



# *Bilingualism and regional entrepreneurship*

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# Bilingualism and regional entrepreneurship

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## Abstract

Entrepreneurship makes important contributions to both regional and national economies; however, entrepreneurship rates vary significantly across and within regions. We apply the communication accommodation theory lens to examine the role that bilingualism plays in regional entrepreneurship. We use aggregated firm and district level longitudinal data on eight northeastern districts in the region of South Tyrol (Italy) during 2000–2015 and demonstrate positive direct effect of bilingualism on entrepreneurship activity. The results can be generalizable to other European multi-cultural regions.

**JEL Classifications** L26 · R11 · Z13

*“I’m not Italian, I can’t be Austrian and I’m definitely not German, how do you say Ich bin ein Südtiroler in English?”* (Green 2017).

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## 1 Introduction

The economic geography literature has long focused on understanding the sources and mechanisms of variations in entrepreneurial growth cities and regions to design regional economic policies (Andersson et al. 2019). However, existing approaches to bestow entrepreneurship are often limited to regional institutional changes (Audretsch et al. 2018; Boudreaux and Nikolaev 2018) and the role of knowledge (Tsvetkova and Partridge 2019) and cultural characteristics (Fritsch and Wyrwich 2014; Fritsch et al. 2019). Simply creating a supportive environment for entrepreneurs by promoting innovation, regional specialization (Andersson and Larsson 2014) as well as high quality of institutions (Charron et al. 2014; Chowdhury et al. 2015) is often insufficient and time-consuming.

Other regional policies are also limited: improving the productivity (van Praag 2007), attracting skilled labor (Kenney and Patton 2005), facilitating innovations systems (Fritsch 2001) and entrepreneurial ecosystems (Isenberg 2010; Stam 2015; Audretsch and Belitski 2017), investing in social capital (Westlund and Bolton 2003; Bradley et al. 2012; Andersson et al. 2016) and stimulating market demand (Sato et al. 2012). The extent literature on entrepreneurship and regional development has focused on contexts and the role that regulation and cultural institutions play in facilitating entrepreneurial activity (Boschma and Fritsch 2009; Tabellini 2010) and entrepreneurial opportunity recognition (De Carolis and Saporito 2006; Radosevic and Yoruk 2013). However, there is a paucity of knowledge how entrepreneurial opportunity recognition and knowledge transfer can happen in a heterogeneous context and the role that communication strategies play to regional entrepreneurship.

Very little is known about how ethnic heterogeneity affects entrepreneurship and the institutional arrangements affecting entrepreneurship (Churchill 2017). The purpose of this study is to explain the mechanism of entrepreneurial opportunity recognition in heterogeneous contexts, as well as to further explore the relationship between bilingualism and regional entrepreneurship in a multicultural region. We use social psychology and communication accommodation theory (CAT) with the idea that speakers adjust (or accommodate) their speech in order to create and maintain positive individual and social interactions as well as demonstrate mutual identities and interests.

The paper focuses on subregional units of analysis (districts), contrasting the prevailing approach which studies the effectiveness of context at a regional (Szerb et al. 2013; Rothstein et al. 2013) and country level (Autio et al. 2014). The choice of our analysis follows the belief that regional and subregional differences matter more than national ones. (Charron et al. 2014).

This study makes two contributions to regional economics and entrepreneurship literature. Firstly, using the social psychology and communication theory perspective (Gudykunst and Kim 1992; Gallois et al. 2005; Gallois and Callan 1997; Miller 2002; Soliz and Giles 2014) we explain how bilingualism can facilitate entrepreneurial activity with a focus on multicultural regions. Secondly, we use longitudinal data to empirically examine the effect of changes in regional bilingualism on new firm formation and density expanding Churchill's (2017) argument on the role of

linguistic fractionalization on entrepreneurship. In addition, we argue that the relationship between bilingualism and entrepreneurship is nonlinear (Audretsch et al. 2018).

We define bilingualism as the ability to speak at least two languages and should not be mistaken for a form of social capital (Westlund and Bolton 2003; De Carolis and Saparito 2006; Andersson et al. 2016) or localized cultural resources (Qian et al. 2013).

This study offers three major findings. Firstly, bilingualism is an important antecedent of regional entrepreneurship, with an increase in a share of bilinguals by one percent increases start-up rates by 0.06 percent and start-up density by 0.08 percent. Secondly, we use a unique indicator for bilingualism, such as the number of residents who passed A-level bilingual test, and demonstrate that higher share of bilinguals increases entrepreneurship activity directly as well as facilitating relative growth of entrepreneurship activity compared to other regions. Thirdly, the extent of bilingualism in a region serves as a conduit in new ideas and may increase the ability to communicate knowledge more effectively (Feldman and Zoller 2012; Andersson et al. 2016).

The remainder of this study is organized as follows. Section 2 discusses the role of language in regional entrepreneurship. Section 3 describes the South Tyrol case study. Section 4 presents the data and empirical method. Thereafter, Sect. 5 shows the results and a series of robustness checks. And finally, Sect. 6 discusses main findings and concludes.

