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WORKING PAPER NO. 752

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June 2025

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ISSN: 2240-9696

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Demographic Change and Entrepreneurship Across Regions: Long-Run Evidence from Italy

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Abstract
This paper studies the relationship between demographic change and entrepreneurship and highlights its spatial dimension. We digitize historical censuses to reconstruct entrepreneurship rates and the age structure of Italian provinces since 1960. We develop an estimation framework that relates entrepreneurship to granular age cohorts of the local population, leveraging instrumental variables to address endogeneity issues. Our results uncover stark regional heterogeneity. In Northern Italy, we find a hump-shaped age-entrepreneurship profile peaking at cohorts aged 30-40. In the South, entrepreneurship increases with age. Regional differences in the local business environment partly account for the different estimated profiles.

JEL Classification: J11, L26, R11.

Keywords: entrepreneurship, demographic change, regional differences, long run.

Acknowledgments: We thank Antonio Accetturo, Maria Stella Chiaruttini, Marcello Pagnini, Filippo Scoccianti, Luca Sessa, Paolo Sestito, Roberto Torrini and seminar participants at the Bank of Italy and the XIX World Economic History Congress for comments and suggestions. We also thank Elena Genito for excellent research assistance. The views expressed are those of the authors and do not necessarily reflect the views of the Bank of Italy. The authors report there are no competing interests to declare.

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1. Introduction

Demographic change is viewed as one of the key factors affecting economic growth globally in the next decades. Researchers have explored several channels through which demographic forces shape economic development, such as labor productivity and innovation (Acemoglu and Restrepo 2017, 2022; Bloom et al. 2001, Jones 2010; Lee 2003; Prskawetz 2005). One such channel is entrepreneurship. As the recent drop in business dynamism came together with workforce ageing, economists have increasingly focused on the demographic determinants of entrepreneurship and startup rates (Liang et al. 2018).

Both demographics and entrepreneurship are heavily shaped by place-specific factors (Audretsch and Fritsch 1994; Böhm et al. 2021; Gregory and Patuelli 2015; Hall and Sobel 2008; Lee et al. 2004). In turn, the local economy may also mediate the relationship between the two, resulting in age-entrepreneurship profiles that change across space. To investigate this, we examine the case of Italy in the second half of the 20th century—a time when the country was experiencing huge demographic shifts and rapid industrialization, both varying dramatically across macro-areas.

Historical, spatially disaggregated data on entrepreneurship is rare. Our study leverages province-level population censuses for Italy reporting information on specific occupations, including entrepreneurs, which we digitize. A key advantage of the data relative to comparable sources—besides its granularity and historical depth—is that it allows separating entrepreneurs (our focus) from similar categories such as the self-employed. This allows us to build a novel dataset that reconstructs entrepreneurship rates in Italian provinces since the 1960s.

We compute our measure of entrepreneurship rate as the total number of entrepreneurs in a province as a share of the local labor force. We begin by studying the evolution of entrepreneurship in Italy in the recent decades, along with breakdowns by macro-areas, gender and education groups. We document the increasing educational attainment of Italian entrepreneurs, the rising share of women and the widening of the North-South entrepreneurship gap.

We then move to the empirical analysis, investigating how entrepreneurship has been affected by demographic change. The main specification is a province-level panel regression that relates the local entrepreneurship rate to age shares of the working-age population between 1961 and 2011. We aim to trace granular age-entrepreneurship profiles that are robust to multicollinearity issues, potential confounders and simultaneity. We thus adopt the estimation framework proposed in Fair and Dominguez (1991), which imposes functional restrictions on the age profile that largely reduce the number of parameters to be estimated, while resorting to an instrumental variable (IV) strategy that instruments each age cohort with the ten-years younger cohort observed ten years earlier in each province (Bönte et al. 2009; Skans, 2008)—

see Barbiellini Amidei et al. (2024) for a similar approach. Additionally, our regressions include location and census-year fixed effects, as well as time-varying controls for local labor market and demographic characteristics. We also ensure that accounting for possible confounders such as historical migration rates does not affect the results.

National-level estimates suggest a hump-shaped age-entrepreneurship profile—largely in line with the empirical evidence in the literature (reviewed below). However, the estimated profile is asymmetric, peaking for age cohorts between 40 and 45 years, and has wide confidence intervals. Indeed, these estimates mask stark heterogeneity across macro-areas of Italy. In Northern regions, a hump-shaped pattern neatly emerges, with higher and statistically significant contributions to entrepreneurship coming from age groups 25 to 40. In Southern Italy, we find that entrepreneurship rates increase with age, with positive and significant coefficients associated to cohorts aged 50 to 60.

We address possible explanations for the increasing age-entrepreneurship profile in Southern Italy, such as technological intensity of local productions, or the local business environment, including availability of credit and the role of informal networks. We find that controlling for proxies of the local business environment accounts, at least in part, for the positive contribution of old age cohorts to entrepreneurship in Southern Italy. Still, our analysis does not rule out additional, hard-to-capture explanations for these regional differences, such as a less business-oriented culture in the South.

This paper speaks to the broad literature on entrepreneurship and its relationship with demographic change. The key role of entrepreneurs in modern societies has long been studied by economists (Marshall 1890; Schumpeter 1911). This has sparked a rich literature on the drivers of entrepreneurship (Blanchflower and Oswald 1998; Evans and Jovanovic 1989; Levine and Rubinstein 2017). Research has identified age as a key factor, as individual preferences and abilities correlated with entrepreneurship change during the life cycle (Lazear 2004). Most evidence suggests a hump-shaped relationship, with entrepreneurship peaking in the late thirties—when the creativity of the youth combines with the experience and networks acquired with aging (Azoulay et al. 2020; Evans and Leighton, 2009; Lévesque and Minniti 2006; Kopecky 2019).[1] Entrepreneurship has also become a relevant research subject in regional economics, with a growing body of work documenting how place-specific characteristics shape local entrepreneurship (Ács et al. 2015). In turn, local factors may mediate how entrepreneurship is affected by demographic shifts, so that age-entrepreneurship profiles

[1] Parker (2009), Zhao et al. (2021) and Syed et al. (2024) provide reviews of the literature. At more aggregate levels, research also points to population ageing slowing startup rates by reducing the labor force and the pool of potential entrepreneurs, or preventing young workers from acquiring experience in the labor market (Anelli et al., 2023; Bönte et al. 2009; Engbom 2018; Hopenhayn et al. 2022; Karahan et al. 2024; Liang et al. 2018).

estimated at the national level may hide relevant heterogeneity. This paper uncovers precisely that heterogeneity. While we confirm the established hump-shaped link between age and entrepreneurship, we also suggest that such relationship masks differences between local labor markets, as entrepreneurship seems to increase with age in areas where the business ecosystem is less favorable to young entrepreneurs. Our results confirm that accounting for spatial disparities is crucial for both entrepreneurship research and policy (Ortega-Argilés 2022).

