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HUMAN CAPITAL AND URBAN GROWTH IN ITALY, 1981-2001

by Francesco Giffoni*, Matteo Gomellini** and Dario Pellegrino**

Abstract

This paper analyses the contribution of human capital, measured using the share of residents holding a college degree, to urban growth, gauged by the growth in employment, between 1981 and 2001. According to our estimates, starting with a ten per cent higher share of college-educated residents was associated with a higher growth in employment in the 0.5-2.2 per cent range. These results hold when considering both the municipal and the local labour market (LLM) levels, and they are robust to a wide set of urban characteristics. Our findings are confirmed using a measure of education dating back to 1931 as an instrument for human capital. Furthermore, we exploit a spatial localization model with human capital premiums to disentangle the estimated effect into two components related to *productivity* and *life quality* respectively. We find that productivity contributed to more than 60 per cent of the effect of human capital on urban growth at municipal level, and to over 90 per cent at the wider LLM level.

Contents

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1. Introduction[1]

Urban areas are a crucial junction of the economy: they are drivers of economic, social and cultural changes and turn out to be of utmost importance when economic growth is considered. Crowding together in cities, in fact, often produces advantages that economists refer to as agglomeration economies (Rosenthal and Strange, 2004).

Nonetheless, only a few decades ago many scholars talked about the 'death of cities' as a consequence of the decrease in population and employment that many important urban areas were experimenting. Nowadays many cities have emerged, or re-emerged, as hubs of economic activity. Agglomeration of human capital and the related spillovers are addressed as the main responsible for this rebirth (De Groot *et al*., 2015).

This paper moves along the strand of literature that focuses on the role of human capital as a driver of long-run growth of urban areas. We follow in particular the works of Glaeser and Saiz (2004) and Shapiro (2006), in order to estimate the contribution of human capital, proxied by the share of population holding a college degree, to urban growth, proxied by the growth of employment in a panel of Italian urban areas observed in two decades, 1981-1991 and 1991-2001. According to Moretti (2012), this is the time span in which human capital replaced physical capital as the best predictor of urban growth in most advanced economies. We limit our econometric analysis to urban areas with a population larger than 50,000 in which both positive and negative forces linked to agglomeration are more likely to show off. As far as the definition of urban areas is concerned, we consider both municipalities (which we call 'cities') and the associated Local labor markets (LLMs).

Once we have estimated the effect of human capital on the growth of employment we show how the relationship is robust controlling for a set of variables encompassing main urban characteristics (demographic structure, sector of specialization), using also regional and time fixed effects. Then, we further check the issue of causality using secondary education levels in 1931 as an instrumental variable for current levels of human capital.

Finally, at least two mechanisms lie behind the effect of human capital on urban areas' growth. Indeed, human capital affects urban growth through two types of externalities: 1) highly educated people spur productivity and raise wages, thus attracting more people and workers (*productivity* channel); 2) areas with more educated residents experience faster growth in the

[1] We are grateful to Antonio Accetturo, Federico Barbiellini Amidei, Giuseppe Croce, Maurizio Franzini, Andrea Neri, Paolo Naticchioni, Andrea Lamorgese, Francesco Nucci, Marcello Pagnini, Michele Raitano, Francesco Vercelli. We are also grateful to an anonymous referee, to participants at the seminar held at the Bank of Italy in December 2015 and March 2016, and to members of the Interuniversity Research Center on Welfare State (CRISS-University of Rome La Sapienza). The opinions set out in this article are of the authors and do not necessarily reflect those of the Bank of Italy.

quality of life (*amenity* channel) leading to desirable outcomes such as better workplace conditions and consumption possibilities which, *ceteris paribus,* attract more workers.

As we discuss more extensively in the paper, these channels can be identified only considering simultaneously the human capital effect on wages (usually a proxy of productivity) and on house prices (usually a proxy of life quality)[2]. In order to do so, we calibrated a simple spatial general equilibrium model using estimated data on wages and house prices to determine what share of the overall employment growth effect of human capital is due to productivity, and what share is due to improvements in the quality of life.

The paper is, then, structured as follows. In section 2 we provide the main theoretical insights as far as the connections between human capital and urban growth are concerned. We also provide the identification framework useful for the subsequent quantitative analyses. In section 3 we present some stylized facts and descriptive evidences about Italy. Section 4 presents our main econometric exercises, including the IV estimates, and section 5 performs robustness checks. Finally, in section 6, on the basis of both background estimates and data reconstruction described in the Appendix, we resort to the model of Shapiro (2006) to disentangle the two channels, namely the *productivity* and the *amenity* channel. Section 7 concludes.

2. Literature and identification strategy

Urban economics essentially deals with agglomeration forces which drive economic agents' location choices. Human capital externalities, as underlined by Duranton and Puga (2004), could be regarded as one of the main drivers of these forces. Their relevance have been taken into account since endogenous growth models: Romer (1986) highlights the role of knowledge spillovers in generating asymmetric local development patterns; Lucas (1988) underlines how repeated social interactions among economic agents make cities as the best place to foster skills diffusion and new ideas. Furthermore, high education levels could also empower local economies by reducing crime and improving local political selection (Moretti, 2004).

Many empirical analyses related to US cities underline a strong positive correlation between education levels and city employment growth (Glaeser, Sheinkman and Shleifer, 1995; Simon and Nardinelli, 2002)[3].

[2] In fact, both productivity and amenities affect wages and house prices: productivity raises directly wages and indirectly house prices because more people settle in the location where wages are higher; amenities affect directly house prices and indirectly wages since individuals who move in areas where education has improved life quality may be willing to accept, ceteris paribus, smaller wages being in part compensated by a better quality of life. Thus, wages and house prices' changes must be considered simultaneously.

[3] While per capita income is the standard measure for country-level growth, at local level internal migration can rule out

Our focus is on the nexus that goes from human capital to urban growth, not the other way round. This relationship can be generated by two potential externalities. Firstly, knowledge spillovers increase productivity and therefore spurs wages and attract employment. A number of researchers have adopted this explanation (see, for example, Simon and Nardinelli, 2002), and it has received some support from the work of Rauch (1993) and Moretti (2004), who show that, conditional on observable worker characteristics, productivity (proxied with wages) is higher in high human capital cities.

Secondly, there are reasons to believe that a higher level of education might spur also the attractiveness of a city as a working place since educated population might bring about higher levels of social capital, increasing local demand (and, arguably, supply) for entertainment and cultural activities. In this sense an educated neighborhood may endogenously increase the quality of life (Glaeser, Kolko and Saiz, 2001, talk about "consumer city". See also Glaeser and Gottlieb, 2006 and Diamond, 2015)[4].

According with these intuitions, in section 4 we estimate the relationship between employment and human capital using the following reduced form equation:

$$\log\left(\frac{N_{i,t+1}}{N_{i,t}}\right) = \hat{\beta}_{emp} H_{i,t} + \delta X_{i,t} + \varepsilon^{N}_{i,t+1} \qquad (1)$$

where $N_{i,t}$ is the employment in city i at time t, and $H_{i,t}$ is human capital measured with the share of residents with a college degree. $X_{i,t}$, are controls which include initial levels of population[5]. We check the robustness of this relationship and its heterogeneity at the spatial level (paragraph 5) also using an instrumental variable.

Thus, once $\hat{\beta}_{emp}$ is estimated, in paragraph 6 we try to separate the two channels at work. Following, in particular Glaeser and Saiz (2004) and Shapiro (2006), we use the urban general equilibrium model set out by Roback (1982) to identify the relative contribution of the two externalities. The model (see Appendix D), suggests that it is possible to "decompose" $\hat{\beta}_{emp}$ with an appropriate formula, in order to extrapolate the relative contribution of productivity and

most of the real income differences generated by local productivity advantages: indeed increased labor supply is expected to moderate wage increases and push up real estate prices. That is the main reason why variation in population and/or employment are the most used measures of local development (Glaeser 1994). We do not investigate the issue related to skill-bias agglomeration effects (Adamson *et al*., 2004; Dalmazzo and de Blasio, 2011).

[4] Shapiro (2006) states that there is a third channel that passes through omitted variables, those features of an area that can be correlated with both human capital and employment growth. Even if past research finds that including a broad set of controls does not eliminate the positive correlation between employment growth and human capital (Glaeser, Scheinkman and Shleifer, 1995; Glaeser and Shapiro, 2003), concerns remain about the causal interpretation of this association. We'll deal with these aspects also using an IV approach.

[5] In a different take of this equation, we consider the employment rate – i.e., employment/population – as dependent variable, an alternative proxy of the economic growth of cities.

amenities using data on *wages* and *house prices*. Using the Bank of Italy Survey on Household Income and Wealth (SHIW), we constructed data for hourly *wages and house prices* at the city level (Appendix C). With these data in hand, we estimate the direct impact of human capital on house prices ($\hat{\beta}_{price}$) and on wages ($\hat{\beta}_{wage}$). These two coefficients, together with two more parameters (see paragraph 6), allow us to calibrate our model (Appendix D), and to detect whether the relationship between human capital and employment growth is driven by productivity or by consumption externalities.

3. Descriptive evidences on Italian cities

In this paragraph we present some key facts about urban growth in Italy in the long run[6]. Our analyses consider two population thresholds for our cities (20,000 or 50,000: see Glaeser and Resseger, 2010), and the corresponding Local labor markets (LLMs[7]) to which these cities belong. If the former are hardly self-contained in terms of commuting flows, they are better units of analysis for understanding the role of human capital-induced amenities. Conversely, LLMs have the feature of being self-contained systems in terms of labor market.

Considering those cities which had more than 20,000 inhabitants at the beginning of the XX century, their population grew on average by 7.9 per cent per decade between 1911 and 2001. This figure exceeds aggregate population growth by 2.3 percentage points[8]. In 1971, more than 25 per cent of Italian population was concentrated in the thirty largest cities covering two percent of national territory[9].

Nonetheless, in the last thirty years of the XX century cities underwent a period of serious decline: Milan lost approximately thirty per cent of its population, shrinking from 1.73 to 1.25 million inhabitants, a destiny shared with many other big cities both in Italy and around the world, like Amsterdam, Barcelona. Boston, Paris (Oswalt, 2006).