## 2 The role of language in regional entrepreneurship

The role of bilingualism and multilingualism in entrepreneurship is likely to be stronger in European regions than anywhere in the world due its special differences in institutions, culture and economic development (Boschma and Fritsch 2009; Charron et al. 2014; Fritsch et al. 2019). European regions have been long known for its fractionalization in cultures and languages. Churchill (2017) has examined the effect of ethnic heterogeneity on various outcomes associated with entrepreneurship and the institutional environment for entrepreneurship using indices of ethnic and linguistic fractionalization. The study demonstrated that ethnic heterogeneity may negatively influences entrepreneurship, while little is known about the role of language in communication between various ethnic groups in Europe and how it may affect regional entrepreneurship. Higher cultural and linguistic fractionalization in European regions results in a specific distribution of skills, labor force and entrepreneurship activity (Audretsch et al. 2010; Charron et al. 2014; Nathan 2015).

This study departs from the prior research on regional institutions and entrepreneurship (Fritsch and Wyrwich 2014; Fritsch et al. 2019) that facilitates trust and knowledge sharing (Audretsch et al. 2010; Westlund et al. 2014). It also builds on the cultural and linguistic fractionalization literature (Churchill 2017) as well as entrepreneurial cognition, which helps to understand new ideas and introduce them to market (Qian et al. 2013; Audretsch and Belitski 2013). Several studies using evidence from Japan (Aoyama 2009) and Europe (Andersson and Koster 2010;

Radosevic and Yoruk 2013) in examining the role language plays for entrepreneurial activity have been helpful. Our argument on the relationship between bilingualism as a form of linguistic fractionalization only applies to regions with substantial ethnic groups with a different mother tongue due to deep historical circumstances. Modern migration to certain places is not a focus of this study.

Thus, language acts as location-specific resources (Lawson 1999) that enables individuals to adjust to community expectations, develop trust, collaborate and facilitate entrepreneurial cognition (Alvedalen and Boschma 2017). Frequent contacts between community members increase communication competences and decrease anxiety related to market uncertainty when new ideas are introduced (Gudykunst and Nishida 1984). Theories of communication such as speech accommodation theory (SAT) and communication accommodation theory (CAT) can be helpful to better interpret the social physiological mechanism of entrepreneurial cognition (Shepard et al. 2001; Sachdev and Bourhis 2001). Both CAT and SAT have been known since the early 1970s (Ball et al. 1984), with CAT being most popular providing a robust basis to examine mutual influences in communication while taking account of social and cognitive factors (Gallois et al. 2005).

Two CAT strategies are convergence and divergence, which are supported by the satellite theories developed to account for communication between various ethnic groups (Giles et al. 1987). While the divergence strategy is an expression of the desire to show the distinctiveness of a cultural background and self-identity, the convergence strategy is used to facilitate comprehension and collaboration (Street and Giles 1982). For example, a bilingual person may purposely exaggerate a language's similarities and differences when choosing whether and how to collaborate. Soliz and Giles (2014) argue that an increase in communication accommodation results in an increase in interpersonal attraction, openness and social networks. Altogether, interpersonal attraction, openness and social networks act as conduits for new ideas, opportunities, technologies and tacit knowledge (Owen-Smith and Powell 2004) converging entrepreneurial outlooks (De Carolis and Saporito 2006). The convergence strategy of CAT allows an individual who speaks a similar language to share community knowledge and ideas, and therefore, presumably individuals become more likeable to another community (Gallois et al. 2005). This leads to connections among entrepreneurs, investors and other EE stakeholders based on accommodation and trust. Thakerar and Giles (1981) and Thakerar et al. (1982) introduced the cognitive function into accommodation strategies. This involves speakers organizing their output to take account of the requirements of listeners and facilitates comprehension and collaboration.

The cognitive function of accommodation strategies facilitates bilingual entrepreneurs or would-be entrepreneurs wishing to use their language skills to negotiate and reduce market uncertainty with potential customers, suppliers, governments and other collaborators (Gudykunst and Nishida 1984, 2001). Accommodation strategies are important at the exploratory stage of business creation and when conducting market research (March 1991), at the point when customer needs and fears are still unknown and entrepreneurial cognition needs to be matched with the market needs of customers which represent different cultural or ethnic communities.

The cognitive functions of an entrepreneur (E) converge to customer's (C) speech characteristics in order to facilitate comprehension. At the same time, we may choose to diverge from C's speech in order to remind C of their non-shared community memberships and hence prevent production of similar or shared ideas and explore new ideas. (E) diverges in order to encourage C to adopt a more situationally appropriate solution for a specific product or service.

Divergence strategies could help investors (I) and collaborators to identify new opportunities in different markets while building on the distinctiveness of (E), (C) and (I) and not on information asymmetries. Additional stakeholders might rely on the knowledge embedded in bilingual (E) to ensure their knowledge could be applied across communities.

Both divergence and convergence strategies of the cognitive function in CAT (Giles et al. 1987) are used by bilingual entrepreneurs and would-be entrepreneurs to access customers and explore the markets. It is likely that the returns of bilingualism are higher in a region that has a critical mass of customers speaking both languages for an entrepreneur to be able to use the language to engage with community and prospective customers. We hypothesize:

**Hypothesis** In a multicultural region, bilingualism facilitates entrepreneurship activity.

### 3 Multiculturalism of the South Tyrol

South Tyrol is an autonomous region located in northeastern Italy which borders Austria and Switzerland. South Tyrol's gross domestic product (GDP) is significantly above the European average and almost matches the GDP per capita of Germany (Astat 2018). South Tyrol also has Italy's lowest unemployment rate at 4.0 (3.2) percent in 2012 (2017), while the Italian average was 10.1 (11.2) percent (Astat 2018). The province is divided into eight districts called *Bezirksgemeinschaften* in German and *comunità comprensoriali* in Italian, including the capital Bozen-Bolzano. Tourism plays a fundamental role in the local economy. According to Astat (2018), about 9% of the area's GDP comes directly from tourism (Astat 2018).