This paper also brings in a novel, long-run perspective to the age-entrepreneurship link. There is indeed little knowledge on how demographic shifts—a secular phenomenon—impact entrepreneurship in the long run, due to the lack of sources of historical entrepreneurship data. By digitizing historical census tables, this paper fills this gap and reconstructs entrepreneurship rates up to several decades in the past. Our measure of entrepreneurship rates comes directly from information on individual occupations, rather than being inferred from indirect measures such as self-employment or firm dynamics—a common data limitation (OECD 2017).

Last, this paper contributes to the economic history literature studying the development of Italy in the post-World War II decades, with reference to the North-South gap (Federico et al. 2019; Felice 2019) and to entrepreneurial dynamics (Nuvolari et al. 2018; Rinaldi and Tagliazucchi 2019). We construct a novel measure of entrepreneurship rate from historical tables, disaggregated at the local level and including information such as gender and education, which we use to provide an historical account of entrepreneurship in Italy and to offer insights into North-South gaps in economic development.

The paper is structured as follows: Section 2 describes our data and definition of entrepreneurs, in relation with other definitions used in the literature; Section 3 reports descriptive trends in entrepreneurship rates in Italy over the last decades, highlighting regional patterns; Section 4 presents the econometric analysis and results; Section 5 investigates regional differences in the age-entrepreneurship relationship. The last Section concludes.

2. Definitions and Data

Defining entrepreneurs. Entrepreneurship data is typically sourced from business demography databases or from population censuses (CES 2018). In this paper, we use population census data for Italy, available at the province (NUTS-3) level and obtained from the Italian National Institute of Statistics (Istat). Population censuses provide the most complete and time-homogeneous set of official statistics for the active population. We collect and digitize historical tables on the professional status of the active population across all Italian provinces between 1961 and 2011. From these, we compute the key outcome variable of the paper—the entrepreneurship rate, computed as the share of individuals classified as

"entrepreneurs" over total active population (the labor force).[2] The tables further include information on gender, sector, and education, which we also digitize.

The professional status categorization in our data defines "entrepreneurs" as "*those who manage their own business, have at least one employee and whose job mainly consists of organising and managing the firm's activity*" (Istat 2013). A key advantage of the data relative to comparable sources is that we can distinguish "entrepreneurs" from the "self-employed".[3] Self-employment has become a popular measure of entrepreneurship in the absence of a clear indication of entrepreneurial status in many data sources (Garrett and Wall 2006). This has several limitations (Sauer and Wilson 2016). Self-employment does not distinguish between entrepreneurs and individuals who do not employ other people and run low-risk, low-productivity businesses (Levine and Rubinstein 2020). Also, the self-employed are directly involved in the production process, whereas our focus are the managerial and creative skills of entrepreneurs. We thus exclude self-employed workers from our definition of entrepreneurs.

A limitation of this data source is that the historical provincial data we use in the econometric analysis pool together in only one status "entrepreneurs" and "professionals", where the latter are defined as those "*who practise on their own a profession or a liberal art"* (e.g., lawyers, dentists). To deal with such measurement error in the number of entrepreneurs, the main analysis will focus on the industrial sector only (manufacturing and construction), where professionals have a minor role. We confirm this by inspecting the Labor Force Survey, which reports that, on average between 2008 and 2019, the share of professionals was 5.7% in the whole economy and only 0.8% in the industrial sector. We will, however, also show robustness tests focusing on the total economy, especially zooming in on periods (2001 and 2011) where we can distinguish entrepreneurs from professionals in province-level data.

Demography. Our second main data source are demographic tables reporting the share of residents in 5-year age cohorts (0-4, 5-9, and so on) in each province between 1951 and 2011. We obtain these tables in the historical archives of Istat population censuses, and digitize them.

[2] Our measure of entrepreneurship rate mirrors that used in the Italian Labor Force Survey (Istat 2006). We use the definition of "active population" from the 1951-1991 censuses, that is, the total number of people aged 14 and above that were employed at the time of the census or, if unemployed, were looking for a new job. In the 2001 and 2011 censuses, the definition excludes people looking for first employment, who were considered part of the non-active population (Istat 2013). We harmonize the 2001 and 2011 active population data by also including people looking for first employment, thus obtaining a stable definition of entrepreneurship rate over time.

[3] "Self-employed" individuals are defined as those "*who manage an agricultural farm, a small industrial or commercial firm or a hand-crafting workshop, a shop and participate with their own labor. The self-employed can either have or not have employees. They are different from an entrepreneur as they are directly involved in the production process and this aspect prevails over management*" (Istat 2013).

Other data sources. The paper leverages additional data sources. We obtain data on the local employment rate, the industry share of employment and the share of residents with a high-school or university degree (the three main controls in our regressions) from Istat population censuses. We also reconstruct migration rates between Italian provinces exploiting historical migration tables (Bonifazi and Heins 2000). We use industrial censuses (also sourced from Istat) to compute average firm size, the share of employment in the construction sector as well as the local employment breakdown between high-, medium- and low-technology industries.[4] We also obtain information on the number of bank branches for each province, sourced from Bank of Italy's "Supervisory Registers and Lists". Data on electoral turnout are sourced from the Historical Archive of Italian Ministry of Interior. Last, we complement our province-level dataset with historical regional data on trust and crime, which we source from Nuzzo (2006) and update until 2011 using data from statistical yearbooks (Istat 2013).[5]

3. Entrepreneurship in Italy: Historical Trends

In this Section, we exploit our historical reconstructions to show stylized facts on the evolution of entrepreneurship in Italy in the post-World War II decades. We focus first on entrepreneurs in the total economy, where we leverage data available at the regional (not provincial) level on the number of entrepreneurs excluding professionals. [6] Figure 1 Part A plots the entrepreneurship rate computed as described in Section 2 over time (at census years) in the main Italian geographical areas. Figure 1 Part B zooms into regional detail by plotting the entrepreneurship rate for each region in 1961 (horizontal axis) and 2011 (vertical axis).

Italy witnessed a significant rise in the entrepreneurship rate between 1961 and 1991. The 1960s—the most buoyant phase of Italy's post-war development (Bordo 1993; Crafts and Magnani 2013)—saw a significant and widespread increase in entrepreneurship, with light convergence among regions. During the 1950s, the Italian economy featured a high share of gross domestic savings, which kept growing throughout the 1960s and became available for direct investment in productive activities (Ando et al. 1994). The high returns from industrial activity stimulated the passage to business of members of the middle class (Sylos Labini 1972). The industrial base expanded radically, spreading from the North-West throughout the country.

[4] We use Eurostat's technology intensity classification, which is based on the NACE REV2 classification of economic activities.

[5] Trust is proxied by the number of judicial litigations (total proceedings at the Judiciary), combined with the local crime rate. The crime rate is measured as the number of violent crimes. Both variables are scaled by the local population. See Nuzzo (2006) for details.

[6] In the empirical analysis, run at the provincial level, entrepreneurs and professionals are pooled together and thus we focus on the industrial sector only, where the share of professionals is negligible (see Section 2).