On average, Italian cities didn't share the same fate of, for example, Detroit in terms economic

[6] See Malanima (1998, 2005) and Bosker et al. (2008), Percoco (2013), for a very long run view on the development of Italian cities.

[7] The National Institute of Statistics (ISTAT) identifies LLMs on the basis of the daily commuting flows from place of residence to place of work (ISTAT, 1997). Data at LLM level are available from 1971 onward. We selected those LLM centered in our sample of large cities.

[8] Data for U.S., France and Spain are from Duranton and Puga (2013). Data for Italy come from our computations on Italian censuses. The cities considered in this computations are 442 and they are those which had a population >5,000 residents in 1921.

[9] At the international level, between 1920 and 2010, the population of U.S. metropolitan areas grew on average by 17.9 per cent per decade overcoming the aggregate population growth rate by 5.3 percentage points. In the same time span, urban areas in Spain grew by 18.1 per cent per decade exceeding the aggregate growth rate by 9.2 percentage points. In France, cities grew by 7.7 per cent per decade from 1937 to 2007, two percentage points higher than the national mean (Duranton and Puga, 2013). From this point of view, Italy is not an exception.

activity. From 1951 to 2001, the ten-year employment growth rate of a sample of 442 Italian cities (which had more than 5,000 inhabitants in 1921) was 39 per cent with a standard deviation of 25 per cent (40 and 22 per cent for larger cities). Considering only large cities in Italy (those with more than 50,000 inhabitants in 2001: Table 1), their population fell by 5 per cent between 1981 and 2001 but their total employment grew by 15 per cent on average. If we look at the LLMs centered in the large cities we consider, their population grew by 2 per cent in the same time span and their employment by 17 per cent[10].

Focusing on the period 1981-2001, in Figure 1 we show the correlation between population and employment. In the analyses related to US cities, these two variables move together (Glaeser, 1994) and Italy is not an exception: cities that exhibit higher rates of population growth have also higher growth of employees (Figure 2). Nonetheless, many of the large cities we consider record a reduction in population: the correlation holds "between" cities but not "within" each city where is not infrequent that employment grew and population declined.

Second, we examine the issue of *persistence* in the growth of cities[11]. In studies referred to US the best predictor of the growth of a city appears to be the growth that the city itself recorded in the previous two decades. Different explanations can be given: the simplest one is that there are "bad" and "good" cities which for structural reasons grow in different ways, while another idea is that the cities renew their growth on a cumulative basis ("growth begets growth": Krugman, 1991). In Figure 2, we show that comparing the last two decades of the XX century with respect to employment, Italian cities seem to have a small degree of persistence in the growth process. Thus, there aren't cities which are permanently "good" or "bad" from the standpoint of employment (cfr. Glaeser, 1994).

The third relationship we investigate is partly linked to the second one and concerns the convergence in the levels of employment. Smaller cities, whose number of employees were low at the beginning of the period, were those which subsequently grew at a higher pace? The answer seems to be positive for cities but not for LLMs (Figure 3)

Finally, we come to the key question of our work, showing rough correlations that will be further investigated in the next section: a higher initial endowment of human capital, proxied by the share of college graduates, is able to predict the growth of the city?[12] Figure 4 shows a very

[10] These numbers can be compatible with many interpretations, included the interpretation according to which people prefer to move out of the main cities in order to avoid negative externalities due to, for example, congestion, and face commuting costs rather than living in a congested environment.

[11] Gabaix (1999) and Gabaix and Ioannides (2004) review the knowledge on city size distributions and determinants of urban growth, including the well-known Zipf's law which states that the number of cities of size greater than S is proportional to 1/S.

[12] Many works on US detect strong association between human capital and metropolitan areas' growth. Glaeser,

tiny, if existent, positive correlation between employment growth and the initial endowment of human capital, marked by a high variability. Nonetheless, basic regressions (not shown) detect a positive correlation between initial education and subsequent employment growth from 1951 to 2001. Controlling for initial log employment levels, in cities where the share of graduated population was 10 percent higher in 1951, employment growth has been 1 percent higher. Looking at each single decade and controlling for initial conditions, the estimated coefficients for initial university graduates are always positive ranging from 0.01 during the 1990s to 0.10 during the 1970s. Glaeser and Resseger (2010) suggest that human capital externalities act mainly in larger cities: focusing on population growth of larger cities we found that in the long run (1951-2001) the estimated coefficient is 0.24 but the coefficient is statistically not significant. The negative association between population growth and human capital also remains if we restrict the sample to more densely inhabited cities. When we look at employment growth in large cities, a 10 percent rise in the share of graduates in 1951 is associated with a 1.1 percentage rise in employment growth.

All in all, these results suggest that in Italian cities the presence of people at the top of the education distribution could have spurred employment. Thus, in the next sections, we try to refine this investigation on the nexuses between employment growth and education.

4. Estimating the growth-human capital relationship in urban areas

We now try to understand whether, controlling for a bunch of potentially confounding factors both variable and invariant in time, we can confirm the correlation between human capital and employment growth.

The focus is restricted to the period 1981-2001 (due to data availability[13]) and our measure of city growth is the employment growth between census waves. Our spatial units of analysis are large cities (with a population greater than 50,000 in 1981) and correspondent LLMs. If on the one hand LLMs are increasingly used as the standard unit of analysis in the urban literature for

Scheinkman and Shielfer (1995) show that population growth is positively related to initial human capital, the latter measured using a wide range of education variables. In a thorough investigation of this relationship between 1970 and 2000, Glaeser and Saiz (2004) conclude that, for an average (U.S.) metropolitan area, a one percent higher share of university graduates is associated with 0.5 percent higher growth over the subsequent decade. Glaeser, Ponzetto and Tobio (2011) do not find a positive association between human capital and subsequent population growth: they find "that skills are associated with growth in productivity or entrepreneurship, not with growth in quality of life" in Eastern and Central United States. Glaeser and Saiz (2004) and Shapiro (2006), focus on employment dynamics as a measure of city growth. They find that education has a causal effect on urban growth. Simon and Nardinelli (2002) show that cities, which start out with a higher share of skilled people, grow faster in terms of employment both in the long run and in the short run.

[13] The time span is constrained by employment data availability, as public sector employees have not been accounted in census data before 1981.

Italy (e.g., Di Addario and Patacchini, 2008; Croce and Morettini, 2011, Lamorgese and Petrella, 2016), on the other hand cities on which LLMs are centered area better units of analysis when dealing with amenities. Appendix A describes the sources of all variables.

Table 2 and Table 3 report estimates of the equation (1) for LLMs and cities respectively over the two decades (the 80s and the 90s). We focus on the coefficient relative to the log of the college graduates share, which should therefore be interpreted as the elasticity of the employment growth to this measure of human capital. All regressions include decade-specific fixed effects and initial employment levels.We also allow each geographic unit's standard errors to be correlated over time.

In the case of LLMs (Table 2, column 1), the impact of education on employment growth in a random effects panel estimation which controls only for initial employment and time dummies is the following: a 10 percent increase in the share of college-educated residents is associated with an increase in employment growth of roughly 0.50 percent. In the city-level regressions (Table 3, column 1), the effect of college education is lower: a 10 percent increase in college graduates increases the expected growth rate by 0.36 percent. Initial employment is negatively related to later growth, suggesting convergence.

In column 2 of both Table 2 and 3, we control for a set of urban characteristics, namely regional fixed effects, sectors of specialization and age-distribution. Regional dummies should capture all-time invariant geographic variables as well as regional policies that change slowly over time. Such variables are particularly meaningful for Italy where economic growth has been strictly related to location, as it also emerges from historical accounts (A'Hearn and Venables, 2013; Gomellini and Toniolo, 2017).

We also considered sectors of specialization by controlling for the share of workers in manufacturing, services and trade[14]: such controls enable us to take into account for industrial orientation of the area. Finally we control for age-distribution by adding the initial share of population in the following cohorts: 0-19, 20-34, 35-44, 45-54 and 55-64. The latter variables are useful in order to identify whether the impact of education on growth simply reflects the larger presence of younger people which attained higher education levels or, symmetrically whether lower education stemmed from a larger share of elderly residents. By including these variables, the coefficient on the college educated remains strongly significant and increase both in the LLM and in the city-level regression. Furthermore, a higher share of workers in manufacturing and trade, but not in services, are positively related to urban growth.

[14] In our sample these occupational categories represent roughly 60 per cent of total LLM employment and 70 per cent of total city employment in 1991.

In column 3, we allow specialization to vary over time (interaction with decadal dummies). At LLM (city) level. Column 4 shows that the effect of education on growth persists when we control for city or LLM fixed effects. These dummies address the possibility that skilled individuals are just proxying omitted time-invariant characteristics.

In columns 5, 6, and 7 we deal with the so-called Nickell bias, i.e., the possible bias arising from fixed or random effects estimation of dynamic panel data (Nickell, 1981). First, in column 5, instead of using the lagged dependent variable to control for convergence in the employment levels across LLMs or cities, we use the initial (1981) level of employment. With this time-invariant lagged dependent variable we try to take into account convergence and together to remove the source of bias arising from the non-zero correlation between the error term and the time-variant lagged dependent variable. In column 6 we try to exploit the so called "bracketing properties" (Guryan, 2001), estimating a fixed effect model with no-lagged dependent variable, to be compared with column 7 (OLS estimates with lagged dependent variable). These estimates should represent the upper and the lower bound for the true coefficient.

In column 8 we use the share of college graduates in 1951 as a measure of human capital. This choice aims at reducing the upward bias of the effect of education on employment growth that may arise from reverse causality. In fact, one concern is that the distribution of colleges across cities may reflect expected changes in the local economy[15]. This hypothesis is less likely to hold by using the share of educated in the aftermath of WWII. If so, a 10 percent increase in the share of colleges in 1951 is associated with an increase in the LLMs' decadal employment growth of 0.7 per cent (0.12 in cities).

Despite our attempts to address endogeneity, it is still possible that the distribution of graduates in 1951 is itself endogenous and then correlated with the error term. Most studies in regional science and urban growth suggest that predetermined variables such as the presence of colleges prior to WWII may be exogenous to recent events (see Moretti, 2004). Thus, in column 9, we use the number of students enrolled in high schools in 1931 (from Istituto Nazionale di Urbanistica, 1934) as an instrument for human capital. If we believe that the share of high school enrollment in 1931 is orthogonal to the error term, (at least conditional on observed urban characteristics) a 10 percent increase in the share of college graduates increases significantly the decadal employment growth[16].

