circumstances is motivated based on the literature. Team formation is obviously driven by prospective productive consequences. If the situation carries a higher likelihood that an ethnically diverse team is beneficial, the team composition will be more mixed (Boisjoly et al., 2006). Hence, the measured effects of ethnic diversity on performance in real-world teams are likely to be biased due to endogenous team composition. Examples of studies conducted on the ethnic diversity of teams in real organizations include Carter et al. (2010), Hamilton et al. (2012), Kahane et al. (2013), Leonard et al. (2010) and Parrotta et al. (2010), and their results are ambiguous (Alesina and La Ferrara, 2005).<sup>2</sup>

Laboratory experiments do not suffer from endogenous team composition. Experiments in the lab have established results that are largely consistent with the theory proposed by Lazear (1999). An optimal degree of heterogeneity results from the trade-off between the benefits of more ethnic diversity and the associated increased costs of communication and coordination (Alesina and La Ferrara, 2005). The downside of laboratory studies is that their resemblance to real-world situations may be limited. Moreover, they typically measure short-term effects, whereas the consequences of a team's diversity in terms of, for example, coordination, communication, complementarities and learning are not likely to become evident instantaneously (Boisjoly et al., 2006). It is thus useful to study the effects of team composition in the longer run and preferably in more realistic circumstances.

Some studies measuring the effect of ethnic diversity have tried to combine the advantages of studies in real organizations with experimental studies by carrying out field or 'quasi' experiments. Hansen et al. (2006) resemble the design of a field experiment. They measure the impact of demographic diversity (age, gender and ethnicity) in student groups of four to five students on the team's academic performance and find no effect.<sup>3</sup> Boisjoly et al. (2006) find that attitudes and behaviors change when people of different ethnicity are randomly assigned to live together at the start of their first year of college. White students assigned to African-American roommates show to be significantly more empathetic to these groups.

We conclude that measurements of the causal effect of a team's ethnic diversity on its performance are scarce, especially in the longer run. This kind of measurement is the objective of our study. To this end, we conducted a field experiment in the context of a compulsory entrepreneurship program for undergraduate students in international business at the Amsterdam University of Applied Sciences. We follow 550 students who set up and manage 45 real companies as part of their curriculum in the academic year of

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<sup>2</sup>Other studies examine the effects of ethnic diversity on productivity at the country (Guiso et al., 2009; Montalvo and Reynal-Querol, 2005), region (Ozgen et al., 2011a) or city level (Lee and Nathan, 2011; Ottaviano and Peri, 2006). Related are also studies measuring the impact of ethnic composition of schools or neighborhoods on educational outcomes (e.g., Angrist and Lang, 2004; Aslund et al., 2011; Card and Rothstein, 2007; Hanushek et al., 2009; Hoxby, 2000).

<sup>3</sup>Group composition is random and no exogenous stratification is imposed. Teams are required to select one of three contract forms that determine the authority of grading. The drawback of this design, when interested in the bare effect of ethnic diversity on team performance, is that the effect of interest may be confounded by the contract choice (that may be related to ethnic diversity).

2008-2009. We exploit the fact that the - otherwise homogeneous - population consists of 55% students with a non-Dutch ethnicity from 53 different countries of origin and that we, as outside researchers, were allowed to exogenously vary the ethnic composition of otherwise randomly composed teams. The resulting percentage of students with a non-Dutch ethnicity per team varies from 20% to 90%. We use a rather common definition of ethnicity, i.e., parents' country of birth.

Our field experiment implies a level of controlled circumstances comparable to the laboratory. All teams start up companies at the same time and under equal circumstances and all members are selected from a pool of students, minority or Dutch, of the same caliber. The substantial variation (20-90%) enables us to capture possible non-linearities in the relationship between ethnic diversity and team performance. On the other hand, the entrepreneurship program and the truly joint task with strong incentives to maximize sales, profits and shareholder value of a company in a real market resemble realistic circumstances that are not likely to be mimicable in a laboratory setting. In particular, these circumstances give rise to the formation of a real team in which people have time to establish roles and observations of other team members.

What kind of results might we expect? We combine Lazear's argument (1999) that there is a trade-off between the costs and benefits of an ethnically more diverse team with recent insights from Earley and Mosakowski (2000) and Richard et al. (2004) based on Blau's theory of heterogeneity (1977). The non-formal models in these studies refine Lazear's argument by allowing the costs of communication and coordination to be a non-linear function of ethnic diversity. Moderately heterogeneous teams would incur higher costs of communication and coordination than teams that are homogeneous or heterogeneous in terms of ethnicity. In these moderately heterogeneous teams subgrouping along ethnic lines may have negative effects such as distrust, conflicts or stereotyping between distinct subgroups.<sup>4</sup>

The non-linear relationship between communication costs and ethnic diversity could perhaps be illustrated by considering three types of team compositions: (i) with a low percentage of minorities, (ii) with a substantial subgroup of minorities, and (iii) with a majority group of minorities. In the first situation, the communication costs are probably low. The few minorities present will perhaps not participate in the team process and be left aside. This is costly in the sense that their productivity is lost, but communication can be low cost too and based on habits, language and norms of the majority group (i.e., with a single identity). In the second situation, the group that may not take part in the productive process of the majority is larger. Segregated subgroups may be formed by the majority and the others with distinct manners of work. Hence, costs of diversity are

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<sup>4</sup>Akerlof and Kranton (2005) show that teams' identity could act as a substitute mechanism for formal incentive schemes. In a series of laboratory experiments, Charness et al. (2007) find that group membership and identification with this group, influence individual behavior in strategic environments. Moreover, individuals tend to operate significantly more altruistically towards ingroup members than to outgroup individuals (Chen and Li, 2009). In a field experimental setting, Dugar and Shahriar (2012) find that group identity can reduce moral hazard problems.

higher at this stage. In the third situation, in a truly ethnically diverse team, the costs of communication have probably become lower due to the absence of subgroups and the desirability for every team member to participate in a hybrid team culture with a diverse identity (Earley and Mosakowski, 2000; Richard et al., 2004).

We thus expect that the costs of ethnic diversity follow an inverse u-shaped pattern, whereas the benefits of complementarities and (mutual) learning may be an(y) increasing function of ethnic diversity (Lazear, 1999). However, due to the fact that we do not have any conjectures about the specific forms of the cost and benefit functions relative to each other, the net effect of ethnic diversity on team performance remains a question that needs to be answered empirically. Our empirical analysis renders the following results. The impact of a team's ethnic diversity on its performance as measured in terms of business outcomes is positive, although only starting at a certain turning point at which at least half of the team is ethnically diverse. Before this turning point the relationship is flat or slightly negative. With respect to underlying mechanisms, our data show that more (mutual) learning could explain why ethnic heterogeneous teams achieve better results. Ethnically diverse teams also tend to have a more diverse pool of relevant knowledge facilitating (mutual) learning.

In what follows, Section 2 provides information on the context and design of the field experiment. The context and design, and therefore parts of these descriptions, are similar to the field experiment described in Hoogendoorn et al. (2013). Section 3 describes the data and presents results from randomization checks. Section 4 shows the empirical findings. Section 5 provides a discussion and conclusion.

