The effect of cultural origin on COVID-19 infection rates

# The Effect of Cultural Origin on COVID-19 Infection Rates

Mascia Bedendo[a*] Valentina Febo[a] Linus Siming[b]

Abstract: We examine whether a community's cultural origin affects COVID-19 infection rates by exploiting cultural differences in the bilingual province of South Tyrol in Northern Italy. We find lower infection rates in municipalities with a relatively higher proportion of German speakers, even after controlling for widely used measures of social and civic capital. Our findings can be explained by a more future-oriented behavior of German speakers in comparison with Italian speakers.

Keywords: COVID-19; cultural origin; language; civic capital

JEL: Z1; D91

[a]University of Bologna. Address: Via Capo di Lucca, 34 – 40126, Bologna (Italy).

[b]Free University of Bozen-Bolzano. Address: Piazza Universita', 1 – 39100 Bolzano (Italy).

*Corresponding author.

E-mail addresses: mascia.bedendo@unibo.it (M. Bedendo), valentina.febo3@unibo.it (V. Febo), perlinus.siming@unibz.it (L. Siming).

## 1. Introduction

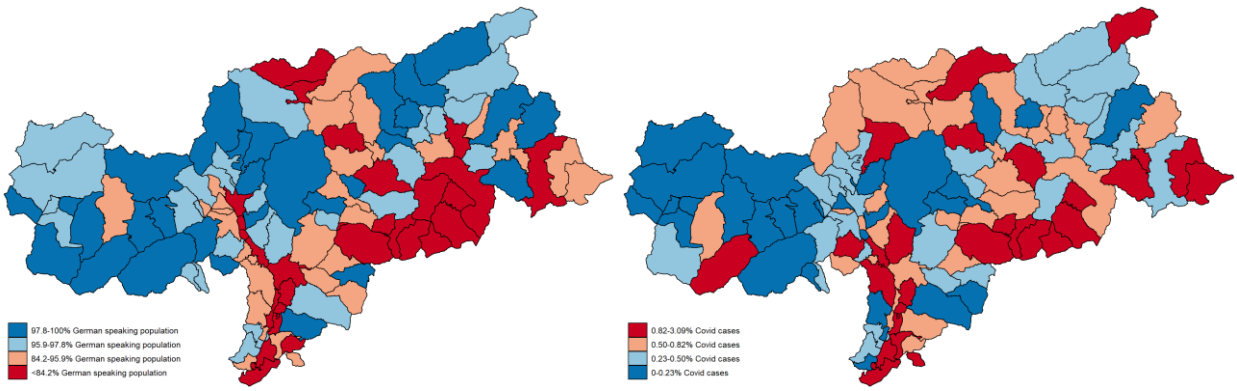
We examine whether a community's cultural origin affects COVID-19 infection rates. Cultural origin is closely associated with a set of traits and values that guide individual and collective behavior. Given the central role played by these two dimensions in containing the spread of COVID-19, we expect cultural origin to contribute to explain infection rates.[1] A growing body of literature has linked cultural traits such as civic capital, social capital, and trust attitudes to compliance with social distancing recommendations (e.g. Barrios et al., 2021; Durante et al., 2021). In this paper we focus on linguistic differences across cultural groups. Chen (2013) documents that individuals who speak a language in which future actions are typically expressed in the present tense (i.e., "weak future-time reference languages", such as German) display stronger future-oriented health behavior (e.g., in terms of exercising more or not smoking) than individuals who speak a language with a strong future-time reference (such as Italian).[2] Within the setting of the COVID-19 pandemic, speaking a weak future-time reference language should translate into better observance of rules and guidelines aimed at preventing infections, if COVID-19 is perceived to be a health threat. Accordingly, we test whether speaking such a language is associated with lower infection rates during the pandemic.

The empirical identification of the effect of cultural origin on the spread of COVID-19 is challenging, because individuals who belong to different cultural groups usually live in different areas that may vary in terms of healthcare policies or regulatory measures adopted to face the pandemic. We address this empirical challenge by exploiting linguistic differences in a sample of

[1] See Lee et al. (2020) for an overview of how the pandemic has spread.
[2] With reference to the example in Chen (2013), the sentence "It will rain tomorrow" can be naturally translated in German using the present tense as "Morgen regnet es", i.e. "It rains tomorrow". By contrast, in Italian, like in English, the sentence requires the use of the future tense, i.e. "Domani pioverà".