[15] Suppose for example that in 1971 people were able to correctly forecast which cities will experience the fastest economic growth in the subsequent decade. To the extent that highly educated people are more willing to move than unskilled, it is possible that the concentration of colleges in a given area in the initial year, may reflect their expectations about future growth.

[16] In the first-stage estimate we regress the log of the percent share of college educated on the log of the percentage

On the basis of the presented findings we conclude that the higher the share of educated people in a given urban area, the higher is the employment growth. This relationship is robust controlling for a wide set of regional, demographic and sectorial characteristics. We also instrumented the human capital variable using education levels which date back to 1931 in order to rule out reverse causality and mitigate eventual omitted variables biases.

5. Robustness checks and heterogeneity

In this subsection we examine the robustness of the human capital-urban growth relationship to a number of alternative specifications. Our main benchmark is the random effect specification including regional, sector and age-cohorts controls (col. 3 of Table 2 and 3).

Columns 1 of Table 4 and 5 replicate the random effects specification by including additional controls. Most studies of local area growth in the post WWII period have found that city amenities such as restaurants and hotels, museums and recreational services, are likely to be provided in high human capital areas and as a consequence this may encourage city growth in those areas. We also include the number of membership organizations as a proxy of social capital. By focusing their attention on Italian cities, Albanese and de Blasio (2014) present evidences that social capital (proxied by voter turnout) is steadily correlated with employment rate and that this arguably reflects some causality running from the former to the latter. If more local endowments in social capital fosters education choices, then it becomes a potential confounding factor in the education-growth relationship[17].

Specification 1 shows that after adding these controls, the impact of human capital remains robust. In addition to membership organization, in column 2 of Tables 4 and 5 we consider electoral participation as an alternative measure of social capital (even if electoral participation might be correlated with factors, like political patronage, which are actually negatively correlated with civism, yet empirical literature have confirmed it as a relevant proxy for social capital). As in the previous regression, while controlling for social capital indicators does not improve the predictive power of the specification, it does not affect the robustness of the impact of human capital.

share of high school enrollment in 1931, the coefficient is 0.375 with a standard error of 0.033. The F-statistic is 127.47 and the F-test reject the null hypothesis that the coefficient in the model is zero with a significance of 1 percent. According to the thresholds of Stock and Yogo (2005), we can be assured that weak instruments issues do not apply. Note, moreover, that in the specification 8 we do not include fixed effects because our instrument would be absorbed by those effects.

[17] Other proxies of social capital suggested by Putnam (1993) are: membership in mutual aid society; membership in cooperatives; strength of mass parties. Glaeser and Saiz (2004) use the number of membership organizations as a measure of social capital in MSAs.

As a third robustness check we control for the interactions between year and regional dummies: this would remove any potential endogeneity resulting from time shocks affecting areas belonging to the same region, like changes in regional policies or shock affecting sectors in which a region is specialized. Results in col. 3 of Tables 4 and 5 show that the education-growth relationship is still robust to year-regions controls.

The choice of 50,000 inhabitants as a minimum population threshold at city level, might be considered arbitrary: therefore we conducted a sensitivity analysis applying different levels of cut-off, to test whether the same relationship persists. In col. 4-5 we use 40,000 and 60,000 cut-off levels: both in cities and in related LLMs results proved to be robust.

As a supplementary exercise we show the results of two regressions using different proxies of city growth, namely population (column 6) and the employment rate for residents (column 7). In the first case, we do not find significant results, confirming the lack of correlation already detected, while for the employment rate we find statistically significant results. Human capital confirms not to be connected with residents growth, and this contrasts the related empirical urban studies for foreign countries where education has a simultaneous predictive power on both employment and population dynamics. All in all, robustness analyses support the results of the exercises shown so far: the correlation between the initial human capital endowment and the subsequent city (LLM) growth is positive and possibly runs from the former to the latter.

Finally, until this point our empirical estimates implicitly assumed that the predictive power of human capital was homogenous across time and space. Now we relax these assumptions, in order to detect whether the impact of human capital differs within our panel-sample. Thus, we investigated time-heterogeneity, i.e. whether the impact of human capital has changed throughout the years. We generated interaction terms between the graduate share and year dummies within the framework of the first two specifications in Table 2-3: results are shown in Table 6 and Table 7 for LLM and cities respectively, in columns 1 and 2.

A second potential source of heterogeneity concerns geography: Italy is among the European countries which show deep regional divides, a fact which arises from different long-run patterns (see Gomellini and Toniolo, 2017). We investigated whether such differences might affect the relationship between human capital and employment growth, with a specific focus on the long-standing North-South divide. In order to do so, we interacted human capital with a dummy for LLMs/cities belonging to Southern regions[18], reporting both the specification with yearly and

[18] The "South" dummy encompasses cities/LLMs belonging to the following regions: Abruzzo, Molise, Campania, Puglia, Basilicata, Calabria, Sicilia, Sardegna.

with full-areas controls (cols. 3 and 4 in Table 6 and Table 7).

With a bit of surprise, in all the specifications these interaction terms result to be not statistically significant, suggesting that the education-growth relationship doesn't differ between North and South, nor across the time span considered.

6. Disentangling the *productivity* and the *amenity* channels

So far, the relationship between human capital and growth seems to hold. We now perform a calibration exercise in order to detect whether such a connection is driven by productivity or by amenities.

The theoretical framework we rely on (Roback, 1982; Glaeser and Saiz, 2004; Shapiro, 2006; Glaeser, 2008) is a urban general equilibrium model where firms and workers are mobile across areas and human capital has positive externalities on both production and utility (see Appendix 4). The model shows that in order to identify the effect of human capital we have to simultaneously consider wages and house prices.

In fact, an increase in human capital raises wages via productivity. Since factors are mobile, more people will settle in the location where wages are higher and this causes also an increase in house prices. The increase in wages could be less than proportional with respect to the increase in house prices because human capital has positive spillovers not only on production but also on utility: individuals living in areas where education improves the "quality of life", may be willing to accept, *ceteris paribus*, smaller wage increases since they are, in part, compensated by a better quality of life.

Thus, as firms' productivity and local utility have opposite effects on local wages (Dalmazzo and de Blasio, 2005 and 2007), the "productivity" and "amenity" components of employment growth due to human capital can be identified only simultaneously considering the effects on wages and on house prices.

Empirical analyses conducted on American cities found different results concerning the channels behind the elasticity of employment to human capital (which we estimated in previous paragraps), $\hat{\beta}_{emp}$: according to Shapiro (2006), around two thirds of its magnitude could be attributed to increased urban productivity, while one third to increased quality of life. Glaeser and Saiz (2004) instead, attribute the whole effect to increased productivity ("…*skilled cities are growing because they are becoming more economically productive (relative to less skilled cities), not because these cities are becoming more attractive places to live*", p. 1).

For the Italian case, Dalmazzo and de Blasio (2011) use individual-level data and analyze the impact of agglomeration on both production and consumption. They find evidence of a substantial urban rent premium, while they do not find support for an urban wage premium. As a consequence they conclude that urban agglomeration is the main source of positive amenities for residents rather than productivity advantages. Di Addario and Patacchini (2008), use micro-data from the Bank of Italy Survey on Household Income and Wealth (henceforth, SHIW), and test whether wages vary with urban scale. They find that college graduates living in the largest LLMs have negative wage premium, concluding that this can be explained with a compensating quality-of-life effect.

Our focus is on changes over time. To consider these changes, we need to know house prices and wages both at the LLM and at city level; we estimate their values as shown in Appendix B. Then, we estimate the effect of human capital both on wage and price dynamics through the following reduced form equations (for details, see the equations 8 and 9 in Appendix D):

$$\log\left(\frac{W_{i,t+1}}{W_t}\right) = \hat{\beta}_{wage}H_{i,t} + \delta X_{i,t} + \varepsilon^{W}_{i,t+1} \qquad (2)$$

$$\log\left(\frac{P_{i,t+1}}{P_t}\right) = \hat{\beta}_{price}H_{i,t} + \delta X_{i,t} + \varepsilon^{P}_{i,t+1} \qquad (3)$$

where $\hat{\beta}_{wage}$ and $\hat{\beta}_{price}$ are the elasticities of wages (W) and house prices' (P) growth to an increase of human capital H in area i at time t. $X_{i,t}$ is a vector of measurable exogenous area characteristics and $\epsilon^{j}_{i,t+1}$ for $j = W, P$ is an error term which has zero mean and is orthogonal to $H_{i,t}$ and $X_{i,t}$. Table 8 and Table 9 report the results of these regressions for LLMs and cities, using the share of college graduates as a proxy for human capital. Growth is measured as the log change in LLM and city fixed effects obtained with the procedures described in the Appendix B and C. As in Shapiro (2006), we standardize this to be a ten-year growth rate in the 1981-2001 period, so we end up with a panel over two decades (the 80s and the 90s). Time dummies are included in all specifications and standard errors are adjusted for correlation of errors within LLMs and cities.

Regressions 1-3 of Panel A in Table 8, show the impact that initial human capital had on housing values at the LLM level. The magnitude of the effect remains quite robust between regression 1 and regression 3; in the latter, regional dummies and the variables used in Table 7 are also included. Regression 3 suggests that a 10 percent increase in the share of college-educated at the LLM level is associated with an increase in the housing value of 1.9 percent over the following decade. In regression 4 we add LLM fixed effects[19]. Panel A of Table 9 looks at cities and the results essentially reproduce those we found for LLMs (here education is a strong predictor of house values also when city fixed effects are considered)[20]. Panels B in Table 8 and in Table 9 examine the connections between wage growth and human capital. At the city level, we find a weak relationship between initial human capital levels and growth in wages. In contrast, growth in wages tends to be higher in those LLMs with greater concentration of college-educated residents: a 10 percent increase in the share of college graduates corresponds roughly to a 0.3-0.9 percent increase in yearly wage growth.

Summing up, the evidences in Table 8 and Table 9 show that growth in house values and wages tends to be higher, on average, in areas with higher share of skilled individuals; a higher level of education increases both wages and the price that workers pay for living in a specific place.