In the late 1960s and early 1970s, the rise in production costs following the oil shocks and the changing industrial relations induced firms to reorganize production processes (Barca and Magnani 1989; Rossi and Toniolo 1996). Over the 1970s and 1980s, the decentralization of production favored the development of small manufacturing companies and chains of specialized suppliers, mostly in industrial districts (Antonelli and Barbiellini Amidei 2011). Entrepreneurship rose in North-Eastern and Central regions, while stagnating in the South.[7]

The entrepreneurship rate stabilized after 1991 throughout the country, at a time when the Italian economy was experiencing a significant slowdown. The industrial system, characterized by the predominance of small and medium firms, suffered competition from developing economies, especially in traditional manufacturing sectors (Amatori et al. 2013). Still, in the regions with a significant presence of industrial districts—especially in the North-East—entrepreneurship rates progressed (Colli 2002). We also notice a slight recovery of Southern entrepreneurship in the early 2000s, perhaps due to stimulus measures launched by the Italian government (e.g., entrepreneurship subsidies introduced in Law Decree n. 185/2000).

Figure 1.B summarizes these patterns. Between 1961 and 2011, the entrepreneurship rate grew more slowly in Southern regions, the North-West area lost a significant part of its lead, and regions of the North-East (and, in part, Central Italy) turned out to be the most dynamic.

Our data sources also allow us to explore additional characteristics of the Italian entrepreneurs over time. We show some descriptive results in Figure 2. Figure 2 Part A breaks down entrepreneurs by education level in 1961, 1991 and 2011.[8] We notice an increasing education level over time, as the share of entrepreneurs with a high-school or university degree rises at the expenses of the share of entrepreneurs with primary school degree or no title at all. Figure 2 Part B focuses on the female share of entrepreneurs. Women represented a small share of entrepreneurs (below 5 percent) in the 1960s. Over time, this share rose threefold reaching above 15 percent in 1990. Afterwards, the rise in the female share of entrepreneurs stalled, similarly as to what observed for the entrepreneurship rate.[9]

The evolution in the entrepreneurship rate described above was paralleled by major demographic shifts. Between 1950 and 1990, Italy completed its demographic transition with death rates bottoming immediately after the war and birth rates continuing to fall until the late 1980s. These dynamics translated into a reduction of the working-age population that is still

[7] Guiso and Schivardi (2011) find higher entrepreneurial activity in Italian clusters featuring stronger learning spillovers and greater variety of intermediate inputs.

[8] Education is a key factor affecting entrepreneurial opportunities (Oosterbeek et al. 2010).

[9] Figure 2 refers to the industrial sector only. This is because we do not have information on entrepreneurs separately from professionals in the data broken down by education and gender, and we want to minimize measurement errors linked to the inclusion of professionals in the outcome (Section 2).

ongoing. These shifts have been particularly marked in Southern regions, which experienced faster population ageing—see Barbiellini Amidei et al. (2024) for details.

4. Estimating the Age-Entrepreneurship Profile

Our decennial census data span five decades (1961-2011) and report the composition of the workforce by occupation, at the province level. We match this dataset with information about the population age structure of Italian provinces as well as with province-level economic characteristics (see Section 2). As highlighted above, we focus on the industrial sector to minimize distortions arising from the presence of professionals, coupled with entrepreneurs, in the historical data. Manufacturing has indeed been the leading sector of the Italian economy for most of the period under analysis, and still drives the country's exports and innovation. While the focus on the industrial sector allows us to identify key features of the Italian economy, we will test the robustness of our results when considering total economy rather than the industrial sector in isolation—with the caveat of measurement errors in the entrepreneurship rate.

In our first specification, we relate the entrepreneurship rate to the age structure of the working-age population, expressed as five 10-year age cohorts (15-24 to 55-64) as commonly done in the literature. To avoid perfect collinearity between shares that sum to one, we omit the oldest share (55-64), so that the coefficient associated with any of the four included cohorts is interpreted as the effect on entrepreneurship of a population inflow into that cohort from the group of those aged 55 to 64. In formulae:

$$y_{pt} = \gamma_r + \theta_t + \sum_{j=1}^{4} \delta_j \cdot sh_{pt}^{j} + X'_{pt} \cdot \beta + \varepsilon_{pt} \qquad (1)$$

where y_{pt} is the entrepreneurship rate in province p and census year t, sh_{pt}^{j} are the working-age population shares of age cohort j, γ_r and θ_t are region and year fixed effects and X_{pt} is a matrix of province-level controls.[10] The regression is estimated on decennial data between 1961 and 2011. Our baseline set of controls includes the industry share of employment, the employment rate and the share of residents with at least a high-school degree in each province and census year, aiming to account for economic activity and the structure of the local population and employment. In additional checks, we also include net migration rates at the province level to address a possible source of simultaneity—as economically lively areas with a high rate of entrepreneurship might also attract migrants, which would in turn affect the age

[10] We control for region (rather than province) fixed effects because we do not have many time observations for each province (our censuses are decennial). We show in the Appendix that results do not change much when including province fixed effects.

structure.[11] The coefficients of interest are the δ_j's, associated with each of the four age groups included. Standard errors are clustered at the region level.

We show estimation results in Table 1. Column 1 reports on simple pooled OLS estimates, which point to a hump-shaped age-entrepreneurship profile as commonly found in the literature. In Columns 2 to 4 we augment our specification by adding fixed effects and time-varying controls. In particular, Column 2 accounts for region and census-year fixed effects, Column 3 adds controls for local labor market and demographic characteristics and Column 4 includes province-level net migration rates. The hump-shaped pattern is no longer very visible, as the coefficients for the central age cohorts decrease in magnitude and significance.

Despite our set of fixed effects and controls (including historical migration), the validity of these estimates may still be undermined by the endogeneity of the population age structure. To alleviate these concerns, we resort to an IV strategy which instruments each age share with the 10-years younger share observed 10 years earlier in the same province—an established approach in the literature (Barbiellini Amidei et al. 2024; Bönte et al. 2009; Skans 2008). For instance, the working-age population share of those aged 15-24 in 1981 is instrumented with the share of those aged 5-14 relative to the total population aged 5-54 in 1971.[12] We re-estimate Equation (1) using Two-Stage Least Squares and report the estimated coefficients in Column 5 of Table 1 (the Kleibergen-Paap F-Statistic hints at a very strong first stage). Our IV estimates confirm the results in Table 1 Columns 3 and 4, with a not very clear age-entrepreneurship pattern with negative contributions associated with the 15-24 and especially the 45-54 age cohorts but no effect in the central groups. The most significant estimates imply that a one percent population inflow into the 15-24 and 45-54 classes from the reference age category (55-64) results in a fall in entrepreneurship rate of 0.07-0.09 percentage points. This effect is non-negligible, when compared to an average entrepreneurship rate of 3.7 percent in our sample. The analysis in Section 5 will investigate these patterns more in detail and unveil strong regional differences.

Robustness tests. The above results are robust to various exercises. Appendix Table A1 shows our estimates using province-level fixed effects and standard error clustering as opposed to regional fixed effects and clustering in the main design. The key findings are confirmed overall—

[11] In fact, migration of entrepreneurs is not a primary concern as Italian entrepreneurs tend to start a business close to where they were born (Michelacci and Silva 2007). Still, higher local entrepreneurship might attract other migrants towards the local labor market, which would alter the age composition.