municipalities that share a common institutional setting within the autonomous province of South Tyrol in Northern Italy. Following the annexation to Italy in 1919, the former Austro-Hungarian area of South Tyrol is home to individuals who belong to two main cultural groups: Italian and Germanic[3]. The two groups live next to each other but remain self-segregated in terms of schooling and social interactions. Several papers have exploited this setting to analyze culturally driven behaviors of individuals and companies (e.g. Sutter et al., 2018; Bedendo et al., 2020). Both Italian and German are official languages in South Tyrol. The map to the left in Figure 1 illustrates the linguistic composition of South Tyrol by municipality, measured by the distribution (quartiles) of German-speaking residents. Data are collected from the website of the institute of statistics of South Tyrol (ASTAT) and are based on the 2011 Census, where individuals were asked to self-report their linguistic group.[4] Dark red (blue) areas indicate the lowest (highest) percentages of German speakers. Most municipalities are predominantly German-speaking, although there is a substantial variation in the percentage of Italian-speaking residents.

**Figure 1.** Quartile distributions of municipalities based on language mix (left) and percentage of COVID-19 infected residents (right)




[3] With "Germanic culture" ("Italian culture") we refer to people who speak German (Italian) as mother tongue.
[4] https://astat.provincia.bz.it/it/default.asp

Throughout our analysis, we proxy the cultural mix of a municipality with its proportion of German speakers. Following Chen (2013), we expect municipalities with a higher proportion of German speakers to be associated with lower infection rates. Our results confirm this prediction.

## 2. Empirical approach and results

We gather weekly data on the number of residents with COVID-19 infection (cumulative from the start of the pandemic) for each of the 116 municipalities in South Tyrol from the webpage of the provincial health authority.[5] We collect Friday's figures over 11 weeks, from the first available date, 21 August, to 30 October 2020. Municipal infection rates are computed by dividing the number of residents with COVID-19 by the overall number of residents in the municipality, taken from the 2019 Registry of Residents. The map to the right in Figure 1 illustrates the distribution (quartiles) of the municipal infection rate on 30 October across the province, with dark red indicating the highest infection rates and dark blue the lowest infection rates. A visual comparison with the map of the municipal distribution of German-speaking residents suggests an overlap between cultural origin and infection rates, as lower (higher) infection rates seem to be associated with a higher (lower) proportion of German speakers.

To formally test this observation, we regress the panel of municipal infection rates in week $t$, $y_{i,t}$, on the proportion of German-speaking residents ($GermanSpeaking_i$) in municipality $i$:

$$y_{i,t} = \alpha + \beta\, GermanSpeaking_i + \gamma\, WeekFE_t + \delta\, Controls_i + \theta\, InteractionEffects_{i,t} + \varepsilon_{i,t}$$

[5] https://www.asdaa.it/it/covid-19.asp

**Table 1.** Effect of cultural origin on COVID-19 infection rates by municipality

| | Municipal infection rate | | | |
|---|---|---|---|---|
| | I | II | III | IV |
| GermanSpeaking | -0.008*** | -0.007*** | -0.007*** | -0.006*** |
| | (0.002) | (0.002) | (0.002) | (0.002) |
| Week 2 # GermanSpeaking | -0.000 | -0.000 | -0.000 | -0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Week 3 # GermanSpeaking | -0.000 | 0.000 | -0.000 | -0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Week 4 # GermanSpeaking | -0.000 | -0.000 | -0.000* | -0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Week 5 # GermanSpeaking | -0.000 | -0.000 | 0.000 | 0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Week 6 # GermanSpeaking | -0.000 | -0.000 | -0.000 | -0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Week 7 # GermanSpeaking | 0.000 | -0.000 | 0.000 | -0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Week 8 # GermanSpeaking | 0.000 | 0.000 | 0.000 | -0.000 |
| | (0.001) | (0.001) | (0.000) | (0.001) |
| Week 9 # GermanSpeaking | 0.001 | 0.001 | 0.000 | 0.000 |
| | (0.001) | (0.001) | (0.001) | (0.001) |
| Week 10 # GermanSpeaking | 0.001 | 0.001 | 0.000 | 0.001 |
| | (0.001) | (0.002) | (0.001) | (0.002) |
| Week 11 # GermanSpeaking | 0.001 | 0.001 | -0.000 | -0.000 |
| | (0.002) | (0.002) | (0.002) | (0.002) |
| Ln(Density) | | -0.053 | | -0.054 |
| | | (0.063) | | (0.061) |
| Ln(Altitude) | | -0.009 | | 0.089 |
| | | (0.120) | | (0.104) |
| Elderly | | 0.006 | | -0.000 |
| | | (0.019) | | (0.020) |
| Family Size | | 0.021 | | -0.377 |
| | | (0.305) | | (0.342) |
| General Practitioners | | -0.267 | | -1.412** |
| | | (0.510) | | (0.646) |
| Income | | 0.044** | | 0.039** |
| | | (0.020) | | (0.019) |
| Volunteers | | | 0.002 | 0.006 |
| | | | (0.003) | (0.004) |
| Electoral Turnout | | | 0.024*** | 0.033*** |
| | | | (0.008) | (0.009) |
| Week FE | Yes | Yes | Yes | Yes |
| Week # Controls | No | Yes | No | Yes |
| Week # Social/Civic Capital | No | No | Yes | Yes |
| Constant | 1.147*** | 0.435 | -0.653 | -1.460 |
| | (0.136) | (1.092) | (0.659) | (1.125) |
| Observations | 1,276 | 1,276 | 1,276 | 1,276 |
| $R^2$ | 0.258 | 0.286 | 0.282 | 0.299 |
| Municipalities | 116 | 116 | 116 | 116 |