Let's now see how, by combining the information gathered in the present and in previous paragraphs, we can disentangle a productivity and an amenity effect . Indeed, our final step is measuring whether the city growth-human capital relationship is led by productivity or by amenity. In order to achieve this goal, as shown in Appendix D, first we need to capture the impact of human capital on the growth of productivity and on quality of life, which we call respectively β^a and β^q. It can be shown, in fact, that the share of the employment growth effect that is due to quality of life is equal to $\frac{\beta^q}{(\mu\beta^a+\beta^q)}$.

Since we cannot estimate these parameters directly, we resort to our model. From our theoretical framework, the following two equations can be derived:

$$\beta^a = \hat{\beta}_{price} - \alpha\hat{\beta}_{emp} = (1-\alpha)\hat{\beta}_{emp} + \hat{\beta}_{wage} \quad (4)$$

$$\beta^q = \hat{\beta}_{emp} - \mu\hat{\beta}_{price} = (1-\mu)\hat{\beta}_{emp} - \mu\hat{\beta}_{wage} \quad (5)$$

Where α is the labor's share of output and $(1-\mu.)$ is the share of spending on housing in consumer budget. The intuition is straightforward: the higher is the effect on house prices respect to the effect on wages, the higher is the amenity component.

Let's now perform a calibration exercise, using the coefficients $\hat{\beta}_{emp}$, $\hat{\beta}_{price}$ and $\hat{\beta}_{wage}$ we

[19] Including fixed effects is asking a great deal to the data since real estate prices strongly depend on factors context-specific such as safety, green space and the attractiveness of the area. So, it is very likely that LLM fixed effects capture these aspects. As a consequence, we are not surprised by the zero impact of education. Moreover, we note that, although fixed effects lead to a not significant association between skills and later price growth, the coefficient on human capital for LLMs remains positive.

[20] Results are robust also to IV regressions not shown in the paper.

estimated so far. Let's start with LLMs and then we focus on cities. In Table 2, the coefficient of human capital on employment growth ($\hat{\beta}_{emp}$) ranges from 0.05 to 0.24. We choose the midpoint 0.145 as value of $\hat{\beta}_{emp}$. Panel A in Table 8 shows that $\hat{\beta}_{price}$ ranges between 0.19 and 0.25, as such we fix it to 0.22. $\hat{\beta}_{wage}$ (Panel B, Table 8) is set at 0.06[21].

Literature agrees to set the parameter α = 0.65 – that is a labor's total share of output that includes the return to human capital – while different attempts have been made to estimate the $(1-\mu)$[22], that is the share of spending on housing. ISTAT suggests that this measure for the whole national territory was in 2013 around 29 per cent. In our estimates, this parameter is between 0.31 and 0.43[23].

Now we have all we need to compute β^a and β^q, and using the formula $\frac{\beta^q}{(\mu\beta^a+\beta^q)}$ we can easily disentangle the productivity and the quality of life externalities.

Table 10 presents the results of this exercise. When using $(1-\mu)$ at its lower bound (i.e. 0.31), less than 5 per cent of the connection between human capital and employment growth is explained by amenities in LLMs. This percentage increases to 12.0 percent when the share of spending on housing in the consumer budget is at its upper bound (0.43).

As far as municipalities are concerned, we set our coefficients according to the values estimated so far (always choosing midpoints between different results): $\hat{\beta}_{emp}$= 0.12. (from Table 3); $\hat{\beta}_{price}$= 0.15 (Panel A, in Table 9); $\hat{\beta}_{wage}$ = 0.015 (Panel B, Table 9). Thus, the share of the impact of human capital on growth that can be explained by amenities in the case of municipalities results much higher: 37 per cent when $(1-\mu)$ is set at its lower bound and 42 per cent when at the upper one.

Overall, these findings suggest that on average the bulk of the human capital-growth connection at the local labor market level comes from human capital raising productivity growth rather than spurring amenities consumption. Differently, when we evaluate the role of amenities at the municipal level, consumption externalities seem to play an important role in driving the association between human capital and subsequent employment growth: in a narrowly defined urban context a non-negligible share of the connection education-employment passes through the amenity channel.

[21] Note that these figures are not far from the model predictions according to which $\hat{\beta}_{price} = \hat{\beta}_{emp} + \hat{\beta}_{wage}$.

[22] Raitano (2014) estimates that the share of spending on housing is in the range 10 to 43 percent according to the income decile we are referring to. He suggests that these figures hold if mortgage payments, utilities and maintenance expenses are taken into account. Shapiro (2006) estimates that the share of spending on housing ranges from 0.22 to 0.32.

[23] See appendix C for details. Note that our sample includes only large cities in which the share of consumer spending on housing is arguably greater with respect to small cities.

7. Conclusions

This study examined the contribution of human capital to urban growth in Italy and found that, in the last two decades of the XX century, both cities and Local labor markets with a higher share of residents holding a college degree, recorded a higher growth of employment.

On average, and all else being equal, an urban area with an initial college-educated share of residents 10 percent higher, turned out to have a 0.5-2.2 per cent higher employment growth in the following decade. These results hold controlling for a wide set of urban characteristics like size, demographic structure, sector of specialization, social capital, time and regional dummies. In order to cope with reverse causality and to mitigate omitted variables biases, we resorted to instrumental variable estimation using an education measure dating back to 1931 to instrument current human capital levels: our findings are confirmed. We didn't find any North-South divide.

The mechanism through which human capital affects urban growth is based on two sources of externalities. Firstly, highly educated people spur productivity and this leads to wage increases that attract more workers (*productivity channel*). Secondly, areas with more educated people usually experience more rapid growth in the quality of life and this attracts people and workers too (*amenity channel*). In order to identify the contribution of these two externalities, relying on Shapiro (2006) we calibrated a simple spatial general equilibrium model. In particular, we estimated hourly wages (that proxy productivity) and house prices (from which one can infer life quality) at the city/LLM level by using the Bank of Italy's Survey on Household Income and Wealth, and then we used these values to compute the role of productivity and quality of life to human capital-induced urban areas growth.

Our results suggest that the productivity channel dominates in LLMs, accounting for 90 per cent of the overall human capital effect on growth. On the contrary, externalities due to amenities may have played a non-negligible role at the municipal level: depending on the share of spending on houses in the consumer budget, externalities linked to the quality of life can explain up to 40 percent of the human capital-led growth of Italian cities.

References

Adamson, D.W., D.E. Clark and M.D. Partridge (2004), Do Urban Agglomeration Effects and Households Amenities have a Skill Bias?, *Journal of Regional Science* 44(2): 201-223.

A'Hearn, B. and A.J. Venables (2013), Regional Disparities: Internal Geography and External Trade, in *The Oxford Handbook of the Italian Economy since Unification* (Ed. Toniolo G.) Oxford – Oxford University Press, pp. 599-630.

Albanese, G. and G. de Blasio (2014), Civic Capital and Development in Italy, 1951-2001, *Economic History Working Papers* 32, Bank of Italy, Rome.

Bosker, E. M., S. Brakman, H. Garretsen, H. de Jong and M. Schramm (2008), The Development of Italian Cities 1300-1861, *European Review of Economic History* 12: 97-131.

Bosker, R. and T. Snijders (2012), *Multilevel Analysis: An Introduction to Basic and Advanced Multilevel Modeling*, Sage Pub. Ltd, London.

Croce, G. and L. Morettini (2011), La convergenza dei livelli di capitale umano tra le province italiane dal 1971 al 2001, in D. Strangio (ed.) *Internazionalizzazione e delocalizzazione delle imprese*, McGraw-Hill, Milano, 73-90.

Dalmazzo, A. and G. de Blasio (2005), Where do Human Capital Externalities end up?, *Bank of Italy Working Papers*, n. 554, June.

Dalmazzo, A. and G. de Blasio (2007), Production and Consumption Externalities of Human Capital: An Empirical Study for Italy", *Journal of Population Economics*, 20: 359-382.

Dalmazzo, A. and G. de Blasio (2011), Amenities and Skill-biased Agglomeration Effects: Some Results on Italian Cities, *Papers in Regional Science* 90: 503-527.

De Groot, H., G. Marlet, C. Teulings and W. Vermeulen (2015), *Cities and the Urban Land Premium*, Edward Elgar, Cheltenham.

Di Addario, S. and E. Patacchini (2008), Wages and the city, *Labour Economics* 15(5): 1040- 1061.

Diamond, R. (2015), The Determinants and Welfare Implications of US Workers Diverging Location Choices by Skill: 1980-2000, *American Economic Review*, 106(3): 479-524.

Duranton, G. and D. Puga (2004), Micro-Foundations of Urban Agglomeration Economies. In V. Henderson and J. Thisse (eds.) *Handbook of Regional and Urban Economics*, Volume 4. Amsterdam: North-Holland, 2063-2117.

Duranton, G. and D. Puga (2013), The Growth of Cities, *CEPR Discussion Papers* 9590, Centre for Economic Policy Research, London.

Gabaix, X. (1999), Zipf's Law and the Growth of Cities, *American Economic Review Papers and Proceedings* 89(2): 129-132.

Gabaix, X. and Y.M. Ioannides (2004), The Evolution of City Size Distributions, in V. Henderson and J. Thisse (eds.) *Handbook of Regional and Urban Economics*, volume 4. Amsterdam: North-Holland, 2341-2378.

Gabriel, S.A. and S.S. Rosenthal (2004), Quality of the Business Environment Versus Quality of Life: Do Firms and Households Like the Same Cities?, *The Review of Economics and Statistics* 86(1): 438-444.

Glaeser, E.L. (1994), Cities, Information, and Economic Growth, *Cityscape* 1(1): 9–47.

Glaeser, E.L. (2008), *Cities, agglomeration and spatial equilibrium*, Oxford: Oxford University Press, New York

Glaeser, E.L. and A. Saiz (2004), The Rise of the Skilled City, Brookings-Wharton Papers on Urban Affairs, 5: 47-95.

Glaeser, E.L. and J.M. Shapiro (2003), Urban Growth in the 1990s: Is City Living Back?, *Journal of Regional Science* 43(1) 139-165.

Glaeser, E.L. and J.D. Gottlieb (2006), "Urban Resurgence and the Consumer City", *HIER Discussion*

Papers 2109, Harvard Institute of Economic Research, Harvard University, Cambridge, Mass.