According to 2014 regional data based on the 2011 census, 62.3 percent of the population speak German (Standard German in the written form and an Austro-Bavarian dialect in the spoken form), 23.4 percent use Italian, mainly in and around the two largest cities (Bolzano and Merano), 4.1 percent speak Ladino, a Rhaeto-Romance language, while 10.2 percent of the population (mainly recent immigrants) speak another language as their first language.

One of the English language professors recalled: "*Signs of multilingualism are everywhere in Brixen. Via Dante exists alongside Goethestraße, match reports for the local football team are published in both Italian and German, and the Frankfurter Allgemeine Zeitung is sold alongside the Corriere della Sera*" (Green 2017).

A truly anecdotal story of how bilingualism facilitates entrepreneurship can be found in the following two examples. The Italian farmer Duilio Pirrera originally from Sicily learned German language to negotiate prices and collaborate

with Tyrolean farmers who grow apples, which further were sold in Sicily. Italian native speaker Dmitri Boreiko—resident of South Tyrol, learned German language to expand his business of blade air heating panels to Bavaria, Germany, previously testing the equipment in South Tyrol. He used the knowledge of German to translate technical instructions as well as explain customers how air heating works and how much they can save on installation.

## 4 Data and methods

### 4.1 Data

We constructed a longitudinal dataset at the district level in South Tyrol during 2000–2015 drawing on Bosma and Sternberg (2014) and Fritsch et al. (2019), which include various variables that affect regional entrepreneurship. The firm-level data on new business registered were taken from the Chamber of Commerce of South Tyrol and Istat (Italian Statistical Office). Our sample includes regional firms, which come from a single annual business registry cohort. To match the firms to the level of district from municipality level, we used detailed information on the firm's geographic location (5-digit post code) and a look-up table to match postcodes to the appropriate district. We used the confidential version of the data file, available through the Chamber of Commerce's restricted-access laboratory.

Once the data were classified as non-disclosure and were released to be used in this study, we chose to use the Chamber of Commerce data on new business registrations and new firm formation. Firstly, we covered all firms which are registered as new firms, firm exits including mergers and acquisitions as well as total businesses registered. This made our analysis compatible with other regions where similar indicators are used. Secondly, the data provide extensive geographic coverage. Firms in our sample were in 116 municipalities and eight aggregated districts.

Once the business data was aggregated at a district level (*Bezirksgemeinschaften*), we matched various geographical, socioeconomic and cultural characteristics of districts from the Office of National Statistics (Istat) and the Chamber of Commerce. This approach allowed us to bring language exams metrics to the sample of eight districts over 16 years. Table 1 provides summary statistics of variables used in this study, while Table 2 shows a correlation matrix.

### 4.2 Dependent variables

We used two dependent variables related to start-up rate and start-up density in a district (Audretsch et al. 2019). Start-up rate is measured as a share of newly registered businesses to total businesses registered. Start-up density is measured as a ratio of new registered businesses to total population multiplied by 1000 (Shane and Venkataraman 2000; Audretsch 2007).



**Table 1** Descriptive statistics. *Source:* Astat—South Tyrolean Office of Statistics: 2000–2015. Istat—Italian Office of National Statistics

Variable	Description	Mean	SD	Min	Max
Start-up rate	Share of newly registered firms in total firms, %	5.25	1.14	3.45	8.45
Start-up density	Number newly registered firms per 1000 inhabitants	5.98	1.02	3.85	8.71
Business density	Business density per km (number of businesses registered divided by area and by 1000 km)	0.03	0.06	0.00	0.21
Bilingualism	Share of residents who have passed bilingual/trilingual test (at level A—highest proficiency)	56.28	14.11	26.00	90.10
Bilingualism corrected	Share of residents who have passed bilingual/trilingual test (at level A—highest proficiency) excluding share of public sector workers in a region	45.86	15.59	10.11	81.90
Commuter-in	Share of employees who commute to the region, %	51.31	7.12	37.00	63.50
Human capital	Proportion of employees with university degree and above	0.20	0.07	0.11	0.44
Energy	Share of energy institutions to total number of firms (institutions) registered	0.01	0.01	0.00	0.05
Public	Share of institutions in public administration, defense; social security, education and teaching, health and social care, arts, sports, entertainment and other services to total number of firms (institutions) registered	4.45	1.29	2.47	6.20
Employment	Number of full-time employees, in logs	9.85	0.54	8.65	10.50
<i>Variables used as instruments in the first-stage regression to predict bilingualism intensity</i>					
Unemployment	Unemployment rate, %	3.91	1.61	1.50	9.10
Commercial infrastructure	New non-residential & commercial building available, m3	12.29	0.58	10.62	13.45
Vocational education	Proportion of residents subscribing for vocational education per 1000 residents	20.99	14.39	3.20	63.40
Population growth	Population growth, % to previous year	0.73	0.77	-4.48	2.64
Social income	Social Income per capita per day (in Euro)	30.76	30.74	3.87	182.07