## 2 Context and design

### 2.1 Context

The teams in our field experiment take part in the Junior Achievement (JA) Young Enterprise Start Up Program, in the US known as the JA Company Program. This is the worldwide leading entrepreneurship program in secondary education (US and Europe) and post-secondary education (only Europe). The number of students participating in these JA-programs is substantial and steadily rises over the years (see Oosterbeek et al., 2010).

The entrepreneurship program that we study is a compulsory part of the curriculum at the department of international business studies of the Amsterdam College of Applied Sciences. It lasts for an entire academic year and covers about one-fifth of students' first-year undergraduate curriculum in all sub-departments/fields of study. Our field experiment was conducted in the academic year of 2008-2009.<sup>5</sup> The program is not a business simulation and requires students to set up and manage a real company with a team of about 10 to 12 fellow students on average. Students issue shares, appoint officers and delegate tasks,

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<sup>5</sup>We also randomized students into teams based on their gender in the academic year of 2008-2009 (see Hoogendoorn et al., 2013). Since gender diversity and ethnic diversity are orthogonal this will not contaminate our results in this paper.

produce and market products or services, keep the accounts and organize shareholders' meetings. Students thus frequently interact, build up relationships, and create routines and processes to achieve their common goal. In addition, each company is supported by a coach from the business world. Throughout the program the teams report to their randomly assigned professor and business coach on a regular basis. The companies also pay taxes and social security payments.

Companies typically operate as follows. They start with appointing an interim CEO. Teams then elect officers and delegate tasks among their members. About half of the team works in non-management positions and the other half holds specific management positions including the CEO and CFO. After half a year the management positions are redistributed among the formerly non-managing part of the team.<sup>6</sup> Right from the beginning teams also start to brainstorm about possible products or services, where promising business ideas are further analyzed by conducting market research. Subsequently, the most viable business idea is selected and developed (there are no restrictions in selecting the type of business activity). Once the corporate plan has been finished, teams start to raise capital and organize a shareholders' meeting. Other sources of funding such as personal or outside loans were prohibited. Business operations start as soon as the majority of shareholders approves the corporate plan. Production and marketing of products or services then become the key activities. At the end of the program all companies are liquidated and teams present their annual report for approval at the final shareholders' meeting. Any profits are proportionally divided among the shareholders.

### *Ethnicity*

Students are defined as native or Dutch if both parents are born in the Netherlands, whereas students are considered immigrant, minority or non-Dutch if at least one parent is not born in the Netherlands (see Hartog, 2011). The share of students in our sample with a non-Dutch ethnicity is 0.55 and the percentage of students with a non-Dutch ethnicity varies per team from 20% to 90%.<sup>7</sup> We measure ethnic diversity dichotomously. This is consistent with previous empirical studies (Boisjoly et al., 2006; Carter et al., 2010; Hamilton et al., 2012; Hansen et al., 2006) as well as with our assignment of students to teams. Students with a non-Dutch ethnicity are born abroad in 38% of the cases, with 82% of the fathers born abroad and 87% of the mothers. In 69% of the cases both the father and the mother are born abroad.

Table 1 shows that the students in our sample are from 53 different countries of origin with an average number of approximately 6 different countries of origin per team (panel A). For the purpose of presentation, the descriptive statistics in panel B are clustered by continent (see Parrotta et al., 2010). They indicate that ethnic variation among minority

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<sup>6</sup>The relationship between the ethnic composition of teams and their allocation of roles across ethnicities is discussed below.

<sup>7</sup>The average share of minorities in Dutch higher vocational schools is approximately 0.20, which is close to the population average (Hartog, 2011). The considerably higher share here reflects the international character of this program in the multicultural capital of Amsterdam.

students is substantial. Panel C shows that there are virtually no clusters of ethnic minorities at the team level. The vast majority of ethnic minority students has no team members from the same country of origin (70%), whereas 19% of the ethnic minority students has only one team member from the same country of origin (the average number of students with a non-Dutch ethnicity per team is 6.8 at baseline). Hence, we can safely assume that the share of students with a non-Dutch ethnicity is a true indicator of the team's ethnic diversity.<sup>8</sup> This varies exogenously and substantively. Moreover, the average and range of the share of minorities are similar across fields of study (panel D). We will test for possible pretreatment differences more formally below.

## *2.2 Design*

One week before the start of the entrepreneurship program we obtained administrative data to assist us in assigning students to teams. The ethnicity of students was determined based on students' names, Dutch versus non-Dutch (see Mateos, 2007 for a motivation of this name-based procedure). Nearly 90 percent of these name-based classifications matched with students' actual ethnicity that we retrieved through a pretreatment survey one week later. As expected, most of the mismatches in the category of ethnic minority students occurred among those with Dutch fathers.

Subsequently, we determined and varied the fraction of ethnic minority students for each team within fields of study and assigned students with Dutch and non-Dutch ethnicity randomly to teams in accordance with these fractions. The program coordinators enforced this assignment successfully (only 6 students managed to switch teams during the year). Students and business coaches were uninformed, while professors only knew that a research project was conducted which required to stick to the imposed team assignment. Interviews with students corroborate their ignorance regarding our field experiment.

### *Composition dynamics*

Composition dynamics such as dropouts during the entrepreneurship program or the appointment of students to management teams may compromise the design of our field experiment if these dynamics alter the exogenously imposed ethnic composition of teams.

During the year 104 students (19%) dropped out.<sup>9</sup> This reduced the average team size from approximately 12 at the start to about 10 at the end of the program. The design of our field experiment was not contaminated by dropouts. First, the ethnic composition of teams is largely unaffected. The correlation between teams' share of minorities at baseline and at the end of the program is 0.86. Second, dropout rates do not vary across teams in

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<sup>8</sup>Only two teams form an exception: one accommodates six and the other four members from the same country of origin. Excluding these two teams from the sample does not change the main results.

<sup>9</sup>Dropout rates for first-year students in Dutch higher vocational schools are about 30% on average, including students that switch study and/or school (ref. HBO-raad, 2010). Lower dropout rates than the national average at the department of international business studies of the Amsterdam College of Applied Sciences may be explained by the fact that international programs generally attract students that are more motivated.