Glaeser, E.L. and M.G. Resseger (2010), The Complementarity between Cities and Skills, *Journal of Regional Science*, Volume 50, Issue 1 February, pp. 221–244.

Glaeser, E.L., J.A. Scheinkman, and A. Shleifer (1995), Economic-Growth in a Cross-Section of Cities, *Journal of Monetary Economics* 36(1): 117-143.

Glaeser, E.L., J. Kolko, and A.Saiz (2001), Consumer City, *Journal of Economic Geography* 1(1): 27-50.

Glaeser, E.L., G.A. M. Ponzetto, and K. Tobio (2011), "Cities, Skills, and Regional Change", *HIER Discussion Papers* 2191, Harvard Institute of Economic Research, Harvard University, Cambridge, Mass.

Gomellini, M. and G. Toniolo (2017), The Industrialization of Italy, 1861-1971, O'Rourke K. H. and J. Williamson (Eds.), *The Spread of Modern Industry to the Periphery since 1870*, Oxford: Oxford University Press.

Istituto Nazionale di Urbanistica (1934), *Annuario delle Città Italiane*, Società Anonima Tipografica Castaldi, Roma.

Krugman, P. (1991), *Geography and Trade*, Cambridge: MIT Press.

Lamorgese, A. and A. Petrella (2016), Le città italiane: definizioni, caratteristiche e crescita", mimeo.

Malanima, P. (1998), Italian Cities 1300-1800. A Quantitative Approach, *Rivista di Storia Economica*, pp. 91-126.

Malanima, P. (2005), Urbanisation and the Italian Economy during the Last Millenium, European Review of Economic History Vol. 9, nr. 1, pp. 97-122.

Moretti, E. (2004), Estimating the Social Return to Higher Education: Evidence from Longitudinal and Repeated Cross-Sectional Data" *Journal of Econometrics* 121(1): 175-212.

Moretti, E. (2012), *The New Geography of Jobs*, Houghton Mifflin Harcourt, Boston, New York.

Nickell, S. (1981), Biases in Dynamic Models with Fixed Effects, *Econometrica*, v. 49, n. 6, 1417-26.

Oswalt, P. (2006), *Atlas of Shrinking Cities*, Hatje Cantz Verlag, Germany.

Percoco, M. (2013), Geography, Institutions and Urban Development: Italian Cities, 1300–1861. The Annals of Regional Science 50(1): 135-152.

Putnam, R.D. (1993), *Making Democracy Work. Civic Traditions in Modern Italy*. Princeton: Princeton University Press.

Raitano, M. (2014), L'impatto delle spese per l'abitazione di residenza sulla distribuzione dei redditi familiari in Italia, mimeo.

Rosenthal, S.S. and W. Strange (2004), Evidence on the Nature and Sources of Agglomeration Economies, in V. Henderson and Jacques-François Thisse (eds.) *Handbook of Regional and Urban Economics*, volume 4. Amsterdam: North-Holland, 2119-2171.

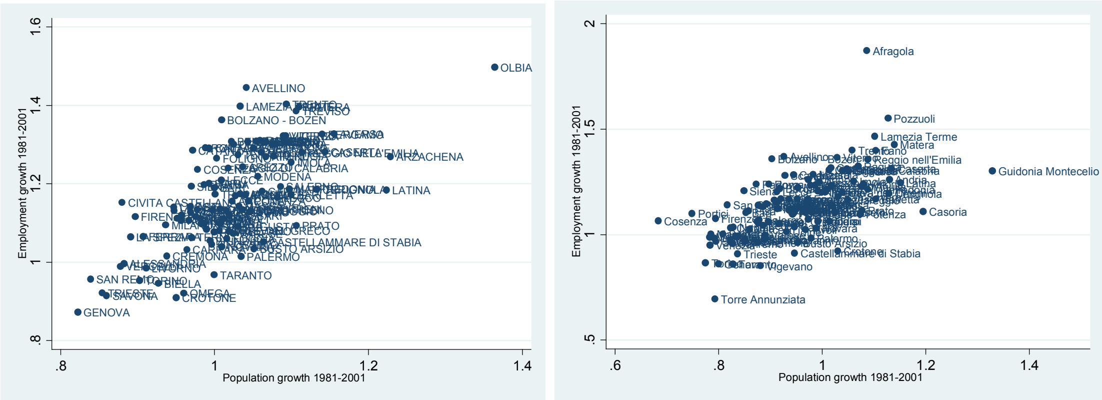
Shapiro, J.M. (2006), Smart cities: Quality of Life, Productivity, and the Growth Effects of human capital, *Review of Economics and Statistics* 88: 324-335.

Simon, C J. and C. Nardinelli (2002), Human Capital and the Rise of American Cities: 1900-1990", Regional Science and Urban Economics 32(1): 59-96.

Stock, J.H. and M. Yogo (2005), Testing for Weak Instrument in Linear IV Regression, in Andrews DWK (eds) *Identification and Inference for Econometric Models*. Cambridge: Cambridge University Press, UK, 80-108.

Figure 1. Population and Employment*

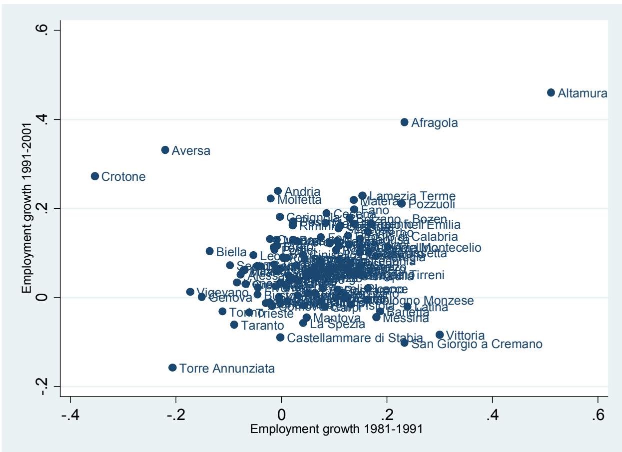
LLMs Cities



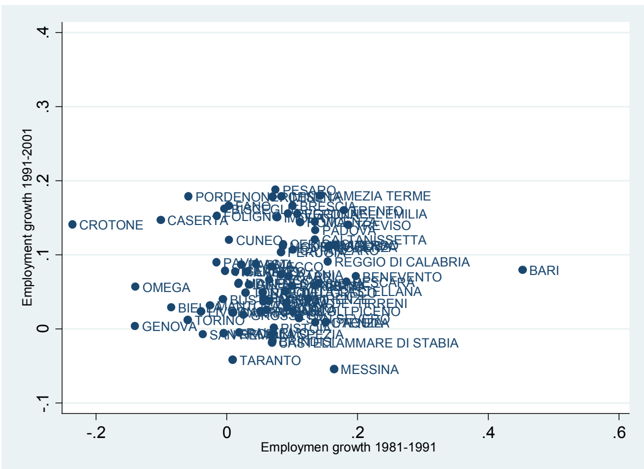
*Growth rates are computed as the ratio between final and initial values of each variable. Hence, a value of the growth rate <1 signals a reduction.

Figure 2. Persistence in employment growth

(a) Cities



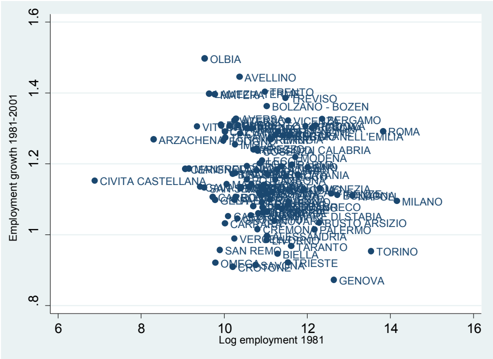
(b) LLMs



Sources: see text, paragraph 3

Figure 3. Convergence in employment

LLMs



Cities

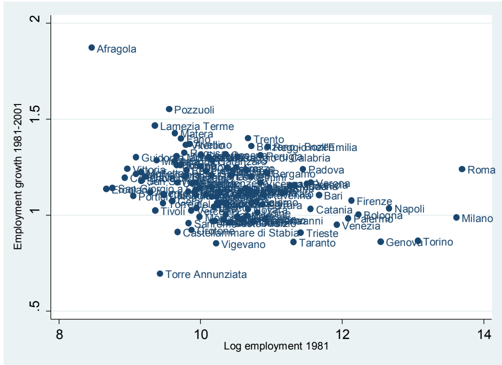
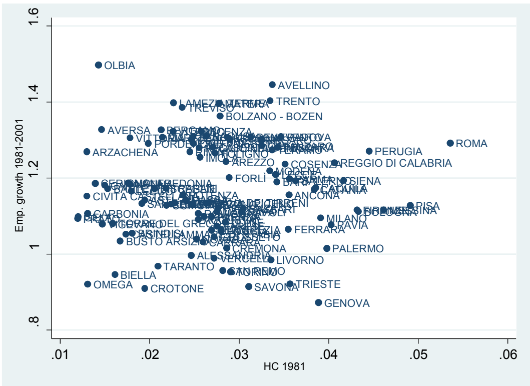


Figure 4. Human Capital and growth

LLMs



Cities

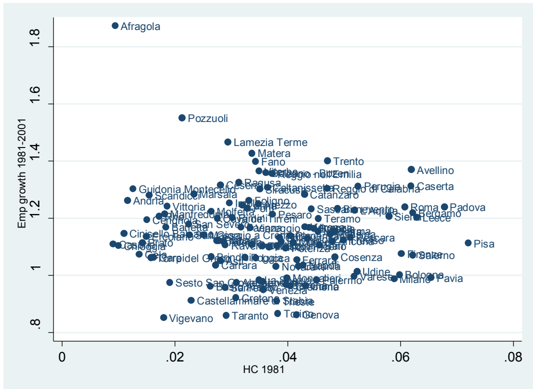


Table 1. Summary statistics

Local Labor Markets					
	Obs	Mean	Std. Dev.	Min	Max
Graduates share (overall)	342	0.046	0.024	0.012	0.125
in 1981	114	0.027	0.009	0.012	0.054
in 1991	114	0.038	0.013	0.013	0.072
in 2001	114	0.073	0.019	0.037	0.125
Employment growth 1981-2001	114	1.175	0.167	0.872	2.323
Population growth 1981-2001	114	1.019	0.082	0.822	1.364

Municipalities					
	Obs	Mean	Std. Dev.	Min	Max
Graduates share (overall)	373	0.059	0.034	0.009	0.173
in 1981	128	0.036	0.014	0.009	0.072
in 1991	125	0.051	0.021	0.012	0.105
in 2001	120	0.094	0.032	0.027	0.173
Employment growth 1981-2001	120	1.160	0.204	0.852	2.643
Population growth 1981-2001	120	0.958	0.109	0.683	1329

Sources: see text, paragraph 3

Table 2. Employment growth and human capital: LLMs.