The number of observations is 128 during 2000–2015

**Table 2** Correlation table. Source: Astat—South Tyrolean Office of Statistics : 2000–2015. Istat—Italian Office of National Statistics

	1	2	3	4	5	6	7	8	9
1. Start-up rate	1								
2. Start-up density	0.83*	1							
3. Business density	0.78*	0.73*	1						
4. Bilingualism	-0.06	0.15	-0.01	1					
5. Bilingualism corrected	-0.39*	-0.15	-0.34*	0.83*	1				
6. Commuter in	-0.17	-0.39*	-0.39*	-0.20*	-0.0645	1			
7. Human capital	0.78*	0.65*	0.71*	-0.07	-0.41*	-0.18*	1		
8.. Energy	0.15	-0.08	0.14	-0.29*	-0.30*	0.24*	0.33*	1	
9. Public	-0.36*	-0.59*	-0.40*	-0.33*	-0.06	0.53*	-0.51*	0.18*	1
10. Employment	0.35*	0.48*	0.47*	0.21*	-0.01	-0.33*	0.56*	-0.15	-0.65*

The number of observations is 128 during 2000–2015. Variables which represent the differences between start-ups rates of South Tyrol and other regions were suppressed to safe space

### 4.3 Independent variables

Measuring bilingualism and multilingualism has always been a difficult task in socioeconomic and social psychology research (Sachdev and Bourhis 2001). Over the past decades, research has focused on indicators of cultural integration and diversity using different operationalization strategies, including value-based survey data (Inglehart 2004), population data and ethnic diversity (Qian et al. 2013; Churchill 2017) and the geographical distribution of personality traits or religious confessions (Stuetzer et al. 2014). We use the share of residents who passed a bilingual/trilingual test (category A) and who lived in district  $i$  in year  $t - 1$ .

In South Tyrol, multilingualism is an advantage. In the private sector, knowledge of German and Italian languages is not a must but is a desirable job criterion and can be acquired in stages. Public sector employees must prove their bilingualism in an examination administered by the province's local government. Bilingualism is tested at four different levels of proficiency from A to D. The level of proficiency required by the employer depends on the job profile and position. Jobs that require a college degree generally require Level A proficiency which is bilingual. We use a share of residents in a district who passed the test at Level A as a proxy for bilingualism. A different bilingualism measure "corrected" for the local public sector share was calculated as part of a robustness check. The adjusted bilingualism rate was calculated by subtracting the share of employee in a local public sector from the share of bilinguals. We calculated the share of local public sector across each of eight municipalities using information on the total number of employees in local public sector and total population. Local sector employees included government ministries—policy, social insurance institutions,

such as Italian Automobile Association and railway company, post office as well as Local administration–provincial administration, school system teachers, local health authorities, provincial parliament, independent provincial administrations, regional administration and regional parliament, public assistance institutions and other local administrations. This bilingualism corrected measure provides us with a cleaner measure for the non-public sector-induced bilingualism pattern of a region. We used one-year lag for all independent variables.

#### 4.4 Control variables

Building on Fotopoulos and Storey (2017), Frenken and Boschma (2007), Fritsch and Wyrwich (2014) and Colombo et al. (2016), we use several control variables to control for regional entrepreneurship.

Firstly, business networks proxied by business density (Bosma and Sternberg 2014; Iammarino and McCann 2006). Secondly, regional human capital is measured as the share of employees with a bachelor university degree and above (Acs et al. 2007). There is a strong relationship between human capital and new knowledge (Kenney and Patton 2005), as well as human capital and the competitiveness of new ventures (Audretsch and Belitski 2020). Thirdly, availability of labor force in a region is measured as a total number of full-time employees, taken in logs (Frenken and Boschma 2007). Fourthly, bilingualism is mandatory for public sector in many multicultural regions. We measure the size of public sector by for a share of entities (institutions) in public administration, defense, social security, education and teaching, health and social care, arts, sports, entertainment and other services to the total number of firms registered (Szerb et al. 2013; Audretsch et al. 2015). Fifthly, share of energy firms and presence of large corporations (Andersson et al. 2018) were included, while a share of commuters measures the workers' mobility. We also control for year fixed effects. We used one-year lag for all control variables.

#### 4.5 Method

We use fixed effects (FE) estimator concentrates on differences that, over time, characterize a single district. Therefore, the FE estimator is also referred to as the “within” estimator. That is, it explains to what extent a given district's change in a variable of interest (bilingualism) affects entrepreneurship activity. It is the very idea of FE to rule out that observed and unobserved time-invariant factors drive the results. Random effects (RE) estimator was used as a robustness check which is obtained by weighing the “within” effect with the “between” effect, which allows us to identify the factors that explain the differences driven by the districts in the panel. While the signs of the coefficients and confidence intervals between RE and FE estimation are similar, the significance of the coefficients is stronger when estimated with RE.