**Table 1.** Descriptive statistics of ethnic diversity

<u>A: Ethnicity (team level)</u>		<u>Mean</u>	<u>SD</u>	<u>Min</u>	<u>Max</u>	
Share of minorities		0.55	0.16	0.20	0.90	
Number of different countries of origin		6.04	1.82	3.00	12.00	
<u>B: Ethnicity (<math>\approx</math> continent)</u>		<u>Fraction</u>				
Netherlands (native)		0.45				
North America / Oceania		0.01				
Central and South America		0.15				
Formerly Communist Countries		0.02				
Muslim Countries		0.17				
East Asia		0.06				
Asia		0.04				
Africa		0.03				
Other European Countries		0.07				
<u>C: Ethnic minority students with number of team members from the same country of origin</u>		<u>Fraction</u>				
0		0.70				
1		0.19				
2		0.05				
$\geq 3$		0.06				
<u>D: Numbers of students and teams, and share of minorities by field of study</u>		<u>Students</u>	<u>Teams</u>	<u>Share of minorities (per team)</u>		
				<u>Average</u>	<u>Minimum</u>	<u>Maximum</u>
Business management		240	18	0.52	0.20	0.79
Management		60	5	0.54	0.31	0.64
Trade management Asia		105	9	0.66	0.42	0.90
Business languages		118	11	0.50	0.22	0.77
Financial management		27	2	0.66	0.58	0.73
Total		550	45	0.55	0.20	0.90

*Note:* Ethnic minority students are from the following countries of origin: *North America / Oceania*, Australia, Canada, United States; *Central and South America*, Antilles, Argentina, Barbados, Brazil, Colombia, Costa Rica, Cuba, Dominican Republic, Guyana, Honduras, Jamaica, Peru, Surinam; *Formerly Communist Countries*, Russia and other East European countries; *Muslim Countries*, Afghanistan, Algeria, Egypt, Eritrea, Guinea, Indonesia, Iran, Iraq, Malaysia, Morocco, Nigeria, Pakistan, Palestine, Somalia, Tunisia, Turkey; *East Asia*, China, Hong Kong, Japan; *Asia*, other Asian countries not included in categories of East Asia and Muslim Countries (India, Laos, Philippines, Singapore, Vietnam); *Africa*, other African countries not included in category of Muslim Countries (Angola, Cameroon, Cape Verde, Gabon, Ghana, Kenya, South Africa); *Other European Countries*, other European countries not included in category of Formerly Communist Countries (Germany, Israel and other West European countries).

relation to their ethnic composition. Regression coefficients of the share of minorities at baseline (and its square) when explaining dropout decisions are insignificant.

Companies appoint a management team twice, for the first and second half of the program. Tests indicate that the ethnic diversity of the entire team - on which the treatment is based - is a realistic reflection of the management team (possibly the more influential part of the team). Regressing the share of minorities in the management team on the share of minorities in the entire team returns a coefficient of 0.95 for the first half of the program and 0.97 for the second half.<sup>10</sup> Moreover, students of non-Dutch ethnicity are not significantly more or less likely to be part of the management team than students of Dutch ethnicity in each of the semesters.

In sum, we are confident that the composition dynamics that take place after the initial assignment of students to teams did not compromise the design of our field experiment.

### *Incentives*

The entrepreneurship program provides various (team and individual) incentives to align students' interests with the business performance of their company. At the individual level, incentives are generated by the threat of dismissal in case of underperformance. This implies exclusion from the program, a loss of credit points and thus a much lower chance of obtaining an undergraduate degree (that requires a minimum number of credit points in the first year). Dismissal requires two-third of the team members' votes together with the consent of their professor. It is a credible threat. Half of the teams experiences at least one dismissal and the average number is 0.73 per team.<sup>11</sup>

Students' grades for the program (20% of GPA) are determined by both individual and team performance and their weight in the total program grade is about 50/50. An indicator of the considerable weight of individual performance is that the average difference between the highest and lowest grade within a team is approximately 1.3 (on a scale from 1 to 10). The relevance of team performance for students' grades is indicated by the positive correlations between the average grade in the team and business performance in terms of, for example, sales (0.34) or positive profits (0.18).

Incentives are further provided by a formal business competition. At the end of the program, six selected teams present their results in a 'business pitch' to a jury of entrepreneurs who select a winner based on business outcomes and presentations. The winning team obtains a cup, often gets some (local) press attention and represents the college in the national competition. In addition, virtually all students own shares of their company. Other shareholders are usually family members, friends or acquaintances.

Reported effort levels in terms of hours are a quantitative reflection of the effectiveness of these incentives. On average, students spend about 8.1 hours per week (s.d. 3.8) on the program, which covers 20% of their curriculum. This is substantial relative to the 32

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<sup>10</sup>These coefficients are similar for median regressions. F-tests further indicate that none of these coefficients are significantly different from 1.

<sup>11</sup>The incidence and number of dismissals are unrelated to both business performance and the ethnic composition of teams.

hours per week students in Dutch higher vocational schools spend on their education (Allen et al., 2009). The incentives discussed above make it likely that the efforts of students are directed towards the business outcomes we measure.

### 3 Data

Data about teams and individuals was collected through administrative data, teams' annual reports and three extensive surveys. Students filled out a survey at the first day of the academic year (pretreatment, in September 2008), halfway (in January 2009) and at the end of the entrepreneurship program (posttreatment, in May 2009). Response rates are respectively 88%, 86% and 78%. We use the information from the questionnaires for various purposes. Based on this, we check the validity of the name-based assignment of students to ethnicities and the random assignment of students to teams given their ethnic background. Moreover, the questionnaires enable us to relate our findings to and control for individual and team characteristics and processes regarding complementarities, (mutual) learning, communication and coordination.

Table 2 reports descriptive statistics of individual and team characteristics. The pretreatment survey administers background characteristics such as age and gender. In addition, we measure scholastic achievements of students just before entering the college (indicated by 'grade point average'). All three surveys also include self-assessments of the knowledge that students have in three areas most relevant for successful entrepreneurship (see Karlan and Valdivia, 2011; Minniti and Bygrave, 2001).<sup>12</sup> Hence, we can trace the individual development of these knowledge areas during the program as a proxy for learning (reported in Table 2 are knowledge levels at baseline on a scale from 1 to 5). As we will discuss more thoroughly in Section 4, self-assessments of team members about the team's atmosphere and the prevalence of conflicts are proxies for communication and coordination in teams.

Business performance metrics are gathered or calculated from the companies' annual reports that we obtained from 43 out of 45 teams. We measure sales, profits and profits per share in euros. We also add a binary indicator of positive profits because students tend to view as the bottom line result whether they are able to satisfy their shareholders. Column (1) of Table 3 shows that average sales for all teams amount to 838 euros with a standard deviation of 707 euros. Profits are on average negative at -69 euros varying from a loss of 1016 euros to a profit of 477 euros. 22 teams make positive profits, while 21 teams run a loss. Profits per share vary between -15 and +15 euros.<sup>13</sup>

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<sup>12</sup>Through standard batteries of questions we also obtain (non-tabulated) validated measures of 'softer' individual characteristics that are associated with entrepreneurship: the 'big five' factor model of personality structure (see Goldberg, 1990; Zhao and Seibert, 2006), and entrepreneurial skills and traits such as creativity, market awareness, networking, perseverance, need for achievement and risk aversion (see Oosterbeek et al., 2010; Parker, 2009).