Dep var.: employment growth	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log (Share of College Graduates), t-10	0.050**	0.122***	0.101***	0.207***	0.067**	0.225**	0.070*		0.237**
	(0.024)	(0.043)	(0.038)	(0.062)	(0.028)	(0.097)	(0.029)		(0.106)
Log (Employment), t-10	-0.022***	-0.331***	-0.265***	-0.990***			-0.142*	-0.295***	-0.288**
	(0.007)	(0.103)	(0.096)	(0.082)			(0.075)	(0.101)	(0.090)
Log (Share of W in Manufacturing), t-10		0.063**	0.012	0.132**	0.042*	0.004	0.040*	0.044*	0.154**
		(0.028)	(0.034)	(0.062)	(0.023)	(0.023)	(0.022)	(0.026)	(0.060)
Log (Share of Workers in Services), t-10		-0.008	0.007	-0.107	0.031	0.039	0.031	-0.019	0.010
		(0.055)	(0.060)	(0.078)	(0.042)	(0.069)	(0.040)	(0.054)	(0.054)
Log (Share of Workers in Trade), t-10		0.042	-0.031	0.121	0.048	0.352***	0.032	0.039	0.119*
		(0.070)	(0.084)	(0.087)	(0.056)	(0.132)	(0.055)	(0.069)	(0.061)
Log (Share Man), t-10*yearDummy			0.059**						
			(0.029)						
Log (Share Serv), t-10*year Dummy			-0.014						
			(0.071)						
Log (Share Trade), t-10*year Dummy			0.089						
			(0.104)						
Log (Share of College Graduates), 1951								0.070**	
								(0.028)	
Log(Employment), t_{1981}					-0.126				
					(0.089)				
Age Distribution	no	yes	yes	yes	yes	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes
Region fixed effects	no	yes	yes	yes	yes	yes	yes	yes	yes
LLM fixed effects	no	no	no	yes	no	yes	no	no	no
Observations	222	222	222	222	222	222	192	216	192
Local Labor Markets	111	111	111	111	111	111	96	108	96
R-squared	0.0287	0.252	0.290	0.290	0.290	0.208	0.282	0.229	0.267

The regressions measure the impact of the log of the share of college graduates on employment growth (ratio of employment between census waves. Standard errors, reported in parenthesis, have been adjusted for serial correlation within local labor markets. ***, **, * denote significance at the 1%, 5%, 10% level respectively.

Table 3. Employment growth and human capital: Cities.

Dep var.: employment growth	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log (Share of College Graduates), t-10	0.036**	0.094***	0.088***	0.135**	0.060**	0.102	0.071***		0.222***
	(0.018)	(0.034)	(0.034)	(0.054)	(0.054)	(0.082)	(0.025)		(0.080)
Log (Employment), t-10	-0.044***	0.219***	-0.201**	-1.026***			-0.118**	-0.163**	-0.281***
	(0.010)	(0.083)	(0.078)	(0.083)			(0.057)	(0.079)	(0.073)
Log (Share of Workers in Manufacturing), t-10		0.003	-0.023	0.040	-0.006	0.041	-0.012	-0.014	0.059*
		(0.026)	(0.034)	(0.058)	(0.024)	(0.088)	(0.026)	(0.028)	(0.034)
Log (Share of Workers in Services), t-10		0.028	0.040	-0.048	0.023	0.232*	0.003	0.067	-0.010
		(0.056)	(0.073)	(0.089)	(0.045)	(0.129)	(0.027)	(0.061)	(0.070)
Log (Share of Workers in Trade), t-10		-0.049	-0.093	-0.126	0.008	-0.107	0.002	-0.073	0.063
		(0.058)	(0.074)	(0.082)	(0.040)	(0.123)	(0.044)	(0.058)	(0.051)
Log (Share Man.), t-10*year Dummy			0.025						
			(0.031)						
Log (Share Serv.), t-10*year Dummy			-0.045						
			(0.093)						
Log (Share Trade), t-10*year Dummy			0.073						
			(0.067)						
Log (Share of College Graduates), 1951								0.012	
								(0.029)	
Log (Employment), t_{1981}					-0.098				
					(0.054)				
Lagged Age Distribution	no	yes	yes	yes	yes	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes
Region fixed effects	no	yes	yes	yes	yes	yes	yes	no	yes
Cities fixed effects	no	no	no	yes	no	yes	no	no	no
Observations	256	256	256	256	256	256	256	254	204
Cities	128	128	128	128	128	128	128	127	102
R-squared	0.028	0.235	0.252	0.079	0.247	0.059	0.255	0.207	0.321

The regressions measure the impact of the log of the share of college graduates on employment growth (ratio of employment between census waves. Standard errors, reported in parenthesis, have been adjusted for serial correlation within local labor markets. ***, **, * denote significance at the 1%, 5%, 10% level respectively.

Table 4. Employment growth and human capital in LLMs: Robustness tests.

Dep Var	Employment growth					Population	Emp. rate
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log (Share of College Graduates), t-10	0.109***	0.119***	0.100***	0.099***	0.061***	0.010	0.103***
	(0.041)	(0.042)	(0.036)	(0.033)	(0.020)	(0.014)	(0.032)
Log (Employment), t-10	-0.205**	-0.315***	-0.253***	-0.330***	-0.032		0.676***
	(0.097)	(0.106)	(0.084)	(0.084)	(0.059)		(0.078)
Log (Share of Workers in Manufacturing), t-10	0.043	0.061**	0.012	0.054***	0.056***	0.043***	0.013
	(0.027)	(0.028)	(0.042)	(0.020)	(0.018)	(0.011)	(0.025)
Log (Share of Workers in Services), t-10	0.156	-0.001	0.046	-0.026	0.026	0.035*	-0.044
	(0.099)	(0.055)	(0.056)	(0.045)	(0.035)	(0.020)	(0.047)
Log (Share of Workers in Trade), t-10	-0.027	0.031	-0.083	0.034	0.081**	0.010	0.021
	(0.075)	(0.069)	(0.081)	(0.055)	(0.041)	(0.021)	(0.053)
Log (Restaurants and Hotels per 100 inhabitants), t-10	-0.068						
	(0.042)						
Log (Museums and Ricreational Estab. per 100 inh.), t-10	-0.031						
	(0.022)						
Log (Membership Organizations per 100 inhabitants), t-10	-0.028						
	(0.022)						
Log(Electoral turnout), t-10		-0.011					
		(0.011)					
Log (Population), t-10						0.108	-1.277***
						(0.112)	(0.255)
Lagged Age Distribution	yes	yes	yes	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	yes	yes	yes	yes
Region fixed effects	yes	yes	yes	yes	yes	yes	yes
Year-Region fixed effects	no	no	yes	no	no	no	no
Year-Sector fixed effects	no	no	yes	no	no	no	no
LLM fixed effects	no	no	no	no	no	no	no
Observations	222	218	222	272	172	222	222
LLMs	111	109	111	136	86	111	111
R-squared	0.299	0.243	0.348	0.255	0.451	0.477	0.960

Standard errors, reported in parenthesis, have been adjusted for serial correlation between cities. ***, ** , * denote significance at the 1%, 5%, 10% level respectively.

Table 5. Employment growth and human capital in cities: Robustness tests.

Dep Var	Employment growth					Population	Emp. rate
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log (Share of College Graduates), t-10	0.080**	0.094***	0.092***	0.105***	0.056**	0.023	0.073***
	(0.035)	(0.034)	(0.030)	(0.024)	(0.028)	(0.015)	(0.028)
Log (Employment), t-10	-0.192**	-0.218***	-0.191***	-0.241***	-0.046		0.779***
	(0.083)	(0.083)	(0.071)	(0.061)	(0.041)		(0.061)
Log (Share of Workers in Manufacturing), t-10	0.001	0.004	-0.047	0.034	0.033	0.031**	-0.029
	(0.026)	(0.026)	(0.045)	(0.021)	(0.024)	(0.015)	(0.022)
Log (Share of Workers in Services), t-10	0.064	0.035	-0.003	-0.001	0.083	-0.010	0.018
	(0.067)	(0.057)	(0.075)	(0.045)	(0.065)	(0.024)	(0.048)
Log (Share of Workers in Trade), t-10	-0.042	-0.050	-0.113	0.006	0.060	0.027	-0.076*
	(0.055)	(0.058)	(0.073)	(0.046)	(0.043)	(0.029)	(0.044)
Log (Restaurants and Hotels per 100 inhabitants), t-10	-0.020						
	(0.026)						
Log (Museums and Ricreational Estab. per 100 inh.), t-10	-0.034						
	(0.025)						
Log (Membership Organizations per 100 inhabitants), t-10	0.022						
	(0.024)						
Log(% Electoral turnout), t-10		-0.018**					
		(0.008)					
Log (Population), t-10						0.427***	-1.214***
						(0.139)	(0.223)
Lagged Age Distribution	yes	yes	yes	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	yes	yes	yes	yes
Region fixed effects	yes	yes	yes	yes	yes	yes	yes
Year-Region fixed effects	no	no	yes	no	no	no	no
Year-Sector fixed effects	no	no	yes	no	no	no	no
LLM fixed effects	no	no	no	no	no	no	no
Observations	256	256	256	344	192	256	256
LLMs	128	128	128	172	96	128	128
R-squared	0.251	0.240	0.309	0.295	0.332	0.471	0.961

Standard errors, reported in parenthesis, have been adjusted for serial correlation between cities. ***, ** , * denote significance at the 1%, 5%, 10% level respectively.