[12] Instrument validity in our setting hinges on exogeneity of lagged population shares conditional on the set of fixed effects and controls. Barbiellini Amidei et al. (2024) provide evidence in favor of validity of such instrument by means of an additional instrumental variable based on lagged birth rates (Shimer 2001). We unfortunately cannot replicate this exercise here as historical births data are available only at the regional level.

in fact, results are even starker when using province fixed effects, as we find negative and significant coefficients associated also to the 15-24 age cohort. Table A2 runs our 2-SLS estimates for the total economy (rather than just the industrial sector), both for the entire 1961-2011 period (where we cannot distinguish between entrepreneurs and professionals) and separately for the 2001-2011 years, where instead census tables provide a breakdown between the two occupation categories. Again, the baseline findings are confirmed.

Polynomial estimates. We then seek a more granular age-entrepreneurship profile. To do so, we refine our measure of the population age structure to ten 5-year classes (15-19 to 60-64). To avoid collinearity issues that might arise due to the larger number of parameters being estimated, we follow an approach first introduced in Fair and Dominguez (1991) and augmented in Barbiellini Amidei et al. (2024) by the adoption of instrumental variable techniques. We impose the ten age parameters (one associated with each age share) to lie on a quadratic polynomial and restrict their sum to be equal to zero. These two constraints reduce the number of parameters to be estimated to just two, attached to two moments of the age distribution. The ten cohort-specific estimated coefficients are then backed out from the two reduced-form ones (see Appendix A for details and derivations). To address endogeneity concerns, we again instrument each age group with the 10-years younger group, observed ten years earlier. Thus, for example, the (working-age) population share of those aged 15-19 in 1981 is instrumented with the share of those aged 5-9 relative to the total population aged 5-54 in 1971. Our regressions include the same set of controls as in Equation (1), together with region and census-year effects, and cluster standard errors by region. The resulting age-entrepreneurship profile is showed in Figure 3, using both OLS (Part A) and 2-SLS (Part B). Both the OLS and the IV estimates point to a slightly "asymmetric" hump-shaped profile peaking between 40 and 45 years, but not precisely estimated. As we document in the next Section, this somewhat unclear pattern can be attributed to a different shape of the curve across the main macro-areas.

5. Regional Differences

The estimates showed so far suggest that demographic change has affected entrepreneurship rates in Italy. The observed patterns are, however, not clearly discernible, with a hump shape possibly emerging but with broad confidence intervals (Figure 3.B). We now investigate whether these findings originate from differences between macro-areas of Italy, which have evolved differently both in their entrepreneurship rates and demographic shifts over the last decades (Section 3). Did demographic factors act differently in shaping entrepreneurial dynamics in different areas of the country?

To answer, we estimate Equation (1) separately for the four main macro-areas (North-East, North-West, Center and South) and show our most robust IV estimates (corresponding to Table 1 Column 5) in Table 2. There is indeed remarkable heterogeneity across areas. In the North, and especially the North-East (as described above, the most vibrant region in the country over the last decades), we notice a positive contribution to entrepreneurship associated with younger age cohorts. In the Center and, above all, Southern Italy, we estimate negative coefficients for each age group below the oldest one, highlighting a positive entrepreneurship effect associated with older people.[13] In addition, results in the South appear to be more precisely estimated. A possible reason for this is that, as we note in Section 3, demographic trends have been more intense in the South compared to other regions over the last decades, making this area a better setting to precisely estimate the effects of demographic change (Barbiellini Amidei et al. 2024).

These markedly different patterns are clearly visible in Figure 4, which shows IV-based age-entrepreneurship profiles separately for the North (Part A) and the Center-South (Part B). In the North, we find a hump-shaped pattern peaking for age cohorts between 25 and 39. In the Center-South, we document instead an increasing age-entrepreneurship profile.

What explains North-South differences? In the last part of the paper, we investigate the drivers of the different age-entrepreneurship profiles across areas. Northern and Southern Italy differ in several aspects that may mediate the effects of age on entrepreneurial activity. These include different economic composition, as Southern regions typically feature industries with lower technological intensity and smaller firms. We thus control for average firm size, employment breakdown between high, medium and low technology sectors, and employment share of the construction sector. Our goal is to account for differences in innovation and risk profiles characterizing different industrial productions, with traditional sectors—where experience matters more than innovations brought by the young—more prevalent in the South.

Other potential confounders relate to access to entrepreneurship, which depends on factors such as credit availability and the quality of the local business environment. Guiso et al. (2004) find that in more financially developed areas individuals are more likely to become entrepreneurs, and do so at younger ages. The depth of the financial system and the different levels of access to credit have indeed been indicated as key factors explaining the North-South divide in business development (Cannari and Gobbi 2010). We then use the number of bank branches per inhabitant at the province level as a proxy for financial development and access to bank credit. Social capital and trust can also play an important role in the local business environment (Davidsson 2006). For entrepreneurs, social capital could provide networks

[13] These results hold when estimating our regressions including province fixed effects (Table A3).

facilitating the discovery of opportunities and the selection of suppliers, workers, and markets. Measuring social capital is typically hard—even more so when this has to be done at the local level, and going decades back in time. We include several possible proxies of social capital, including province-level electoral turnout (computed for national elections in the year closest to each population census) and regional measures of trust and crime rates.

Indeed, the rising age-entrepreneurship profile we obtain in the South might be consistent with some peculiarities of the social and business environment. With lower social capital, successful entrepreneurship hinges on a long-established network of business relationships, which needs more time and a higher age to build. In addition, more binding financial constraints impose a larger initial capital endowment to start a business, which requires more time (hence a higher age) to be accumulated.

We thus re-estimate Equation (1) separately for Southern regions, and augment it by progressively including the above controls. Table 3 shows the coefficients. Column 1 reports IV estimates for the baseline specification (the same as in Table 2 Column 3), where all age groups below the 55-64 cohort enter with negative and significant coefficients. In Column 2, we try to better capture sectoral characteristics and control for average firm size, technological intensity and weight of the local construction sector. Estimates decline in size, but remain significant overall. Column 3 adds controls for the local business environment, including availability of credit, voting turnout and (regional) measures of trust and crime rates. Coefficient estimates decline further and, albeit still negative, become less significant for the central age groups—while remaining negative and significant for the younger cohorts. This suggests that features of the local business environment in the South explain, at least in part, why older age groups contribute significantly to entrepreneurship rates.

This analysis comes with a number of caveats. Our proxies for the local business environment are imperfect, especially when considering very long time horizons and for hard-to-capture factors such as trust. In addition, other factors we are unable to account for might be at play, such as other types of financial constraints (less developed equity markets, high interest rates, required collateral and credit rationing); local competition; uneven distribution of industrial districts and the role of urbanization and agglomeration economies; or a less business-oriented and more risk-averse culture. While our analysis unveils different age-entrepreneurship profiles between different areas of Italy and suggests possible reasons for it, future work and better data sources could shed more light on the mechanisms.