<sup>13</sup>Shares have a nominal value of 20 euros. The mean number of shares issued is 52 (s.d. 21.5), while the minimum and maximum numbers of shares sold are respectively 15 and 100. Roughly half of the shares are owned by team members themselves (approximately 50 euros per student on average); the remaining shareholders are usually family members, friends or acquaintances. The number of shares and, hence,

**Table 2.** Descriptive statistics of individual and team characteristics

	Scale	Mean	SD	Min	Max
<u>Individual level</u>					
Age	years	19.37	1.99	15.98	30.92
Gender (dummy = 1 if female)	0/1	0.44	0.50	0.00	1.00
Grade point average	1-10	6.46	0.24	6.05	7.23
Business knowledge	1-5	2.66	0.88	1.00	5.00
Entrepreneurship knowledge	1-5	2.71	0.98	1.00	5.00
Leadership knowledge	1-5	3.14	0.98	1.00	5.00
<u>Team level</u>					
Size (at baseline)	persons	12.22	2.09	8.00	16.00
Conflicts	1-5	2.23	0.59	1.00	3.67
Atmosphere	1-5	3.53	0.55	2.33	4.83

Columns (2) through (7) of Table 3 present descriptive statistics of business outcomes for different degrees of ethnic diversity. We tabulate two pairs of cutoff levels around the average share of minorities in the sample of 0.55. Columns (2) through (4) with cutoffs at 45% and 65% of minorities indicate that teams of high ethnic diversity tend to perform better than teams of moderate ethnic diversity in terms of profits, the probability of profits being positive and profits per share. Performance differences are less pronounced in a comparison between teams of low and high ethnic diversity, although the descriptive statistics suggest that on average business outcomes are slightly higher for teams of high ethnic diversity. Columns (5) through (7) show a similar pattern for more symmetric cutoff levels at a share of minorities of 0.40 and 0.60. However, we lack support among teams of low ethnic diversity due to the limited number of observations in the range below 40% of minorities (only 6 teams). In what follows, our main focus is therefore on teams with a moderate or high share of minorities (i.e., teams of moderate or high ethnic diversity).

#### *Randomization*

To examine whether students are randomly assigned to teams of different ethnic composition, we regress students' characteristics on the share of minorities in their team, separately for students of Dutch and non-Dutch ethnicity (see Table 4). The first two columns of panel A show that native (Dutch) students who are assigned to teams with many ethnic minority students are somewhat less likely to be female and more likely to study 'trade management Asia'. The last two columns of panel A indicate that ethnic minority students assigned to teams with a high share of minorities are somewhat more likely to be younger and to study 'trade management Asia'. In all other dimensions, the assignment of native (Dutch) and ethnic minority students is random.

Similarly, we examined at the team level whether (average) characteristics of students correlate with the ethnic composition of teams. Panel B shows that ethnic diversity is not systematically related to any of the (average) team characteristics except for the likelihood of funding of companies is unrelated to the ethnic diversity of teams.

**Table 3.** Descriptive statistics of business outcomes

		All	Ethnic diversity (0.45 and 0.65)			Ethnic diversity (0.40 and 0.60)		
			Low share<0.45	Moderate 0.45≥share≤0.65	High share>0.65	Low share<0.40	Moderate 0.40≥share≤0.60	High share>0.60
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
Sales (euros)	Mean	838	859	881	745	1183	826	735
	SD	707	634	891	349	622	895	468
	Min	0	130	0	265	593	130	0
	Max	4209	2226	4209	1267	2226	4209	1953
Profits (euros)	Mean	-69	-39	-146	41	-97	-78	-51
	SD	318	375	346	164	468	294	305
	Min	-1016	-1011	-1016	-247	-1011	-848	-1016
	Max	477	294	477	294	294	477	294
Positive profits (0/1)	Mean	0.51	0.70	0.29	0.75	0.67	0.37	0.61
	SD	0.51	0.48	0.46	0.45	0.52	0.50	0.50
	Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Max	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Profits per share (euros)	Mean	-0.51	0.42	-2.07	1.46	-1.84	-0.58	0.01
	SD	6.42	7.75	6.33	5.07	7.05	6.64	6.29
	Min	-15.48	-15.48	-12.87	-8.04	-15.48	-11.78	-12.87
	Max	15.64	15.64	11.36	12.79	3.67	15.64	12.79
N		43	10	21	12	6	19	18

of studying 'trade management Asia'. Based on the randomization checks here all analyses in the next section include a dummy for this field of study.

**Table 4.** Randomization checks at the individual and team level

	Share of minorities			
<b>A: Individual level</b>	Native (Dutch) students		Ethnic minority students	
Age	0.805	(0.771)	-2.184**	(0.876)
Gender	-0.524**	(0.220)	0.067	(0.237)
Grade point average	-0.019	(0.089)	0.188	(0.117)
Business management	-0.284	(0.536)	-0.700	(0.463)
Management	-0.048	(0.383)	-0.222	(0.206)
Trade management Asia	0.459*	(0.265)	0.863*	(0.443)
Business languages	-0.363	(0.498)	-0.112	(0.377)
Financial management	0.235	(0.164)	0.171	(0.221)
<b>B: Team level (average)</b>	All students			
Age	-0.093	(0.473)		
Gender	-0.193	(0.166)		
Grade point average	-0.052	(0.058)		
Business management	-0.562	(0.432)		
Management	-0.075	(0.272)		
Trade management Asia	0.815**	(0.354)		
Business languages	-0.328	(0.408)		
Financial management	0.150	(0.148)		
Team size	1.579	(1.820)		

*Note:* In panel A each coefficient comes from a regression at the individual level of the row variable on the share of minorities, separately for native (Dutch) and ethnic minority students (robust standard errors in parentheses). In panel B each coefficient comes from a regression at the team level of the row variable on the share of minorities (bootstrapped standard errors in parentheses; 1000 replications). \*\*\*/\*\*/\* denotes significance at the 1%/5%/10%-level.

## 4 Results

### 4.1 Main findings

Table 5 shows the relationship between the share of minorities in a team and four measures of business performance: sales, profits, the probability of profits being positive and profits per share. Note that a larger share of minorities implies a more ethnically diverse team due to the limited presence of ethnic clusters within these teams. In panels A and B performance measures are regressed on the share of minorities in the team and its square (using OLS, median and robust M-estimation regression). The specifications in panel A testing for a linear effect of the share of minorities on business performance turn out insignificant. We also test polynomial specifications in panel B and these turn out being (largely) insignificant too, although the point estimates consistently suggest a u-shaped relationship between the share of minorities and business performance with the minimum at a share of about 0.55.