The FE estimation with year fixed effects is as follows:

$$S_{it} = \beta_0 + \beta_1 B_{it-1} + \beta_2 w_{it-1} + \lambda_t + \varepsilon_{it} \quad (1)$$

where  $S_{it}$  is a dependent variable of entrepreneurship in district  $i$  at time  $t$ . We deal with sixteen waves of data for each dependent and independent variable.  $B_{it-1}$  is a vector of our variables of interest: the share of residents who passed the test class  $A$  in the total number of residents for district  $i$  in year  $t - 1$ .  $w_{it-1}$  is a vector of control variables for district  $i$  in year  $t-1$ . Moreover, we include an additional vector  $\lambda_t$  is a vector of time-fixed (district invariant effects) over each time period  $t$  across all districts.  $\varepsilon_{it}$  is the error term that consists of two components:

$$\varepsilon_{it} = \gamma_i + v_{it} \quad (2)$$

where  $\gamma_i$  controls for other characteristics of districts which remain unobserved (e.g., health, digital and other physical and soft infrastructure), while  $v_{it}$  is the error term.

To address the concern of multicollinearity, we used a variance inflation factor (VIF) in all four models. All variables have scores between 3 and 6 (Kutner et al. 2004), and the average VIF for each model is 4.2.

We argue that the effect of bilingualism on entrepreneurship activity is likely to be nonlinear, because an increase in the proportion of bilingual residents is unlikely to facilitate entrepreneurial activity at a linear trend. Thus, an increase in bilingual population by 1 percent when the share of bilinguals in the total population is low (0–5%) is likely to bestow entrepreneurial activity to a greater extent than the similar increase when the share of bilingual population in a region is relatively high (30–40%). Latter is likely to facilitate entrepreneurship, but the overall size of the effect will be smaller. We also note that the significance and size of  $\beta_1$  might not always reflect the nature of the relationship. The margins are a tool to explain a relationship when the direction of the relationship may be nonlinear, rendering that the net effect is statistically insignificant. The predictive margins should be used Rising (2012) in order to visualize how a change in bilingual residents (A level test) contributes to a marginal change in entrepreneurship.

Building on Williams (2012) and Rising (2012), the beta coefficients in Table 3 (for start-up rates and density) provide the averaged results of model estimation and are limited in capturing nonlinear effects. For example, a one-unit change in share of residents who have become bilingual may result in a disproportional change in entrepreneurship activity, which cannot be measured by the beta coefficient directly from Table 3.

We calculated two post-estimated predictive margins as suggested in Rising (2012) for start-up rate and start-up density using bilingualism rate (Table 3 column 1) and bilingualism rate adjusted for public sector workers (Table 3 column 1). Sane estimation was performed with start-up density. We used the “margins” command in the statistical software STATA 15 to compute the standard errors of the means.

## 5 Results

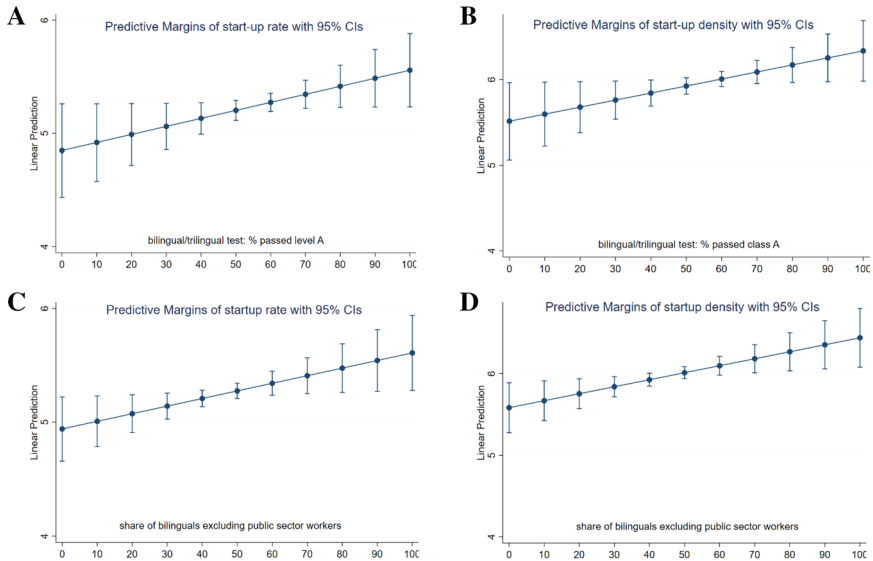
We interpret our findings and draw conclusions related to our hypotheses using both the beta coefficients of bilingualism from Table 3 and the predictive margins (Fig. 1).

**Table 3** Start-up rates and density fixed effects estimation with original values of bilingualism. *Source:* Astat—South Tyrolean Office of Statistics : 2000–2015. Istat—Italian Office of National Statistics