Table 6. The relationship between human capital and employment growth in LLMs across time and space.

Dep var: employment growth	(1)	(2)	(3)	(4)
Log (Share of College Graduates), t-10	0.071**	0.125***	0.075***	0.107***
	(0.029)	(0.043)	(0.027)	(0.039)
Log (Employment), t-10	-0.022***	-0.328***	-0.016**	-0.340***
	(0.007)	(0.106)	(0.007)	(0.108)
Log (Share of Workers in Manufacturing), t-10		0.062**		0.067**
		(0.030)		(0.028)
Log (Share of Workers in Services), t-10		-0.007		-0.005
		(0.055)		(0.055)
Log (Share of Workers in Trade), t-10		0.040		0.054
		(0.071)		(0.066)
Log (Share of College Graduates), t-10*year Dummy	-0.038	-0.007		
	(0.040)	(0.039)		
Log (Share of College Graduates), t-10*South Dummy			-0.057	0.039
			(0.037)	(0.049)
Lagged Age Distribution	no	yes	no	yes
Year fixed effects	yes	yes	yes	yes
Region fixed effects	no	yes	no	yes
LLM fixed effects	no	no	no	no
Observations	222	222	222	222
LLMs	111	111	111	111
R-squared	0.0328	0.254	0.0469	0.260
Estimation model	OLS	OLS	OLS	OLS

Table 6 shows the time-variant (col. 1 and 2) and space-variant (col. 3 and 4) impact of the log of the share of college graduates on employment growth at the LLM level. Standard errors, reported in parenthesis, have been adjusted for serial correlation within LLMs. ***, ** , * denote significance at the 1%, 5%, 10% level respectively. Sources: see text.

Table 7. The relationship between human capital and employment growth in cities across time and space.

Dep var: employment growth	(1)	(2)	(3)	(4)
Log (Share of College Graduates), t-10	0.041**	0.093***	0.047**	0.099***
	(0.019)	(0.033)	(0.019)	(0.031)
Log (Employment), t-10	-0.045***	-0.218***	-0.042***	-0.224***
	(0.010)	(0.084)	(0.010)	(0.083)
Log (Share of Workers in Manufacturing), t-10		0.003		-0.001
		(0.027)		(0.028)
Log (Share of Workers in Services), t-10		0.027		0.027
		(0.057)		(0.055)
Log (Share of Workers in Trade), t-10		-0.048		-0.056
		(0.058)		(0.059)
Log (Share of College Graduates), t-10*2001 Dummy	-0.009	0.001		
	(0.024)	(0.026)		
Log (Share of College Graduates), t-10* South Dummy			-0.022	-0.012
			(0.030)	(0.035)
Lagged Age Distribution	no	yes	no	yes
Year fixed effects	yes	yes	yes	yes
Region fixed effects	no	yes	no	yes
LLM fixed effects	no	no	no	no
Observations	256	256	256	256
Cities	128	128	128	128
R-squared	0.0859	0.235	0.0943	0.240
Estimation model	OLS	OLS	OLS	OLS

Table shows the time-variant (col. 1 and 2) and space-variant (col. 3 and 4) impact of the log of the percent college graduates on employment growth at the city level. Standard errors, reported in parenthesis, have been adjusted for serial correlation within cities. ***, **, * denote significance at the 1%, 5%, 10% level respectively. Sources: see text.

Table 8. Human capital, house values and wage growth: LLMs.

	(1)	(2)	(3)	(4)	(5)
	PANEL A. Dependent variable is growth in House value				
Log (Share of Coll Grad), t-10	0.245***	0.207***	0.190***	0.090	0.246
	(0.069)	(0.062)	(0.060)	(0.114)	(0.347)
Log (House value), t-10	-1.052***	-1.337***	-1.350***	-1.700***	-1.355***
	(0.115)	(0.087)	(0.085)	(0.064)	(0.091)
	PANEL B. Dependent variable is growth in Wage				
Log (Share of College Graduates), t-10	0.029***	0.029***	0.023***	0.029**	0.096**
	(0.007)	(0.006)	(0.006)	(0.012)	(0.047)
Log (Rental price), t-10	-0.091***	-0.101***	-0.097***	-0.118***	-0.099***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Year fixed effects	yes	yes	yes	yes	yes
Region fixed effects	no	yes	yes	no	yes
LLM fixed effects	no	no	no	yes	no
Other variables in Table 7	no	yes	yes	yes	yes
Observations	191	191	191	191	188
Local Labor Markets	101	101	101	101	99
R-squared	0.329	0.525	0.564	0.894	0.519
Estimation Method	OLS	OLS	OLS	OLS	IV

Table 8 shows the impact of the log of the share of college graduates on the dependent variable in LLMs. House values and wage growth are measured as the log change in LLM fixed effects obtained as described in Appendix C. Standard errors, reported in parenthesis, have been adjusted for serial correlation within LLMs. ***, ** , * denote significance at the 1%, 5%, 10% level respectively.

Table 9. Human capital, house values and wage growth: cities.

	(1)	(2)	(3)	(4)
	PANEL A. Dependent variable is growth in House values			
Log (Share of College Graduates), t-10	0.207***	0.131**	0.108*	0.197*
	(0.054)	(0.056)	(0.060)	(0.109)
Log (House value), t-10	-1.177***	-1.247***	-1.242***	-1.466***
	(0.068)	(0.059)	(0.068)	(0.058)
	PANEL B. Dependent variable is growth in Wages			
Log (Share of College Graduates), t-10	0.008*	0.003	0.003	0.016*
	(0.005)	(0.005)	(0.005)	(0.008)
Log (Wage), t-10	-0.064***	-0.076***	-0.110***	-0.110***
	(0.007)	(0.006)	(0.006)	(0.006)
Year fixed effects	yes	yes	yes	yes
Region fixed effects	no	yes	yes	no
City fixed effects	no	no	no	yes
Other variables in Table 8	no	yes	yes	yes
Observations	200	200	200	200
Cities	108	108	108	108
R-squared	0.612	0.739	0.751	0.951
Estimation Method	OLS	OLS	OLS	OLS

Table 9 shows the impact of the log of the share of college graduates on the dependent variable at the city level. House values and wage growth are measured as the log change in city fixed effects obtained as described in Appendix C. Standard errors, reported in parenthesis, have been adjusted for serial correlation within cities. ***, ** , * denote significance at the 1%, 5%, 10% level respectively.

Table 10. Human Capital and Growth: productivity and amenity channel (α = 0.65).

Share of spending on housing $(1-\mu)$	Eq. (11) and (12)	Impact of human capital on growth of: *Productivity* β^a	*Quality of life* β^q	**Share due to quality of life** $\frac{\beta^q}{\mu\beta^a+\beta^q}$
LLM				
0.31	Avg $\hat{\beta}_{wage}$ $\hat{\beta}_{price}$	0.102	0.013	0.05
0.40		0.102	0.031	0.12
CITIES				
0.31	Avg $\hat{\beta}_{wage}$ $\hat{\beta}_{price}$	0.065	0.021	0.33
0.40		0.065	0.034	0.42

Calculations of the parameters β^a and β^q are based on formulas (11) and (12) in Appendix D. Theoretically, the values of β^a and β^q should not change when either $\hat{\beta}_{wage}$ or $\hat{\beta}_{price}$ are used to determine their values. Empirically this occurs because our calibration slightly deviates from the relationship $\hat{\beta}_{price} = \hat{\beta}_{emp} + \hat{\beta}_{wage}$. Thus, we use an average of the values stemming from the two different takes of equations (11) and (12).

Table A. Highest and lowest house prices and wage fixed effects, 2000. City and LLM levels.

A. House values fixed effects
VPC: cities=0.461; LLMs=0.472

	Shapiro (2006) Strategy				Multilevel Analysis			
	Cities		**LLM**		**Cities**		**LLM**	
Highest	Siena, SI	(0.38)	BOLZANO	(0.94)	Siena, SI	(0.88)	BOLZANO	(0.80)
	Bolzano, BZ	(0.29)	CUNEO	(0.71)	Bolzano, BZ	(0.78)	CUNEO	(0.59)
	Viareggio, LU	(0.13)	SIENA	(0.66)	Viareggio, LU	(0.63)	SIENA	(0.57)
	Firenze, FI	(0.05)	LA SPEZIA	(0.65)	Firenze, FI	(0.55)	LA SPEZIA	(0.56)
	Milano, MI	(0.03)	CESENA	(0.60)	Bologna, BO	(0.47)	CESENA	(0.50)
Lowest	Andria, BT	(-1.04)	TARANTO	(-0.44)	Caltanissetta, CL	(-0.44)	LAMEZIA T.	(-0.39)
	Caltanissetta, CL	(-1.04)	LAMEZIA T.	(-0.42)	Andria, BT	(-0.45)	TARANTO	(-0.40)
	Marsala, TP	(-1.05)	CALTANIS	(-0.35)	Marsala, TP	(-0.47)	CALTANIS	(-0.40)
	Taranto, TA	(-1.09)	CROTONE	(-0.42)	Crotone, KR	(-0.53)	CROTONE	(-0.47)
	Crotone, KR	(-1.10)	MARSALA	(-0.44)	Taranto, TA	(-0.53)	MARSALA	(-0.50)

C. Hourly wage fixed effects
VPC: cities=0.06; LLMs=0.062

	Shapiro (2006) Strategy				Multilevel Analysis			
	Cities		**LLM**		**Cities**		**LLM**	
Highest	Padova, PD	(0.35)	PADOVA	(0.30)	Piacenza, PC	(0.14)	PIACENZA	(0.14)
	Piacenza, PC	(0.16)	PIACENZA	(0.24)	Milano, MI	(0.09)	PISTOIA	(0.09)
	Pistoia, PT	(0.12)	PISTOIA	(0.21)	Pistoia, PT	(0.08)	BOLZANO	(0.09)
	Prato, PO	(0.14)	MASSA	(0.20)	Bolzano, BZ	(0.08)	PRATO	(0.08)
	Rho, MI	(0.11)	PRATO	(0.19)	Prato, PO	(0.06)	RAVENNA	(0.08)
Lowest	S.G. Crem, NA	(-0.32)	FOGGIA	(-0.21)	S.G. Crem, NA	(-0.10)	SALERNO	(-0.15)
	Foggia, FG	(-0.35)	ALTAMURA	(-0.22)	Salerno, SA	(-0.11)	T. GRECO	(-0.17)
	Ragusa, RG	(-0,36)	CROTONE	(-0.25)	Foggia, FG	(-0.15)	RAGUSA	(-0.17)
	Crotone, KR	(-0.38)	RAGUSA	(-0.35)	Marsala, TP	(-0.16)	ALTAMURA	(-0.21)
	Marsala, TP	(-0,67)	FOGGIA	(-0.44)	Ragusa, RG	(-0.17)	MARSALA	(-0.26)

House values fixed effects are the coefficients on cities and LLMs dummies in cross-section regressions (multilevel regressions) of the log value of dwellings on these dummies and controls for observable housing characteristics. Hourly wage fixed effects are the coefficients on city and LLM dummies in cross-section regressions (multilevel regressions) of the log of hourly wages on these dummies and controls for observable worker features. See Appendix B.