**Table 5.** Ethnic diversity and team performance

	Sales			Profits			Pos. profits	Profits per share		
	OLS (1)	Median (2)	Robust (3)	OLS (4)	Median (5)	Robust (6)	OLS (7)	OLS (8)	Median (9)	Robust (10)
<b>A: Linear</b>										
% minorities	-597.8 (624.5)	-267.3 (722.2)	15.3 (664.3)	106.7 (318.0)	3.2 (330.0)	-71.4 (237.8)	0.153 (0.528)	3.779 (6.200)	-0.122 (5.995)	1.751 (5.556)
$R^2$	<i>0.02</i>	<i>0.03</i>	<i>0.03</i>	<i>0.02</i>	<i>0.03</i>	<i>0.00</i>	<i>0.03</i>	<i>0.01</i>	<i>0.01</i>	<i>0.00</i>
<b>B: Polynomial</b>										
% minorities	-3798.5 (3968.5)	-3780.9 (4734.9)	-5009.1 (4322.8)	-1741.8 (2071.2)	-3018.7* (1621.2)	-2215.7 (1567.4)	-4.622 (3.170)	-29.232 (34.954)	-40.341 (33.848)	-48.841 (35.781)
% minorities <sup>2</sup>	2942.8 (3528.0)	3561.9 (4040.7)	4306.0 (3646.3)	1699.5 (1671.1)	2664.7* (1381.7)	1942.6 (1316.9)	4.391 (2.693)	30.350 (28.902)	36.524 (29.662)	45.266 (29.096)
<i>Minimum</i>	<i>0.65</i>	<i>0.53</i>	<i>0.58</i>	<i>0.51</i>	<i>0.57</i>	<i>0.57</i>	<i>0.53</i>	<i>0.48</i>	<i>0.55</i>	<i>0.54</i>
$R^2$	<i>0.04</i>	<i>0.05</i>	<i>0.11</i>	<i>0.05</i>	<i>0.06</i>	<i>0.08</i>	<i>0.11</i>	<i>0.04</i>	<i>0.05</i>	<i>0.07</i>
<b>C1: Spline (0.50)</b>										
1st segment	-977.5 (2308.9)	-903.9 (2238.4)	-1709.2 (1938.0)	-598.8 (1046.5)	-955.1 (958.6)	-964.8 (947.3)	-1.816 (1.469)	-7.962 (17.040)	-18.541 (18.435)	-19.408 (19.467)
2nd segment	-359.8 (1347.9)	786.2 (1072.7)	722.2 (834.8)	548.8 (398.8)	405.2 (445.5)	442.1 (401.3)	1.387* (0.811)	11.137 (8.285)	11.402 (10.001)	13.080 (8.892)
$R^2$	<i>0.02</i>	<i>0.05</i>	<i>0.08</i>	<i>0.05</i>	<i>0.05</i>	<i>0.08</i>	<i>0.11</i>	<i>0.03</i>	<i>0.05</i>	<i>0.07</i>
<b>C2: Spline (0.55)</b>										
1st segment	-1205.2 (1404.8)	-903.9 (1521.8)	-1102.3 (1451.2)	-568.9 (766.7)	-955.1 (647.4)	-946.6* (559.9)	-1.801* (1.088)	-9.349 (13.563)	-17.288 (10.851)	-17.494 (12.553)
2nd segment	35.7 (1199.3)	786.2 (1191.1)	790.7 (921.3)	811.3* (459.4)	1007.6** (486.3)	757.9* (401.8)	2.191** (0.872)	17.471* (9.552)	16.378* (9.696)	19.601** (8.261)
$R^2$	<i>0.03</i>	<i>0.05</i>	<i>0.07</i>	<i>0.06</i>	<i>0.08</i>	<i>0.13</i>	<i>0.17</i>	<i>0.05</i>	<i>0.07</i>	<i>0.10</i>
<b>C3: Spline (0.60)</b>										
1st segment	-1200.1 (1012.2)	-903.9 (1329.7)	-814.2 (1191.7)	-514.4 (630.3)	-718.5 (497.0)	-786.4* (424.9)	-1.422* (0.854)	-8.327 (10.805)	-14.429 (9.575)	-14.789 (10.222)
2nd segment	464.8 (1236.0)	1733.7 (1609.5)	1079.4 (1155.7)	1202.3* (632.2)	1257.0** (607.1)	1042.3** (517.3)	2.933** (1.143)	25.136** (11.410)	22.331* (12.322)	26.773** (10.950)
$R^2$	<i>0.03</i>	<i>0.05</i>	<i>0.06</i>	<i>0.08</i>	<i>0.08</i>	<i>0.14</i>	<i>0.18</i>	<i>0.07</i>	<i>0.08</i>	<i>0.12</i>

*Note:* Based on information from 43 teams. All specifications include a dummy for the field of study 'trade management Asia'. OLS, Median and Robust refer to the estimation method. Median and robust specifications for positive profits are excluded since this variable is dichotomous. Bootstrapped standard errors in parentheses (1000 replications). \*\*\*/\*\*/\* denotes significance at the 1%/5%/10%-level.

Panels C1 through C3 of Table 5 measure the effect of ethnic diversity on business performance using more flexible spline functions that allow for distinct slopes below (1st segment) and above (2nd segment) a certain share of minorities. Spline functions may be particularly informative in this case since the distribution of the share of minorities in our sample is asymmetric, i.e., teams with a relatively high share of minorities are actually heterogeneous in terms of ethnicity (instead of homogeneous and of one non-Dutch ethnicity). We employ different cutoff levels around the sample average of 55% of minorities, which also happens to be the share of minorities that minimizes business performance as suggested by the less flexible quadratic specifications. The results from these spline functions in panels C1 through C3 with a cutoff at respectively 50%, 55% or 60% of minorities are similar if we use other cutoffs such as at a share of minorities of 0.45 or 0.65 (not tabulated).

The columns of panel C1 report the relationship between ethnic diversity in the team and business performance above and below 50% of minorities. The coefficients are not significantly different from zero. Panel C2 shows the results for the cutoff at a share of minorities of 0.55. All point estimates for the share of minorities, given that this share is above 0.55, are positive (and except for sales) statistically significant. When the share of minorities is lower than or equal to 0.55, all coefficients are negative and in two cases significantly so. The point estimate in column (5) of panel C2 implies that profits increase by 100 euros (about one-third of a standard deviation) if the share of minorities is raised from 0.6 to 0.7. The columns of panel C3 show a similar pattern for the relationship between business performance and ethnic diversity above and below 60% of minorities: profits, the probability of profits being positive and profits per share only increase with the share of minorities in the segment above 60% of minorities.<sup>14</sup>

As panels C1 through C3 of Table 5 show, these results are not driven by outliers since they are largely insensitive to using OLS, median or robust M-estimation regression. Table A1 in the appendix indicates (for various cutoff levels) that the results also remain similar if we estimate spline functions with three segments (i.e., with teams of low, moderate and high ethnic diversity). Here, business performance is lower for teams of low and moderate ethnic diversity relative to teams of high ethnic diversity, although the number of teams may slightly limit the precision of the estimates across different cutoffs.

The results presented in this subsection show that the relationship between team performance and ethnic diversity is flat or tends to decline down to a certain threshold level and starts increasing beyond this threshold level. The specific level of this threshold is around a share of minorities of 0.55. Hence, only if ethnic diversity is sufficiently substantial the net effect of ethnic diversity on team performance is positive. This finding is not at odds with the idea that the costs of coordination and communication offset the benefits of complementarities and (mutual) learning in homogeneous and moderately heterogeneous teams, while the benefits of sharing and exchanging relevant knowledge outweigh these

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<sup>14</sup>F-tests acknowledge that the coefficients of the first and second segment in panels C2 and C3 are not identical for profits, the probability of profits being positive and profits per share (not tabulated).



costs in more heterogeneous teams.