Robust standard errors in parentheses. *Significant at 10%. **Significant at 5%. ***Significant at 1%.

In a first specification, we only include weekly fixed effects to capture the general evolution of the pandemic, and interactions between weekly fixed effects and the proportion of German speakers, to assess whether the language effect varies across the sample period. The estimation output is shown in Table 1, Column I, and confirms that municipalities with a relatively higher proportion of German speakers have significantly lower infection rates.

The lack of significance of the interaction terms indicates that the effect persists over the sample period and is mostly driven by the initial infection rates that stem from the first wave of the pandemic. In a second specification, we add a series of municipal control variables ($Controls_i$) that could be correlated with both infection rates and the geographical distribution of German speakers in South Tyrol, namely: (a) the natural logarithm of population density, measured as total residents in the municipality over the surface in square kilometers, to account for the possibility that COVID-19 spreads faster in more densely populated areas that may have a lower proportion of German speakers; (b) the natural logarithm of altitude in meters, to control for both the possibility of a slower spread of COVID-19 and the less immediate access to testing facilities in mountainous areas that may be relatively more populated by German speakers; (c) the proportion of residents aged 65 or above, which is a generally-accepted risk category for COVID-19; (d) the average family size in the municipality, to control for the possibility that infection rates are higher in large families and that family size may be related to the cultural group; (e) the number of general practitioners over total residents in the municipality, to measure proximity to medical aid; (f) the income per capita, to control for economic factors. Data are obtained from ASTAT and the Ministry of Economics and Finance.[6] We also add interaction terms of all these control variables

[6] https://www.finanze.gov.it

with weekly fixed effects ($InteractionEffects_{i,t}$). The estimation results in Column II indicate that these additional municipal characteristics do not explain away the cultural effect.

Next, we explore to what extent our findings on the link between cultural origins in South Tyrol and COVID-19 infection rates can be explained by proxies of social and civic capital. Several recent contributions document that high levels of social and civic capital are associated with higher compliance with social distancing recommendations (e.g. Barrios et al., 2021; Durante et al., 2021). Given that social distancing helps contain the infection and that social and civic capital are important distinctive traits of culture, our findings may be reflecting this association if German speakers display higher social and civic capital than Italian speakers. To assess this channel, we use two widely used proxies of social and civic capital that are available at the municipality level. The first is the average electoral turnout computed across all national elections and referenda that took place between 2018 and 2020, obtained from the Ministry of Internal Affairs.[7] The second is the number of volunteers of non-profit organizations in the municipality over total residents, as reported in the 2011 Census.[8] In Column III we augment our baseline specification with these two variables as well as their interactions with weekly fixed effects. In Column IV we additionally control for municipality-specific characteristics and their interaction terms. We observe that the inclusion of social and civic capital variables does not affect the magnitude and statistical significance of our main variable, suggesting that cultural origin, as measured by one's mother tongue, has an impact on COVID-19 infection rates over and above the effect of the level of social and civic capital associated with a given cultural group. The positive and significant coefficient of electoral turnout may seem counterintuitive, as it suggests that municipalities with higher turnout

[7] https://dait.interno.gov.it/elezioni/open-data

[8] Similar results (available upon request) are found when using the number of non-profit organizations over total residents in place of the proportion of volunteers.

(and hence, higher civic capital) experience higher infection rates. However, we recommend caution when implementing and interpreting social and civic capital indicators at the municipality level, since the existing literature has generally validated their use at coarser geographical levels (such as countries, regions/states, or provinces). Additionally, South Tyrol overall scores very highly in terms of social and civic capital compared to the rest of Italy, with an average electoral turnout across municipalities of 69% (standard deviation, s.d., of 4%) against 65% (s.d. of 8%), and an average volunteer proportion of 32% (s.d. of 14%) against 9% (s.d. of 8%).