Conclusions

This paper studies the relationship between demographic change and entrepreneurship leveraging historical data for Italy. By means of instrumental variable techniques, we estimate

age-entrepreneurship profiles that aim to account for endogeneity issues. In line with theoretical predictions and empirical analyses from other settings, we provide evidence of an hump-shaped relationship between age and entrepreneurship at the national level. This relationship is, however, not precisely estimated. We indeed uncover stark heterogeneity across macro-areas of Italy. In the North, the age-entrepreneurship profile is clearly hump-shaped and significant, peaking between 25 and 40 years of age. In Southern regions, instead, the entrepreneurship rate increases with age. We highlight how the local business environment in the South, with more binding financial constraints and more relevance given to the creation of informal networks, might favor entrepreneurship at older ages.

This evidence bears important policy implications. As governments around the world increasingly implement interventions to stimulate entrepreneurship (OECD 2020), our findings suggest that policy should be tailored to place-specific characteristics and to the nature of local entrepreneurship (Ortega-Argilés 2022). Importantly, policy should not assume a uniform entrepreneurial life-cycle across regions. To the extent that governments aim to stimulate entrepreneurship among the youth, for example, their efforts should focus on creating a suitable business ecosystem and reduce frictions to early-career entrepreneurship in areas where such conditions are not in place.

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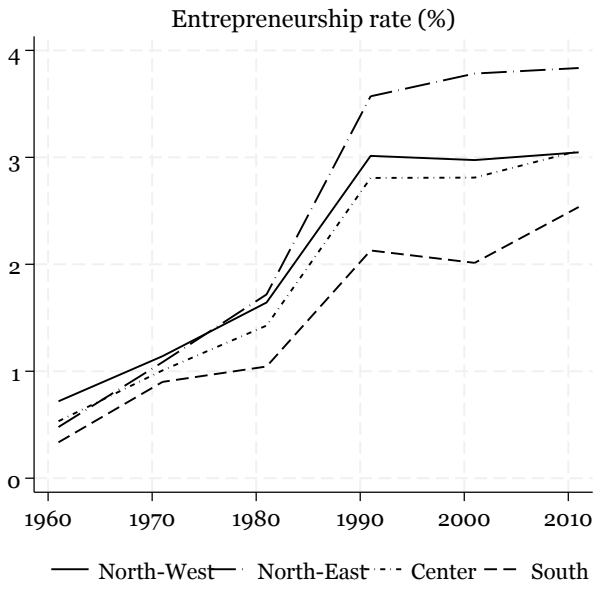
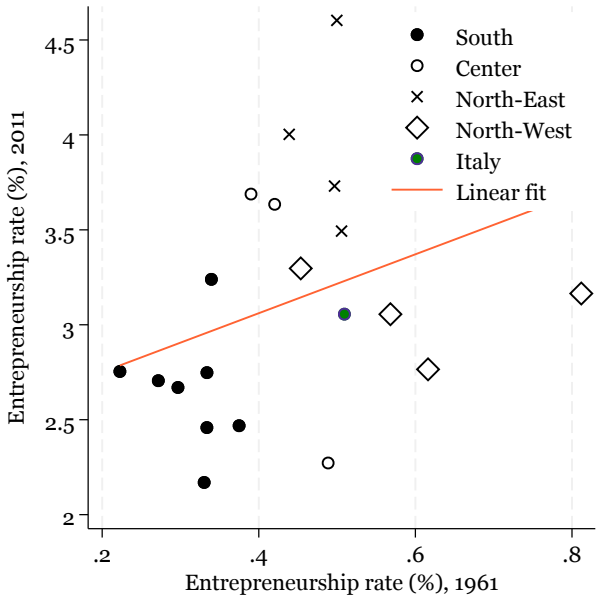
Figures

Figure 1. Entrepreneurship rate in Italy, 1961-2011

A. Entrepreneurship rate in Italy



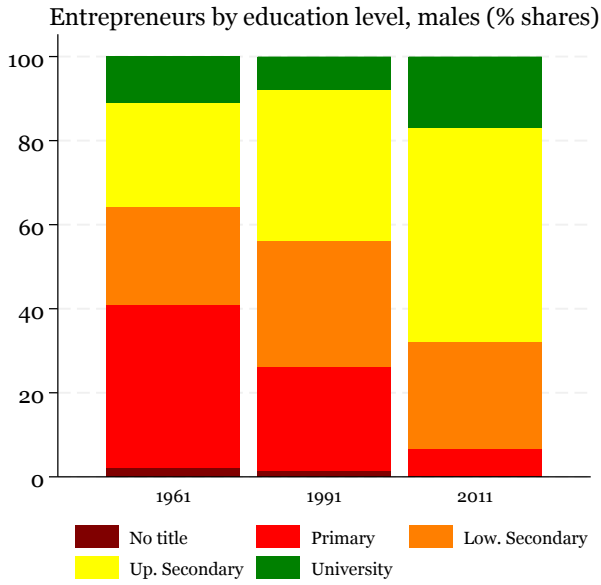
B. Entrepreneurship rate across macro-areas



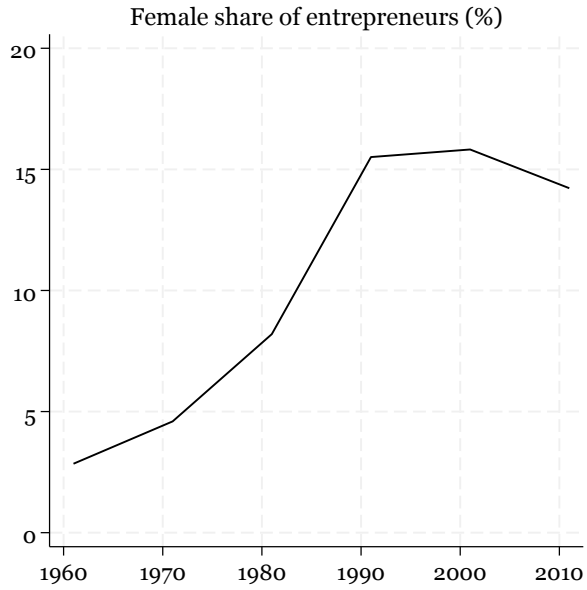
Notes: Historical reconstruction of entrepreneurship rates in Italy using population censuses, using data on total economy. Entrepreneurship rate computed using number of entrepreneurs as share of labor force. We use data on entrepreneurs only (excluding professionals), available at regional level for the years 1961, 1971, 2001 and 2011. In Part A, we impute the share of entrepreneurs only (excluding professionals) for the years 1981 and 1991 using available data for 1961, 1971, 2001 and 2011.