#### *4.2 Costs and benefits of ethnic diversity*

In this subsection we explore whether our data, collected through the questionnaires, indeed suggest mechanisms that possibly drive the effect of ethnic diversity on team performance. If the variable that we employ as an indicator of a mechanism is unrelated to the ethnic diversity of teams then we can conclude that this mechanism will not explain our findings. On the other hand, if we find a relationship between a certain mechanism and ethnic diversity then this mechanism possibly contributes to the explanation of our results. However, for the mechanism to actually explain our findings, it also needs to have an impact on team performance. Unfortunately, we cannot conceive of a research design (including ours) that allows testing this. The mechanisms of interest are endogenous and we lack exogenous variation to identify their causal impact. In what follows, we first consider the mechanisms that are associated with the costs of ethnic diversity and subsequently the mechanisms that are related to its benefits.

For communication and coordination, we expect that moderately heterogeneous teams incur higher costs of communication and coordination than teams that are homogeneous or heterogeneous in terms of ethnicity. We measure coordination and communication costs in terms of a team's atmosphere and personal conflicts (see Earley and Mosakowski, 2000; Richard et al., 2004). Teams' atmosphere is administered by asking students to rate the atmosphere within their team on a 5-points scale in the posttreatment survey. Likewise, conflicts in the team are surveyed by asking students to what extent there was conflict or disagreement between team members about personal matters (that are not task-related). More personal conflicts and a worse team atmosphere are expected to coincide with worse communication and coordination due to, for example, subgrouping along ethnic lines, distrust or stereotyping. In line with Alesina and La Ferrara (2005), we find that homogeneous and moderately heterogeneous teams tend to experience less conflicts than heterogeneous teams (not tabulated). However, the data also indicate that teams' atmosphere and ethnic diversity are not significantly related. In sum, these results do not consistently suggest that the costs of communication and coordination might drive our main findings.

For the benefits, we expect a positive relationship between ethnic diversity and business performance due to more complementarities and (mutual) learning in ethnically diverse teams. We measure learning in terms of the development in three knowledge areas most relevant for successful entrepreneurship: business, entrepreneurship and leadership (see Karlan and Valdivia, 2011; Minniti and Bygrave, 2001). For each of these knowledge areas, the indicator of individual learning is the difference between the self-assessed level in the posttreatment and pretreatment questionnaire. Table 6 reports results from least squares regressions (panels A and B) and spline functions (panels C1 through C3) of team-average learning in business, entrepreneurship and leadership knowledge on ethnic diversity. Again,

**Table 6.** Learning and ethnic diversity

	Development in knowledge of								
	Business			Entrepreneurship			Leadership		
	OLS (1)	Median (2)	Robust (3)	OLS (4)	Median (5)	Robust (6)	OLS (8)	Median (9)	Robust (10)
<b>A: Linear</b>									
% minorities	0.275 (0.436)	0.054 (0.485)	0.241 (0.471)	-0.090 (0.351)	0.061 (0.590)	-0.138 (0.389)	0.237 (0.393)	0.032 (0.660)	0.232 (0.465)
$R^2$	<i>0.34</i>	<i>0.24</i>	<i>0.42</i>	<i>0.34</i>	<i>0.18</i>	<i>0.32</i>	<i>0.30</i>	<i>0.16</i>	<i>0.27</i>
<b>B: Polynomial</b>									
% minorities	-2.670 (1.970)	-1.874 (2.385)	-2.659 (2.476)	-3.455** (1.727)	-3.835 (2.889)	-3.669 (2.540)	-3.789** (1.799)	-3.825 (2.617)	-3.999** (1.903)
% minorities <sup>2</sup>	2.690 (1.656)	1.891 (2.035)	2.514 (2.157)	3.088** (1.557)	3.228 (2.568)	3.192 (2.344)	3.691** (1.650)	3.468 (2.494)	3.891** (1.810)
<i>Minimum</i>	<i>0.50</i>	<i>0.50</i>	<i>0.53</i>	<i>0.56</i>	<i>0.59</i>	<i>0.57</i>	<i>0.51</i>	<i>0.55</i>	<i>0.51</i>
$R^2$	<i>0.38</i>	<i>0.27</i>	<i>0.47</i>	<i>0.39</i>	<i>0.25</i>	<i>0.37</i>	<i>0.38</i>	<i>0.24</i>	<i>0.33</i>
<b>C1: Spline (0.50)</b>									
1st segment	-1.067 (0.919)	-1.331 (1.182)	-0.897 (1.244)	-1.471 (0.913)	-2.057* (1.088)	-1.741 (1.138)	-1.324* (0.760)	-1.705 (1.029)	-1.607 (1.090)
2nd segment	1.049* (0.623)	0.867 (0.656)	0.779 (0.622)	0.753 (0.530)	0.858 (0.745)	0.752 (0.624)	1.191** (0.549)	1.131 (0.852)	1.374** (0.686)
$R^2$	<i>0.38</i>	<i>0.26</i>	<i>0.46</i>	<i>0.39</i>	<i>0.26</i>	<i>0.37</i>	<i>0.37</i>	<i>0.26</i>	<i>0.36</i>
<b>C2: Spline (0.55)</b>									
1st segment	-0.786 (0.649)	-0.731 (0.811)	-0.881 (0.798)	-1.270** (0.646)	-1.833** (0.846)	-1.476** (0.693)	-1.142* (0.635)	-1.247 (0.749)	-1.287* (0.712)
2nd segment	1.321** (0.656)	0.908 (0.757)	1.091 (0.685)	1.130* (0.599)	1.219 (0.876)	1.114 (0.711)	1.662*** (0.626)	1.243 (0.869)	1.729** (0.729)
$R^2$	<i>0.38</i>	<i>0.28</i>	<i>0.49</i>	<i>0.41</i>	<i>0.27</i>	<i>0.41</i>	<i>0.41</i>	<i>0.28</i>	<i>0.37</i>
<b>C3: Spline (0.60)</b>									
1st segment	-0.493 (0.638)	-0.638 (0.686)	-0.731 (0.625)	-0.971* (0.553)	-1.568** (0.764)	-1.179** (0.569)	-0.831 (0.525)	-1.175 (0.756)	-0.896 (0.655)
2nd segment	1.585* (0.873)	1.304 (1.144)	1.459 (1.100)	1.480* (0.793)	1.540 (1.209)	1.499 (1.046)	2.133** (0.883)	2.502* (1.345)	2.129* (1.228)
$R^2$	<i>0.38</i>	<i>0.28</i>	<i>0.51</i>	<i>0.40</i>	<i>0.25</i>	<i>0.40</i>	<i>0.41</i>	<i>0.25</i>	<i>0.36</i>

*Note:* Based on information from 43 teams. All specifications include controls for team size, field of study 'trade management Asia' and team-average knowledge levels at baseline. OLS, Median and Robust refer to the estimation method. Bootstrapped standard errors in parentheses (1000 replications). \*\*\*/\*\*/\* denotes significance at the 1%/5%/10%-level.

we present results from using OLS, median and robust M-estimation regression. Panel A shows no significant linear effect of the share of minorities on learning, whereas panel B suggests a u-shaped relationship with the minimum at a share of approximately 0.55.