**Table 2.** Effect of cultural origin on infection rates conditional on reaching 10 cases

| | Municipal infection rate | | | |
|---|---|---|---|---|
| | I | II | III | IV |
| GermanSpeaking | -0.008*** | -0.007*** | -0.006*** | -0.005*** |
| | (0.002) | (0.002) | (0.002) | (0.002) |
| Ln(Density) | | -0.051 | | -0.079 |
| | | (0.092) | | (0.085) |
| Ln(Altitude) | | -0.026 | | 0.087 |
| | | (0.178) | | (0.133) |
| Elderly | | -0.013 | | -0.019 |
| | | (0.035) | | (0.036) |
| Family Size | | 0.181 | | -0.502 |
| | | (0.496) | | (0.517) |
| General Practitioners | | 0.687 | | -1.189 |
| | | (2.566) | | (2.127) |
| Income | | 0.038 | | 0.051* |
| | | (0.035) | | (0.031) |
| Volunteers | | | 0.010 | 0.011 |
| | | | (0.007) | (0.007) |
| Electoral Turnout | | | 0.046*** | 0.056*** |
| | | | (0.017) | (0.018) |
| Week FE | Yes | Yes | Yes | Yes |
| Week # GermanSpeaking | Yes | Yes | Yes | Yes |
| Week # Controls | No | Yes | No | Yes |
| Week # Social/Civic Capital | No | No | Yes | Yes |
| Constant | 1.161*** | 0.569 | -2.471** | -2.758 |
| | (0.142) | (1.690) | (1.211) | (1.922) |
| Observations | 738 | 738 | 738 | 738 |
| $R^2$ | 0.283 | 0.323 | 0.315 | 0.339 |
| Municipalities | 87 | 87 | 87 | 87 |

Robust standard errors in parentheses. *Significant at 10%. **Significant at 5%. ***Significant at 1%.

The fact that the pandemic did not impact all municipalities at the same time enables us to also control for its staggered spread. In Table 2 we re-estimate our panel analysis by including a municipality into the sample only when at least 10 COVID-19 cases have been confirmed, as in Ferraresi et al. (2020). We again note that municipalities with a relatively higher proportion of German speakers have significantly lower infection rates across our four different specifications. Results are unchanged (and available upon request) if we lower the threshold down to one COVID-19 case for a municipality to be included in the panel. We conclude that the results from Table 1 cannot be explained away by the staggered spread of the pandemic in South Tyrol.

Our evidence on the relation between language groups and infection rates is broadly consistent with the argument of Chen (2013), in the sense that the lower infection rates observed in municipalities with a relatively higher proportion of German-speaking residents can be interpreted as a manifestation of their future-oriented behavior. Importantly, this effect is not explained away by differences in widely used measures of social and civic capital.

## 3. Conclusions

We document significant differences in COVID-19 infection rates across municipalities characterized by different linguistic groups. To isolate the effect of language, we exploit cultural heterogeneity within a single Italian province that shares a common institutional setting. Additionally, we control for differences in standard measures of social and civic capital across linguistic groups in the province. We explain the lower infection rates in municipalities with a relatively higher proportion of German-speaking residents with a more future-oriented behavior in comparison with Italian speakers. Given the difficulty of measuring cultural variables at the

municipal level, we acknowledge that our results can be partly explained by cultural traits other than pure linguistic differences, such as trust or risk aversion. We hope to be able to disentangle the effects of the different cultural traits in future research, should these data become available.

**References**


Barrios, J.M., E. Benmelech, Y.V. Hochberg, P. Sapienza, L. Zingales (2021) "Civic capital and social distancing during the COVID-19 pandemic." *Journal of Public Economics*, 193.

Bedendo, M., E. Garcia-Appendini, L. Siming (2020) "Cultural preferences and firm financing choices." *Journal of Financial and Quantitative Analysis*, 5, 897-930.

Chen, K. (2013) "The effect of language on economic behavior: Evidence from savings rates, health behaviors, and retirement assets." *American Economic Review*, 103, 690-731.

Durante, R., L. Guiso, G. Gulino (2021) "Asocial capital: Civic culture and social distancing during COVID-19." *Journal of Public Economics*, 194.

Ferraresi, M., C. Kotsogiannis, L. Rizzo, R. Secomandi (2020) "The 'Great Lockdown' and its determinants." *Economics Letters*, 197.

Lee, E.C., N.I. Wada, M.K. Grabowski, E.S. Gurley, J. Lessler (2020) "The engines of SARS-CoV-2 spread." *Science*, 370, 406-407.

Sutter, M., S. Angerer, D. Glätzle-Rützler, P. Lergetporer (2018) "Language group differences in time preferences: Evidence from primary school children in a bilingual city." *European Economic Review*, 106, 21–34.