Dependent variable Specification	Start-up rate (1)	Start-up rate (2)	Start-up density (3)	Start-up density (4)
Business density	87.92*** (26.95)	88.83*** (27.01)	132.70*** (29.43)	133.90*** (29.49)
Bilingualism	0.06* (0.00)		0.08** (0.00)	
Bilingualism corrected (excl. public sector workers)		0.07* (0.00)		0.09** (0.00)
Commuter-in	-0.01 (0.06)	-0.01 (0.06)	-0.03 (0.07)	-0.04 (0.07)
Human capital	-6.68* (3.63)	-6.68* (3.63)	-15.60*** (3.96)	-15.61*** (3.96)
Public	0.32 (0.52)	0.33 (0.52)	-0.49 (0.57)	-0.49 (0.57)
Energy	-14.81* (7.07)	-14.99* (7.03)	-10.91 (9.90)	-11.15 (9.90)
Employment	2.69* (1.56)	2.65* (1.56)	2.98* (1.70)	2.95* (1.61)
Constant	-23.58* (13.89)	-23.85* (13.93)	-20.72 (15.17)	-21.12 (15.21)
No obs.	128	128	128	128
$r^2$ within	.13	.14	.31	.32
$r^2$ overall	.57	.58	.65	.65
$r^2$ between	.65	.66	.88	.89
$F$ stat	3.61	3.69	7.40	7.49
$F$ test $u = 0$	21.43	21.36	6.10	6.22
Sigma $u$	5.43	5.47	8.62	8.68
Sigma $e$	.42	.43	.45	.47
Rho	.97	.97	.97	.97

Method of estimation: Fixed (FE) panel data estimation. \*= significant at 10% level, \*\*=significant at 5% level, \*\*\*significant at 1% level

Our hypothesis is supported. Bilingualism rate is an important predictor of start-up rate and density in eight districts of South Tyrol, Italy (Fig. 1a, b). We found that the adjusted level of bilingualism also predicts the level of start-up rates and density in districts of South Tyrol (Fig. 1c, d). Both coefficients of bilingualism and bilingualism corrected for public sector are positive in columns 1–4 (Table 3). In economic terms, this result can be reported as an increase by 1 percent of bilingualism rate results in 0.06 percent increase in start-up rate (column 1, Table 3) and 0.08 percent increase in start-up density (column 3, Table 3). An increase of one percent of the adjusted bilingualism rate increases start-up rates and start-up density by 0.07 and 0.09 percent, respectively (column 2 and 4, Table 3).



Source: Astat – South Tyrolean Office of Statistics : 2000–2015. Istat – Italian Office of National Statistics

**Fig. 1** Predicted outcome as a result of change in residents who passed the bilingual test (class A) (start-up rate—**a**; start-up density—**b**, start-up rate with bilingualism corrected for public sector workers—**c**; start-up density with bilingualism corrected for public sector workers—**d**). Source: Astat—South Tyrolean Office of Statistics : 2000–2015. Istat—Italian Office of National Statistics

South Tyrol represents *Mittelstand* culture, typical for this area with many family-owned businesses sustainable through generations of entrepreneurs (De Massis et al. 2018). Positive coefficients of bilingualism represent that the language may serve as a conduit for new knowledge and knowledge transfer mechanism (Owen-Smith and Powell 2004). The results in Fig. 1 are both interesting and unexpected. We visualize that changes in a bilingual population in a district positively affect entrepreneurial activity, with the best prediction around 50 percent of bilingual population in a region which may be associated with gaining a “critical mass” of bilingualism (Bathelt and Cohendet 2014).

Other interesting findings are related to the control variables. Districts with relative higher number of energy firms have lower start-up rates (Table 3), while start-up density is less affected. Business networks proxied by business density positively affect both start-ups rates and density supporting previous findings of Iammarino and McCann (2006) and Andersson and Larsson (2014) who advocated for the importance of regional collaboration and co-location of firms for regional growth. The share of residents with university degrees was negatively associated with start-up rates and density. This is not surprising for South Tyrol with its high proportion of family small firms, also known as *Mittelstand*, while residents with high school- and university-level qualifications often join their family business and community (De Massis et al. 2018). Holding a university degree increases the opportunity cost of doing business and self-selects higher talent into

the larger corporate organizations and employment outside of the region. Higher labor force size increases start-up rate supporting Audretsch and Keilbach (2007) and Audretsch et al. (2006) argument of employees using uncommercialized knowledge to start their own business. Finally, we controlled for the role of public sector in start-up rates (Chowdhury et al. 2019). The coefficient is negative but not statically significant, which demonstrates that districts with different share of public institutions are likely to have similar level of regional entrepreneurship.

## 5.1 Robustness checks

Modeling the relationship between regional bilingualism and entrepreneurship presents a set of challenges, especially that there may be certain reasons why people subscribe and pass a language test. Residents may select into language programs because they want to start working for a public sector or they expect some benefits from the language. At the same time, there will be people who already speak the language resulting in a difference between the share of people that speaks the language informally (without a certificate) or formally (having a certificate). We can address this issue by predicting the rate of bilingualism as well as adjusted bilingualism rate. We apply a sequential approach, which was introduced by Crépon et al. (1998), and at the first stage we predict the extent to what individuals pass the bilingual test Level A in each district. In our robustness check, an individual decides whether to subscribe for the language course and test or not, then, given that the individual chooses to do subscribe, it then has a certain propensity to pass the test. This statement of the problem can be modeled with a standard sample selection model. The rate bilingualism equation was computed as the expected level of bilingualism in a district given the district's characteristics. The first stage of the model fills in their propensity to sign up for the language course with what might have been expected given the level of unemployment in a district, availability of new commercial infrastructure, vocational education programmes per 1000 residents, population growth and social minimum income per resident (in euro).