Spline functions in panels C1 through C3 of Table 6 with a cutoff at respectively 50%, 55% or 60% of minorities indicate that the relationship between learning and share of minorities is flat or declines down to a threshold level of about 0.55 and starts increasing beyond this threshold level. Hence, on average, members of ethnic heterogeneous teams learn more than members of homogeneous and moderately heterogeneous teams. Additional regressions at the individual level, that we run separately for students of Dutch and non-Dutch ethnicity, show that the learning benefits of more ethnic diversity accrue to similar extents to both groups (not tabulated). Moreover, and probably as an explanatory factor of the higher learning levels in more diverse teams, the data show some evidence that ethnically diverse teams enter the entrepreneurship program at the start with a more diverse pool of relevant knowledge than less heterogeneous teams (see Lazear, 1999). Table 7 indicates that complementarities between team members and the coefficients of variation of business, entrepreneurship and leadership knowledge at baseline tend to be larger in ethnically diverse teams.<sup>15</sup>

All in all, based on these results we cannot reject the idea that ethnic diversity benefits (mutual) learning and heterogeneous knowledge, possibly leading to better team performance. This finding is partly consistent with the theoretical ideas formulated in the introduction. Ethnically diverse teams tend to have a more diverse pool of relevant knowledge and (possibly based on this) experience more learning and achieve better results. However, we do not find support for the idea that moderately heterogeneous teams incur higher costs of coordination and communication.

## 5 Discussion and conclusion

This paper shows evidence of a positive impact of ethnic diversity on team performance, although only starting at a certain turning point at which at least half of the team is ethnically diverse. Before this turning point the relationship is flat or slightly negative. Hence, only if ethnic diversity is sufficiently substantial the net effect of ethnic diversity on team performance is positive. In line with theoretical predictions (Lazear, 1999), our data suggest that ethnic heterogeneous teams benefit from a more diverse pool of relevant knowledge facilitating (mutual) learning.

Our study is motivated by the fact that many decisions in organizations are nowadays

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<sup>15</sup>In Table 7 a diverse pool of relevant knowledge at the start of the program is operationalized by: (i) complementarities between the self-assessed knowledge that team members have in business, entrepreneurship and leadership, and (ii) the coefficients of variation of business, entrepreneurship and leadership knowledge in teams at baseline. Complementarities are constructed by first standardizing all three knowledge dimensions, subsequently computing the teams' maximum for each knowledge dimension, and then determining the teams' minimum of the maximums of all three knowledge dimensions. Supposedly, if students of different ethnicity complement each others knowledge, these minimums are higher in ethnically diverse teams.

**Table 7.** Complementarities and diversity in relevant knowledge

	Complementarities			Diversity in knowledge of								
	Business/E'ship/Leadership			Business			Entrepreneurship			Leadership		
	OLS (1)	Median (2)	Robust (3)	OLS (4)	Median (5)	Robust (6)	OLS (7)	Median (8)	Robust (9)	OLS (10)	Median (11)	Robust (12)
<b>A: Linear</b>												
% minorities	0.690 (0.533)	1.397 (0.872)	1.181 (0.920)	0.129* (0.076)	0.186 (0.127)	0.126 (0.094)	0.105 (0.109)	0.079 (0.160)	0.096 (0.132)	-0.059 (0.071)	-0.047 (0.105)	-0.049 (0.084)
$R^2$	<i>0.28</i>	<i>0.22</i>	<i>0.41</i>	<i>0.54</i>	<i>0.32</i>	<i>0.46</i>	<i>0.17</i>	<i>0.03</i>	<i>0.14</i>	<i>0.23</i>	<i>0.13</i>	<i>0.19</i>
<b>B: Polynomial</b>												
% minorities	-3.776 (3.132)	-4.352 (4.273)	-2.763 (4.155)	-0.371 (0.418)	-0.639 (0.662)	-0.402 (0.502)	-0.766 (0.520)	-1.038 (0.809)	-0.786 (0.657)	-0.597 (0.364)	-0.272 (0.580)	-0.599 (0.446)
% minorities <sup>2</sup>	4.065 (2.697)	4.517 (3.784)	3.828 (3.742)	0.457 (0.371)	0.670 (0.574)	0.483 (0.433)	0.800* (0.475)	0.978 (0.733)	0.811 (0.605)	0.493 (0.323)	0.211 (0.518)	0.503 (0.402)
<i>Minimum</i>	<i>0.46</i>	<i>0.48</i>	<i>0.36</i>	<i>0.41</i>	<i>0.48</i>	<i>0.42</i>	<i>0.48</i>	<i>0.53</i>	<i>0.48</i>	<i>0.61</i>	<i>0.64</i>	<i>0.60</i>
$R^2$	<i>0.35</i>	<i>0.24</i>	<i>0.58</i>	<i>0.56</i>	<i>0.34</i>	<i>0.51</i>	<i>0.23</i>	<i>0.10</i>	<i>0.20</i>	<i>0.28</i>	<i>0.15</i>	<i>0.24</i>
<b>C1: Spline (0.50)</b>												
1st segment	-1.376 (1.318)	-1.680 (1.862)	-1.321 (1.754)	-0.025 (0.179)	0.040 (0.292)	-0.041 (0.216)	-0.239 (0.208)	-0.356 (0.315)	-0.246 (0.247)	-0.245 (0.164)	-0.156 (0.259)	-0.229 (0.185)
2nd segment	1.878** (0.812)	2.126* (1.243)	2.144* (1.253)	0.218* (0.124)	0.234 (0.174)	0.224 (0.143)	0.315* (0.170)	0.309 (0.260)	0.311 (0.213)	0.054 (0.104)	0.027 (0.183)	0.061 (0.126)
$R^2$	<i>0.37</i>	<i>0.26</i>	<i>0.40</i>	<i>0.55</i>	<i>0.33</i>	<i>0.50</i>	<i>0.23</i>	<i>0.09</i>	<i>0.19</i>	<i>0.27</i>	<i>0.14</i>	<i>0.22</i>
<b>C2: Spline (0.55)</b>												
1st segment	-0.526 (1.053)	-0.054 (1.437)	-0.392 (1.325)	-0.016 (0.148)	-0.159 (0.232)	-0.033 (0.182)	-0.177 (0.162)	-0.272 (0.244)	-0.183 (0.191)	-0.201 (0.135)	-0.150 (0.185)	-0.189 (0.144)
2nd segment	1.889* (1.000)	1.960 (1.649)	2.167 (1.451)	0.273* (0.150)	0.330 (0.217)	0.286 (0.188)	0.397** (0.196)	0.464 (0.319)	0.391 (0.258)	0.086 (0.122)	0.031 (0.218)	0.099 (0.159)
$R^2$	<i>0.34</i>	<i>0.24</i>	<i>0.37</i>	<i>0.56</i>	<i>0.34</i>	<i>0.51</i>	<i>0.24</i>	<i>0.11</i>	<i>0.19</i>	<i>0.27</i>	<i>0.14</i>	<i>0.22</i>
<b>C3: Spline (0.60)</b>												
1st segment	0.022 (0.929)	0.783 (1.312)	0.790 (1.246)	-0.012 (0.119)	-0.068 (0.190)	-0.032 (0.158)	-0.134 (0.139)	-0.167 (0.216)	-0.147 (0.173)	-0.172 (0.111)	-0.143 (0.167)	-0.167 (0.124)
2nd segment	1.831 (1.335)	1.933 (1.932)	2.830 (1.843)	0.370* (0.190)	0.401 (0.279)	0.397* (0.229)	0.532** (0.254)	0.507 (0.395)	0.534 (0.329)	0.141 (0.165)	0.054 (0.271)	0.157 (0.197)
$R^2$	<i>0.31</i>	<i>0.22</i>	<i>0.57</i>	<i>0.56</i>	<i>0.35</i>	<i>0.52</i>	<i>0.26</i>	<i>0.11</i>	<i>0.21</i>	<i>0.27</i>	<i>0.14</i>	<i>0.23</i>