Figure 2. Italian entrepreneurs by education, gender and age

A. Share of entrepreneurs by education

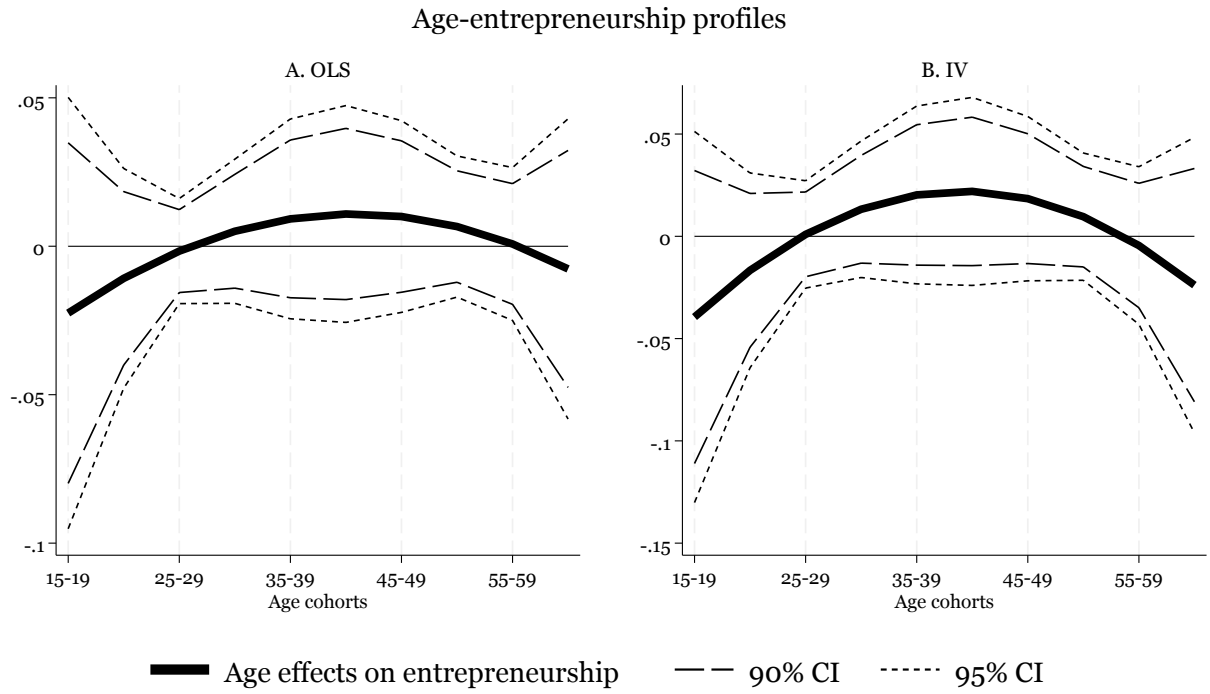


B. Share of entrepreneurs, female



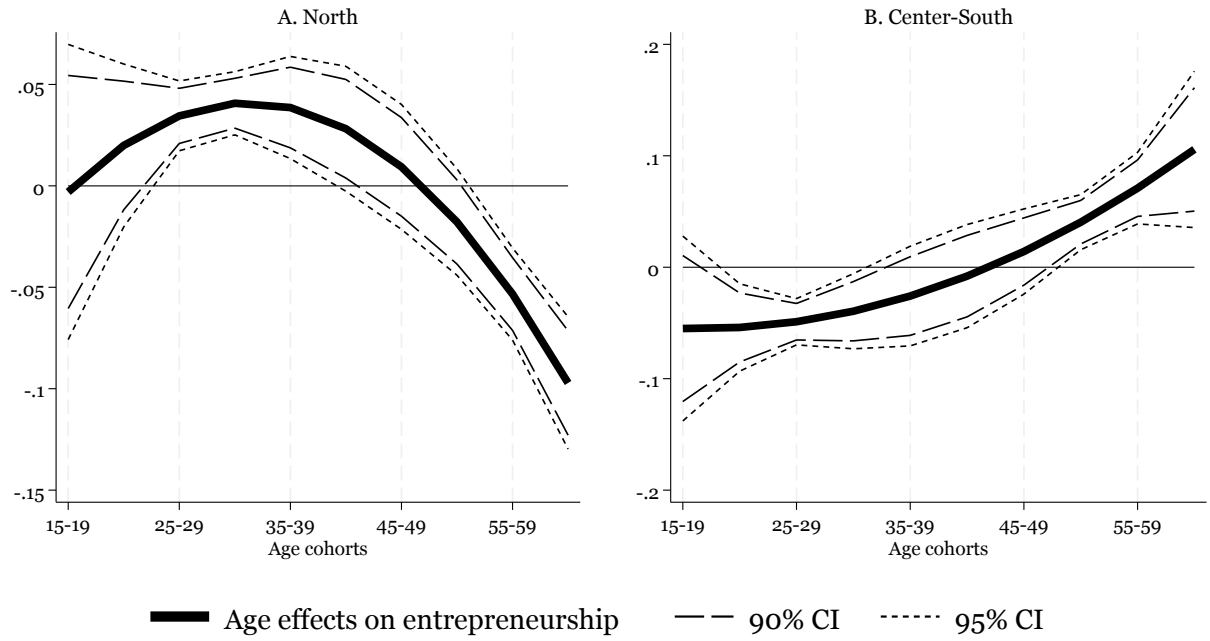
Notes: Entrepreneurs broken down by education attainment (Part A) and gender (Part B). Both graphs refer to the industrial sector only, and to entrepreneurs and professionals.

Figure 3. Age entrepreneurship profiles for Italy, OLS and IV estimates



Notes: Estimated age-entrepreneurship profile for Italy, years 1961-2011. The dependent variable is the entrepreneurship rate in the industrial sector, expressed as the share of entrepreneurs and professionals over the active population in the same sector. Population shares computed as fractions of the working-age population. The specification controls for region and year fixed effects and province-level controls (employment rate, manufacturing share of employment, share of residents with a high-school or university degree, net migration rate). The coefficients in Part B are 2-SLS estimates where age shares are instrumented with their 10-years lag. Standard errors cluster-corrected at the region level. The age-entrepreneurship profiles are obtained using the method proposed in Barbiellini Amidei et al. (2024) and summarized in Appendix A.

Figure 4. Age entrepreneurship profiles by macro-area, IV estimates



Notes: Estimated age-entrepreneurship profile for Italy, years 1961-2011. The dependent variable is the entrepreneurship rate in the industrial sector, expressed as the share of entrepreneurs and professionals over the active population in the same sector. Population shares computed as fractions of the working-age population. The specification controls for region and year fixed effects and province-level controls (employment rate, manufacturing share of employment, share of residents with a high-school or university degree, net migration rate). We show 2-SLS estimates where age shares are instrumented with their 10-years lag. The model is estimated separately for regions in Northern Italy (Part A) and Center-South of Italy (Part B) Standard errors cluster-corrected at the region level. The age-entrepreneurship profiles are obtained using the method proposed in Barbiellini Amidei et al. (2024) and summarized in Appendix A.