This statement of the problem is modeled with a standard sample selection model. The bilingualism rate variable was computed as the expected bilingualism intensity given the district's characteristics.

$$B_{it} = \begin{cases} B_{it}^* = \beta x_{it-1} + \mu_{it} & \text{if } \textit{bilingualism} > 0 \\ 0 & \text{if } \textit{bilingualism} = 0 \end{cases} \quad (3)$$

where  $B_{it}^*$  is the unobserved latent variable corresponding to the district's level of bilingualism and  $x_{it-1}$  is a set of determinants of the bilingualism rate such as the level of unemployment in a district, availability of new commercial infrastructure, vocational education programmes per 1000 residents, population growth and social minimum income per resident (in euro). In addition to instrumented variables,  $x_{it-1}$  also includes the measure of human capital and employment in district  $i$  at time  $t$ .

Looked at another way, including the fitted value of bilingualism intensity in a district in the second stage for districts that actually report bilingualism rate is a form of instrumental variable estimation of the start-up equations, helps to correct for the

number of people who speak the language without the certificate. We estimate a start-up equation using FE model.

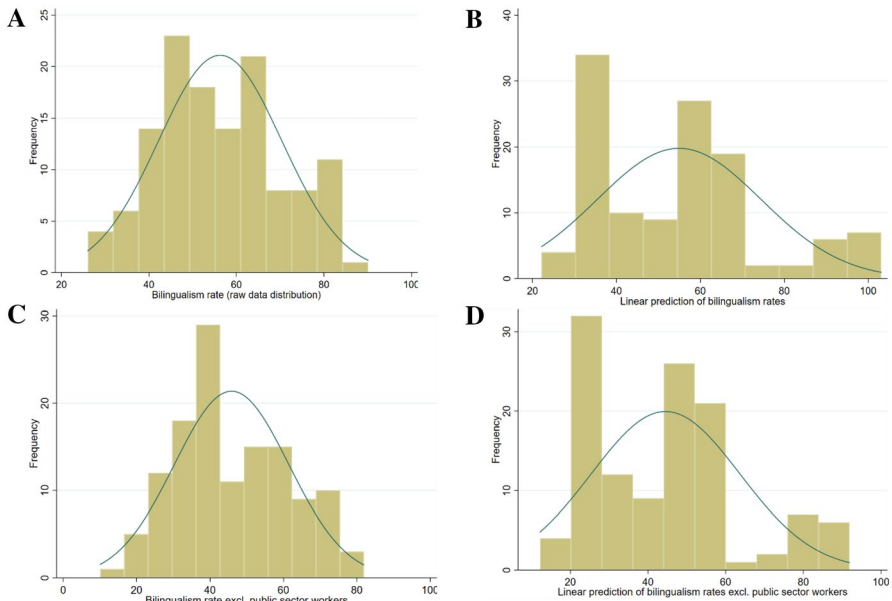
$$S_{it} = \beta_0 + \beta_1 B_{it-1}^* + \beta X_{it-1} + u_{it} \quad (4)$$

$$i = 1, \dots, 128; t = 1, \dots, 15;$$

where  $S_{ijt}$  represents entrepreneurial activity proxied by start-up rate and start-up density in eight districts of South Tyrol at time  $t$ . The terms  $B_{it-1}^*$  in Eq. (4) are the latent variable for the bilingualism intensity of district  $i$  at time  $t$   $u_{ijt}$ . The error term is assumed to be identically and independently distributed with mean zero and constant variance  $\sigma^2$ . Using the predicted values of bilingualism (Fig. 2b), as opposed to the actual values of bilingualism (Fig. 2a) as well as using the predicted values of bilingualism adjusted (Fig. 2d), as opposed to the actual values of bilingualism adjusted (Fig. 2c), the variables included in the first stage but excluded from the second stage to predict bilingualism operate as instruments in Eq. (4).

As controls, the first-stage model also includes human capital and employment measures of the district. The list of variables used as instruments in the first stage is reported in Table 1.

Our results reported in Table 4 are for both start-up rate and start-up density as dependent variables. The results again support our hypothesis that bilingualism increases entrepreneurship activity. In economic terms, this result can be reported as an increase by 1 percent of bilingualism rate results in 0.04 percent increase



**Fig. 2** Actual values of bilingualism rate (a) and predicted values of bilingualism rate (b); the actual bilingualism rate excluding public sector workers (c); predicted values of bilingualism rate excluding public sector workers (d). *Source:* Astat—South Tyrolean Office of Statistics: 2000–2015. Istat—Italian Office of National Statistics



**Table 4** Start-up rates and density fixed effects estimation with the predicted level of bilingualism. *Source:* Astat—South Tyrolean Office of Statistics: 2000–2015. Istat—Italian Office of National Statistics