*Note:* Based on information from 43 teams. All specifications include controls for team size, field of study 'trade management Asia' and team-average knowledge levels at baseline. OLS, Median and Robust refer to the estimation method. Bootstrapped standard errors in parentheses (1000 replications). \*\*\*/\*\*/\* denotes significance at the 1%/5%/10%-level.

assigned to teams (Hamilton et al., 2003) that become increasingly diverse due to the changing composition of Western populations (e.g., Ozgen et al., 2011b). One of the most salient and relevant dimensions of team heterogeneity is ethnicity (Alesina and La Ferrara, 2005). Until today, however, studies analyzing the causal effect of ethnic diversity on team performance in the longer run have been scarce.

We have tried to fill this gap in the empirical literature by conducting a field experiment. The field experiment was conducted in the context of a worldwide leading entrepreneurship education program in one of the largest colleges in Amsterdam. The program is executed as a part of the curriculum of their international business program. Real companies are founded in identical circumstances by 45 teams of approximately 12 students. The student population consists of 55% students with a non-Dutch ethnicity from 53 different countries of origin. As outside researchers, we were allowed to exogenously vary the ethnic composition of otherwise randomly composed teams. Since the program requires students to deliver annual reports, we could measure their performance in terms of sales, profits and profits per share. All in all, this is a genuinely interesting opportunity to measure the longer term effect of ethnic diversity on team performance in realistic though controlled circumstances.

Several limitations pertain to this study. There are discrepancies between the business teams in our study and teams in business practice. Individuals in our teams are relatively young, lack serious labor market experience and some of the teams have unprecedented high degrees of ethnic diversity. These characteristics might, to some extent, limit the external validity of our study. Moreover, although advantageous for the internal validity of our study, the random composition of teams is probably not representative of common practice in business. Finally, our experimental design does not allow for a causal interpretation of mechanisms such as (mutual) learning that lead to higher performance of ethnic heterogeneous teams.

Nevertheless, teams' substantial and genuinely joint task with strong incentives to maximize performance of a real company in which team members have time to establish roles and observations of other members closely resembles the functioning of teams in business practice. Given the upcoming increase of the share of minorities in the labor force it is likely that any team will become more and more diverse in terms of ethnicity. Our study might provide a realistic preview of the impact that a high degree of ethnic diversity may have on the performance of teams.

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**Appendix Table A1.** Ethnic diversity and team performance (spline functions with three segments)

	Sales			Profits			Pos. profits	Profits per share		
	OLS (1)	Median (2)	Robust (3)	OLS (4)	Median (5)	Robust (6)	OLS (7)	OLS (8)	Median (9)	Robust (10)
<b>C1: Spline (0.50 and 0.60)</b>										
1st segment (N=13)	-72.3 (3383.4)	-903.9 (2832.8)	-1475.2 (2542.9)	-25.5 (1305.0)	19.5 (1091.9)	-298.3 (1186.7)	-0.566 (1.553)	5.519 (20.586)	-1.568 (21.003)	-1.451 (21.464)
2nd segment (N=12)	-3855.7 (5694.8)	-1702.8 (4160.3)	379.6 (3194.1)	-1665.6 (1924.9)	-2380.6 (1993.9)	-1827.1 (1789.0)	-3.438 (2.537)	-40.931 (34.724)	-44.992 (41.217)	-45.332 (38.860)
3rd segment (N=18)	1121.1 (1511.8)	1863.9 (1730.1)	832.5 (1324.0)	1486.8** (750.4)	1533.8* (836.2)	1272.7* (743.1)	3.431*** (1.329)	33.194** (13.609)	30.027* (17.104)	33.510** (15.465)
$R^2$	0.05	0.05	0.07	0.09	0.09	0.16	0.20	0.09	0.09	0.14
<b>C2: Spline (0.45 and 0.65)</b>										
1st segment (N=10)	-1982.7 (3386.2)	-4112.3 (3331.4)	-3445.7 (3215.0)	-70.7 (1601.9)	-729.5 (1746.8)	-546.6 (1919.0)	-0.833 (2.146)	9.147 (28.721)	-14.834 (31.870)	-3.369 (37.745)
2nd segment (N=21)	-441.6 (2170.7)	-52.1 (1717.5)	660.5 (1429.9)	-362.8 (782.4)	-376.4 (971.8)	-463.8 (727.6)	-0.804 (1.413)	-13.556 (17.582)	-6.730 (22.359)	-14.604 (18.522)
3rd segment (N=12)	593.0 (1832.0)	1953.7 (1960.7)	869.7 (1948.5)	1233.6 (816.3)	1519.5 (1036.6)	1091.6 (952.3)	3.130* (1.753)	32.469* (16.937)	25.126 (24.939)	32.904 (21.982)
$R^2$	0.04	0.06	0.14	0.05	0.06	0.08	0.13	0.06	0.05	0.08
<b>C3: Spline (0.40 and 0.60)</b>										
1st segment (N=6)	-3825.4 (4174.3)	-8217.8 (4985.2)	-5895.6 (5886.8)	542.9 (2788.9)	1449.7 (3150.5)	-107.4 (4286.7)	1.138 (3.301)	26.214 (48.628)	34.250 (53.268)	9.394 (77.093)
2nd segment (N=19)	179.6 (1455.4)	749.1 (1535.9)	662.8 (1291.8)	-1070.0 (828.7)	-1424.8* (807.7)	-1119.5 (680.6)	-2.768** (1.213)	-26.479 (17.121)	-32.143* (16.135)	-28.274 (18.670)
3rd segment (N=18)	-91.0 (1172.0)	786.2 (1482.4)	487.1 (1219.8)	1426.1** (685.2)	1340.6* (693.3)	1187.0** (584.7)	3.475*** (1.169)	32.448*** (12.559)	27.426** (13.511)	31.785** (13.311)
$R^2$	0.05	0.08	0.22	0.10	0.10	0.15	0.22	0.11	0.10	0.14

*Note:* Based on information from 43 teams. All specifications include a dummy for the field of study 'trade management Asia'. OLS, Median and Robust refer to the estimation method. Median and robust specifications for positive profits are excluded since this variable is dichotomous. Bootstrapped standard errors in parentheses (1000 replications). \*\*\*/\*\*/\* denotes significance at the 1%/5%/10%-level.