Tables

Table 1: Age effects on entrepreneurship, baseline estimates

	Pooled OLS	*Fixed effects & controls*			*2-SLS*
	(1)	(2)	(3)	(4)	(5)
Share of 15-24	-0.390***	-0.108*	-0.094*	-0.070	-0.068
	(0.064)	(0.056)	(0.047)	(0.046)	(0.048)
Share of 25-34	0.045	0.056	0.062	0.036	0.054
	(0.052)	(0.039)	(0.040)	(0.035)	(0.060)
Share of 35-44	0.295***	0.006	-0.036	-0.027	-0.030
	(0.082)	(0.044)	(0.043)	(0.035)	(0.040)
Share of 45-54	-0.413***	-0.084**	-0.094**	-0.104**	-0.089**
	(0.116)	(0.038)	(0.040)	(0.036)	(0.035)
KP F-statistic	-	-	-	-	107.30
Region effects	No	Yes	Yes	Yes	Yes
Year effects	No	Yes	Yes	Yes	Yes
Province controls	No	No	Yes	Yes	Yes
Observations	547	547	547	547	547
Mean outcome	3.70	3.70	3.70	3.70	3.70
Standard Deviation	2.39	2.39	2.39	2.39	2.39
R-squared	0.47	0.92	0.93	0.93	0.93

Notes: Estimates for Equation (1) for a panel of Italian provinces, years 1961-2011. The dependent variable is the entrepreneurship rate in the industrial sector, expressed as the share of entrepreneurs and professionals over the active population in the same sector. Population shares computed as fractions of the working-age population. Column 1 reports pooled OLS estimates; Column 2 controls for region and year fixed effects; Column 3 adds controls for employment rate, manufacturing share of employment and share of residents with a high-school or university degree; Column 4 additionally controls for net migration rate; Column 5 performs 2-SLS estimates where age shares are instrumented with their 10-years lag. Standard errors cluster-corrected at the region level in parentheses. *p<0.1, **p<0.05, ***p<0.01.

Table 2: Age effects on entrepreneurship, IV estimates, by macro-area

	2-SLS estimates			
	North-East (1)	*North-West* (2)	*South* (3)	*Center* (4)
Share of 15-24	0.140***	0.048	-0.239***	-0.103
	(0.041)	(0.053)	(0.045)	(0.069)
Share of 25-34	0.107	0.152**	-0.225**	-0.131**
	(0.073)	(0.061)	(0.111)	(0.064)
Share of 35-44	0.092	-0.053*	-0.131***	-0.106***
	(0.130)	(0.031)	(0.038)	(0.027)
Share of 45-54	0.151*	0.015	-0.161**	-0.049
	(0.086)	(0.050)	(0.075)	(0.039)
KP F-statistic	18.79	188.66	24.04	43.12
Region effects	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes
Province controls	Yes	Yes	Yes	Yes
Observations	119	114	197	117
Mean outcome	3.66	3.58	3.67	3.90
Standard Deviation	2.37	2.11	2.49	2.53
R-squared	0.93	0.94	0.94	0.96

Notes: Estimates for Equation (1) for a panel of Italian provinces, years 1961-2011. The dependent variable is the entrepreneurship rate in the industrial sector, expressed as the share of entrepreneurs and professionals over the active population in the same sector. Population shares computed as fractions of the working-age population. The table shows 2-SLS estimates (Table 1 Column 5) estimated separately on each of the four macro-areas in Italy: North-East (Column 1), North-West (Column 2), South (Column 2) and Center (Column 4) Standard errors cluster-corrected at the region level in parentheses. *p<0.1, **p<0.05, ***p<0.01.

Table 3: Age effects on entrepreneurship in Southern Italy, additional controls

	Baseline	*Additional controls*	
	(1)	(2)	(3)
Share of 15-24	-0.239***	-0.205***	-0.208***
	(0.045)	(0.048)	(0.042)
Share of 25-34	-0.225**	-0.223***	-0.108*
	(0.111)	(0.071)	(0.064)
Share of 35-44	-0.131***	-0.077**	-0.077
	(0.038)	(0.030)	(0.053)
Share of 45-54	-0.161**	-0.110*	-0.099
	(0.075)	(0.066)	(0.075)
KP F-statistic	24.04	90.71	56.68
Region effects	Yes	Yes	Yes
Year effects	Yes	Yes	Yes
Baseline controls	Yes	Yes	Yes
Labor market & technology	No	Yes	Yes
Finance & business environment	No	No	Yes
Observations	197	197	197
Mean outcome	3.67	3.67	3.67
Standard Deviation	2.49	2.49	2.49
R-squared	0.94	0.94	0.95

Notes: Estimates for Equation (1) for a panel of Italian provinces, years 1961-2011, separately for Southern Italy. The dependent variable is the entrepreneurship rate in the industrial sector, expressed as the share of entrepreneurs and professionals over the active population in the same sector. Population shares computed as fractions of the working-age population. Column 1 reports baseline 2-SLS estimates where age shares are instrumented with their 10-years lag (see Table 2 Column 3). Column 2 additionally controls for average firm size, share of employment in high technology and medium technology sectors and share of employment in the construction sector. Column 3 additionally controls for number of bank branches per capita, electoral turnout and measures of local trust and violent crime rates. Standard errors cluster-corrected at the region level in parentheses. *p<0.1, **p<0.05, ***p<0.01.

Appendix A. Polynomial Estimation

Here we briefly summarize our polynomial approach, originally proposed in Fair and Dominguez (1991) and augmented in Barbiellini Amidei et al. (2024) through the use of instrumental variable methods. The goal of this approach is to estimate more granular age profiles than those obtained with ten-years age groups. Historical demographic tables for Italian provinces provide indeed a more detailed breakdown of the population age distribution, across five-years groups. We aim to estimate the following model:

$$y_{pt} = \gamma_r + \theta_t + \sum_{j=1}^{10} \delta_j \cdot sh_{pt}^{j} + X'_{pt} \cdot \beta + \varepsilon_{pt} \qquad (A.1)$$

where all variables are defined in the same way as in Equation (1), as described in Section 4.

As noted in Barbiellini Amidei et al. (2024), leaving the δ_j parameters unconstrained may result in large variations across the estimated age effects, leading to confusing age profiles. In addition, the larger number of explanatory variables likely exacerbates multicollinearity between regressors. We thus impose that each of the ten age coefficients lie on a second-order polynomial to smooth out the age profile.

$$\delta_j = \zeta_0 + j \cdot \zeta_1 + j^2 \cdot \zeta_2 \,, \quad j = 1, \dots, 10 \qquad (A.2)$$

To avoid perfect collinearity, we also normalize the δ_j parameters so that they sum to zero. Combining this condition with (A.2), we obtain:

$$\zeta_0 = -\frac{1}{10} \cdot \left(\zeta_1 \cdot \sum_{j=1}^{10} j + \zeta_2 \cdot \sum_{j=1}^{10} j^2 \right) \qquad (A.3)$$

Putting all together:

$$y_{pt} = \gamma_r + \theta_t + \zeta_1 \cdot \underbrace{\left(\sum_{j=1}^{10} j \cdot sh_{pt}^{j} - \frac{1}{10} \cdot \sum_{j=1}^{10} j \right)}_{\Omega_{pt}^{1}} + \zeta_2 \cdot$$
$$\underbrace{\left(\sum_{j=1}^{10} j^2 \cdot sh_{pt}^{j} - \frac{1}{10} \cdot \sum_{j=1}^{10} j^2 \right)}_{\Omega_{pt}^{2}} + X'_{pt} \cdot \beta + \varepsilon_{pt} \qquad (A.4)$$