Dependent variable Specification	Start-up rate (1)	Start-up rate (2)	Start-up density (3)	Start-up density (4)
Business density	108.01*** (31.50)	108.30*** (31.54)	139.31*** (35.00)	140.51*** (35.05)
Bilingualism	0.04* (0.01)		0.16* (0.02)	
Bilingualism corrected (excl. public sector workers)		0.04* (0.01)		0.17* (0.01)
Commuter-in	-0.02 (0.07)	-0.02 (0.07)	-0.04 (0.07)	-0.04 (0.07)
Human capital	-7.06* (4.06)	-7.01* (4.06)	-16.42*** (4.51)	-16.36*** (4.51)
Public	0.44 (0.58)	0.44 (0.58)	-0.28 (0.64)	-0.28 (0.64)
Energy	-17.69 (13.28)	-18.02 (13.12)	-4.18 (14.75)	-4.69 (14.57)
Employment	3.14* (1.85)	3.13* (1.86)	3.14 (2.05)	3.16 (2.07)
Constant	-28.74* (17.09)	-28.62* (17.16)	-23.65 (18.98)	-23.69 (19.06)
No obs.	128	128	128	128
$r^2$ within	.13	.13	.27	.28
$r^2$ overall	.58	.59	.64	.66
$r^2$ between	.68	.69	.87	.85
$F$ stat	3.24	3.45	5.74	5.79
$F$ test $u = 0$	15.97	16.17	4.59	4.65
Sigma $u$	6.82	6.88	8.86	8.96
Sigma $e$	.44	.44	.48	.49
Rho	.97	.97	.96	.96

Method of estimation: Fixed (FE) panel data estimation. \*= significant at 10% level, \*\*=significant at 5% level, \*\*\*significant at 1% level

in start-up rate (column 2, Table 4) and 0.17 percent increase in start-up density (column 4, Table 4).

## 6 Discussion and conclusion

Bilingualism in a multicultural region is the bread and butter of entrepreneurial activity and is likely to independently of other factors change regional entrepreneurship. This study extends what we know about the role of language, acculturation and maturity of people who practice different cultures and the likelihood of entrepreneurial activity in such regions (Andersson et al. 2017). We developed and tested

a model that confirmed positive and significant impact of bilingualism on entrepreneurial activity in eight South Tyrolian districts. We found that informal bilingualism rate (people who speak the language but do not hold a certificate) has a greater effect on start-up density than start-up rates. We consider this important and interesting finding as more populous areas facilitate face-to-face interactions, resulting in the higher level of language proficiency than in areas with lower density of start-ups and population.

Our study extends the CAT in entrepreneurship by demonstrating the role of language in a multicultural region. It also expands the regional studies literature on the advantages of learning other language for new idea generation and knowledge transfer.

This study is important for regional policy-makers to better understand and balance the inter-regional variability in language and culture as well as taking into consideration the effort to learn a language and not reported actual values of bilingual test results to predict entrepreneurial activity and can be used as regional policy benchmark for regions targeting entrepreneurship in Europe and in Italy. Charron et al. (2014, p. 70) note “the gap between Bolzano region, which ranks near the top of all EU regions, and Campania, which is among the lowest, is wider than the gap between the countries of Denmark and Hungary”.

This sub-national heterogeneity makes the subregional focus the most suitable to exploit variability in entrepreneurship rates (Tabellini 2010). Our findings yield additional insights on the incentives and opportunities supplied by making residents to improve their second language skills and to facilitate regional performances.

Since bilingualism was found to be a desirable resource for entrepreneurial activity, policy-makers in other regions may follow the South Tyrolean example of bilingual tests and other policy measures facilitating bilingualism.

Our study has several limitations. First is the measurement of bilingualism in a region. Taking a language test reflects a selection, for example, to increase own economic success or government subsidy or employment situation. It is neither a culturally nor an institutional emerging process. A question arising from the problem framing why not everybody speaks both languages if it is as beneficial for entrepreneurship, the answer is not straightforward. We argue that there is a latent bilingualism who are not included in the passing test statistics but may still illustrate an effort to learn or speak the language. While we partly control aggregated individual “ability” of learning the language using human capital measures at district level, most important remain factors which affect individual decision-making on whether to learn the language or not. Future studies will use a variety of bilingualism measures, including collecting primary data across representative samples of people who speak language and do (not) hold a certificate.

Secondly, while we estimate the effect of bilingualism within each district of South Tyrol, we were not able to consider districts from other Italian regions (e.g., Val D’Aosta, Trentino, Veneto, etc.) to detect whether bilingualism makes a difference compared to regions where bilingualism is not prevalent and wide spread. We found that the measure of bilingualism is region-specific as other Italian and Austrian regions do not apply such test, because the official statistics does not report data on regions with few or no bilingualism. Future research will aim to perform a

full-fledged analysis for districts of other regions of Italy and other countries with different levels of bilingualism.

Finally, residents may select into language programs because they want to start ventures and expect some benefits from the language. It can be the case that the business idea could have originated before people with entrepreneurial intentions took the course. This raises an endogeneity problem, which we cannot address in this study. Future research will aim to find the valid instruments, expand longitudinal data with detailed case studies and quantitative surveys. It would be interesting to apply CAT to explain early entrepreneurial activity (nascent entrepreneurship) and latent entrepreneurship (Caiazza et al. 2019).

Policy-makers may use our findings in their strategic choices of language policy and the channels to support it in a multicultural region as well as entrepreneurs who may be interested to enter foreign markets or liaise with suppliers abroad looking for a right channel in doing so—learning of language may be the one. Given that rich variations in language and population in the South Tyrol, further analysis may include study of local languages and dialects and further cross-country comparisons (Lucas and Boudreaux 2019). The results could be interesting for policy-makers in other, historically grown, bilingual regions such as Catalonia and the Basque Country in Spain, Valle d’Aosta in Italy, Quebec in Canada, Flanders in Belgium, Moravia in Czech Republic and French Basque Country in France.

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