The number of parameters to be estimated thus collapses to just two (ζ_1 and ζ_2) attached to two moments of the age distribution (Ω_{pt}^{1} and Ω_{pt}^{2}). In turn, one can pin down ζ_0 and reconstruct

the full age profile using (A.2). The standard errors of the age coefficients are obtained by noting that:

$$\delta_j = \zeta_1 \cdot \underbrace{\left(j - \frac{1}{10} \cdot \sum_{j=1}^{10} j \right)}_{c_1(j)} + \zeta_2 \cdot \underbrace{\left(j^2 - \frac{1}{10} \cdot \sum_{j=1}^{10} j^2 \right)}_{c_2(j)}, \qquad j = 1, \dots, 10 \qquad (A.5)$$

So that:

$$var\left(\hat{\delta_j}\right) = c_1^2(j) \cdot var\left(\hat{\zeta_1}\right) + c_2^2(j) \cdot var\left(\hat{\zeta_2}\right) + 2c_1(j)c_2(j) \cdot cov\left(\hat{\zeta_1}, \hat{\zeta}\right), \qquad (A.6)$$

Estimating model (A.4) using OLS still suffers from the endogeneity issues discussed in the paper. We thus instrument the two regressors (Ω_{pt}^1 and Ω_{pt}^2) again using ten-years lagged population shares, as explained in Section 4. Specifically, the $\Omega_{pt}^k, k = 1, 2$ are instrumented as follows:

$$\Omega_{pt}^{k,IV} = \sum_{j=1}^{10} j^k \cdot sh_{pt}^{j,IV} - \frac{1}{10} \cdot \sum_{j=1}^{10} j^k, \quad k = 1, 2 \qquad (A.7)$$

where $sh_{pt}^{j,IV} = pop_{p,t-10}^{j} / pop_{i,t-10}^{5-54}$ is used as instrument for sh_{pt}^{j}. For example, the (working-age) population share of those aged 15-19 in 1981 is instrumented with the share of those aged 5-9 relative to the total population aged 5-54 in 1971.

Appendix Tables

Table A1: Age effects on entrepreneurship, province effects and clustering

	Pooled OLS	*Fixed effects & controls*		*2-SLS*
	(1)	(2)	(3)	(4)
Share of 15-24	-0.390***	-0.112**	-0.077*	-0.095**
	(0.039)	(0.045)	(0.044)	(0.044)
Share of 25-34	0.045	0.010	0.046	0.004
	(0.043)	(0.050)	(0.051)	(0.053)
Share of 35-44	0.295***	-0.039	-0.031	-0.040
	(0.060)	(0.047)	(0.048)	(0.050)
Share of 45-54	-0.413***	-0.108**	-0.098**	-0.106***
	(0.061)	(0.046)	(0.044)	(0.040)
KP F-statistic	-	-	-	80.64
Province effects	No	Yes	Yes	Yes
Year effects	No	Yes	Yes	Yes
Province controls	No	No	Yes	Yes
Observations	547	547	547	547
Mean outcome	3.70	3.70	3.70	3.70
Standard Deviation	2.39	2.39	2.39	2.39
R-squared	0.47	0.96	0.96	0.96

Notes: Estimates for Equation (1) for a panel of Italian provinces, years 1961-2011. The dependent variable is the entrepreneurship rate in the industrial sector, expressed as the share of entrepreneurs and professionals over the active population in the same sector. Population shares computed as fractions of the working-age population. Column 1 reports pooled OLS estimates; Column 2 controls for province and year fixed effects; Column 3 adds controls for employment rate, manufacturing share of employment and share of residents with a high-school or university degree, and net migration rate; Column 4 performs 2-SLS estimates where age shares are instrumented with their 10-years lag. Standard errors cluster-corrected at the province level in parentheses. *p<0.1, **p<0.05, ***p<0.01.

Table A2: Age effects on entrepreneurship, IV estimates, total economy

	Entrepreneurs and professionals, 1961-2011 (1)	*Entrepreneurs only, 2001-2011* (2)
Share of 15-24	-0.072**	-0.079***
	(0.034)	(0.030)
Share of 25-34	-0.079**	-0.040
	(0.040)	(0.048)
Share of 35-44	-0.013	-0.023
	(0.043)	(0.028)
Share of 45-54	-0.087**	-0.073*
	(0.039)	(0.041)
KP F-statistic	80.64	14.07
Province effects	Yes	Yes
Year effects	Yes	Yes
Province controls	Yes	Yes
Observations	547	198
Mean outcome	4.84	3.14
Standard Deviation	2.73	0.72
R-squared	0.98	0.99

Notes: Estimates for Equation (1) for a panel of Italian provinces, years 1961-2011, robustness using entrepreneurship rates for total economy rather than only industry. Column 1 shows the estimates for years 1961-2011, where the entrepreneurship rate is computed considering both entrepreneurs and professionals. Column 2 shows the estimates for years 2001-2011, where we can isolate entrepreneurs from professionals and use only the former to compute the entrepreneurship rate. We run these regressions using province-level fixed effects, to better account for province-specific (time-invariant) characteristics that could be related to the share of professionals. Population shares computed as fractions of the working-age population. The table shows 2-SLS estimates where age shares are instrumented with their 10-years lag. Standard errors cluster-corrected at the province level in parentheses. *p<0.1, **p<0.05, ***p<0.01.

Table A3: Age effects on entrepreneurship, province effects and clustering, by macro-area

	2-SLS estimates			
	North-East (1)	*North-West* (2)	*South* (3)	*Center* (4)
Share of 15-24	0.102*	-0.162*	-0.170*	0.032
	(0.057)	(0.092)	(0.088)	(0.061)
Share of 25-34	0.064	0.019	-0.191	-0.149**
	(0.082)	(0.098)	(0.122)	(0.074)
Share of 35-44	0.142	-0.029	-0.124	-0.369***
	(0.100)	(0.111)	(0.096)	(0.099)
Share of 45-54	0.187*	0.040	-0.172*	-0.335***
	(0.101)	(0.085)	(0.091)	(0.102)
KP F-statistic	20.69	45.58	30.92	59.33
Province effects	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes
Province controls	Yes	Yes	Yes	Yes
Observations	119	114	197	117
Mean outcome	3.66	3.58	3.67	3.90
Standard Deviation	2.37	2.11	2.49	2.53
R-squared	0.97	0.97	0.96	0.98

Notes: Estimates for Equation (1) for a panel of Italian provinces, years 1961-2011. The dependent variable is the entrepreneurship rate in the industrial sector, expressed as the share of entrepreneurs and professionals over the active population in the same sector. Population shares computed as fractions of the working-age population. The table shows 2-SLS estimates (Table A1 Column 4) estimated separately on each of the four macro-areas in Italy: North-East (Column 1), North-West (Column 2), South (Column 2) and Center (Column 4) Standard errors cluster-corrected at the province level in parentheses. *p<0.1, **p<0.05, ***p<0.01.