Appendix A: Data Sources

Variable	Description and Sources
Population	Data refer to resident population. Population Censuses 1861-2001, ISTAT. The 1891 and the 1941 population Censuses were not carried out because of financial difficulties in the first case and WWII in the second one. From 1971 to 2001 data on population are from "Atlante Statistico dei Comuni", ISTAT.
Employment	Employment is the sum of all workers over the ISTAT economic activities' classification "Ateco". Agricultural workers are not taken into account. Industrial and Commercial Censuses 1911-2001, ISTAT. Data for 1911 are from Industrial Census, 1911, Vol. I, Table 1 and Vol. IV, Table IV. Data for 1927 are from Industrial and Commercial Census, 1927, Vol. V and Vol.1. Data for 1951 are from Industrial and Commercial Census, 1951, Vol.1. From 1971 to 2001 data on employment are from "Atlante Statistico dei Comuni", ISTAT.
Share of workers in manufacturing	Employment in manufacturing over total employment. Industrial and Commercial Census, 1951-2001, ISTAT. From 1971 to 2001 data are from "Atlante Statistico dei Comuni", ISTAT. Ateco Section: D
Share of workers in services	Employment in services over total employment. Industrial and Commercial Census, 1951-2001, ISTAT. From 1971 to 2001 data are from "Atlante Statistico dei Comuni", ISTAT. Ateco Sections: K and M
Share of workers in trade	Employment in trade over total employment. Industrial and Commercial Census, 1951-2001, ISTAT. From 1971 to 2001 data are from "Atlante Statistico dei Comuni", ISTAT. Ateco Section: G
Share of college graduates	Number of persons with a university degree over population. Population Census, 1951-2001, ISTAT. From 1971 to 2001 data are from "Atlante Statistico dei Comuni", ISTAT.
Local area wages	Obtained as the cities (or LLMs) fixed effects of independent cross-sectional regressions where we control for age, age squared, civil status dummies, education dummies, sector of economic activity dummies and occupation category dummies. Bank of Italy's Survey on Household Income and Wealth, SHIW, 1987, 1991, 2000.
Local area house values	Obtained as the cities (LLMs) fixed effects of independent cross-sectional regressions where we control for surface, number of bathrooms, presence of an heating system, year of construction, location dummies, category dummies and use status dummies. SHIW, 1986, 1991, 2000.
Local area rents	Obtained as the cities (LLMs) fixed effects of independent cross-sectional regressions where we control for surface, number of bathrooms, presence of an heating system, year of construction, location dummies, category dummies and use status dummies. SHIW, 1986, 1991, 2000.
Restaurants & hotels per 100 inhabitants	Number of Restaurants and Hotels over population (*100). Data are from "Atlante Statistico dei Comuni". Ateco Section: H
Museums & recreat. establishments per 100 inhabitants	Number of museums and recreational establishments over population (*100). Data are from "Atlante Statistico dei Comuni". Ateco Section: O, Two-Digit Code: 92.
Membership Org. per 100 inhabitants	Number of associative organizations over population(*100). Data are from "Atlante Statistic dei Comuni". Ateco Section: O, Two-Digit Code: 91
Enrollment share, 1931(high school)	Number of persons enrolled in a high school over population in 1931. "Annuario delle Città Italiane", Parte II, 1934. Istituto Nazionale di Urbanistica.
FOI, price index.	Blue and white collar workers price index. http://dati.istat.it/

Appendix B: Data Construction

In order to construct data on **house values and wages**, we used two procedures. First, we adopt the procedure used in Gabriel and Rosenthal (2004) and Shapiro (2006). We extract from the Bank of Italy's Survey on Household Income and Wealth (SHIW) **real estate values** for the years 1986, 1991 ad 2000. SHIW reports city codes only from 1986 onwards, so we are limited to use 1986 as starting point and then, as in Shapiro (2006), we standardize the 1986-1991 growth rate to be a ten-year growth rate in the 1981-

2001 period. We restrict our sample only to dwellings (trimming at the 1st and 99th percentile of the distribution of dwelling values).

Then we regress the log of reported dwelling values on city-dummies as well as on a set of controls for dwelling characteristics (surface in square meters, an indicator variable equal to one if two or more bathrooms are available, an indicator variable equal to one if an heating system is available, the year built, dummies for dwelling location, dummies for dwelling category and dummies for use status: see below, Appendix C). We run these regressions separately for each year, so we end up with three house values cross-section series for the years 1986, 1991 and 2000. For each year, we use the coefficients on city dummies as estimates of local differences in house values.

As far as **wages** are concerned, we construct the hourly wage series as follows. We extract from SHIW all workers of age between 15 and 65 in the years 1987, 1991 and 2000. Hourly wages are calculated by dividing the annual earnings by the total amount of hours worked in a year. The sample is trimmed at the 1st and 99th percentile of the distribution of hourly wages. We then regress the log of the hourly wage for each individual on dummies for each city, age and its square, dummies for civil status, educational attainment, sector of economic activity and occupational category. Observations with missing values of the controls were dropped. We estimate separated regressions for each year, so we ended up with three wage series for the years 1987, 1991 and 2000. Relative house values and hourly wage levels in LLMs are obtained by performing the same procedure used in the case of cities. The only difference is that we used dummies for LLMs rather than for cities.

The second way to detect the context-specific effects (i.e. those effects specific of a city or of an LLM) on house prices and individual productivity, is to perform a multilevel analysis (Bosker and Snijders, 2012). We run multilevel regressions separately for each year, where we use dwellings' and workers' characteristics as level-1 variables and city and LLM identifiers as level-2 variables. We extract these coefficients for each city and LLM.

Table A lists the 5 highest and lowest house prices and wages in 2000 for both cities and LLMs obtained with these two strategies. The table shows that city and LLM effects remain robust across alternative estimation methods. In addition, for each variable, we report the variance partitioning coefficient (VPC) which show the percentage of variance of the property prices and individual wages explained by the context-specific effect both at the city and LLM level.

Since these coefficients could be biased because of possible omitted characteristics of workers or of dwellings in the sample, we show that our estimates of local differences in house values and wages are not a mere artifact exploiting different sources of data. For example *Il Reddito nei Comuni Italiani* from 1981 to 1987 published every two years by the Banco di Santo Spirito contains per capita income of all Italian cities. We collected data for the year 1987. Considering 128 cities for which the estimated wage coefficient is available, the correlation between these two measures is 0.63 in 1987 (statistically significant at 1 percent level).

Appendix C: Local Wages, House Values, Rents and the Share of Spending on Housing.

C.1 Measuring Local Area Wages

In order to measure relative hourly wage levels in cities at time t, we regress the log of hourly wage of all workers of age between 15 and 65 in the sample at time *t*, on dummies for cities and a set of controls. In what follows we describe each variable in detail (SHIW variable name in parentheses).

- Hourly wages are calculated by dividing annual earnings by the total amount of hours worked in a year. Annual earnings are those from any activity as employee, including fringe benefits net of taxes an social security contributions (YLM+YLNM). We obtain the total amount of hours worked in a year as average (hours worked per week · months worked · 4.3333 (ORETOT · MESILAV · 4.3333). The sample is trimmed at the 1st and 99th percentile of the distribution of hourly wages.

Set of controls:

- Age in years (ETA) and the square of age in years.

- Civil status (STACIV). The categories are married (code 1); never married or single (code 2); separated or divorced (code 3) and widowed (code 4);

- Educational attainment (STUDIO). The categories, which correspond to completed years of schooling are: none (code 1); primary school (code 2); lower secondary school (code 3); upper secondary school (code 4); university degree (code 5) and postgraduate education (code 6). Observations with missing data on educational attainment were dropped from the hourly wage regression.

- Sector of economic activity (SETTP9). The categories are: agriculture (code 1); industry (code 2); construction (code3); wholesale and retail trade, business and repair services, hotel and restaurants (code 4); transportation and telecommunications (code 5); finance and insurance (code 6); real estate, professional and related services (code 7); public administration and other public and private services (code 8); and not professional condition (code 9). We chose SETTP9 because this variable was available for all the years we were interested in. Observations with missing data on sector of actvity were dropped from the hourly wage regression.

- Occupational category (QUALP10). This variable divides workers into two groups: employees and self-employed/employers. Since our dependent variable is hourly wage as employee, we restict the sample to employees. The categories are: laborer (code 1); employee or teacher (code 2); mid executive level manager (code 3), manager (code 4). The variable (QUALP10) is not available for the year 1987 so we used for this year the variable (QUALP7N). Codes and categories do not change at all. Observations with missing data on occupation were dropped from the regression.

In order to measure relatively hourly wage levels in LLMs, we match each city with the local labor market to which that city belongs. As a result we have 442 cities associated with 277 LLMs. The definition of LLMs we used is based on the 2001 ISTAT classification. Then we follow the same procedure as that described above.

C.2 Measuring Local Area House Values and Rents

In order to measure relative house values in cities in 1986, 1991 and 2000, we regress the log of the value of all dwellings at time *t*, on dummies for cities and on a set of controls. The dependent variable and housing characteristics are described below (variable name as reported in SHIW are in parentheses).

- House Value (VALABIT). SHIW reports the value of four types of real estate: dwelling (code 1); other building (code 2); agricultural land (code 3); and not agricultural land (code 4). We limit our sample to only dwellings. The sample is trimmed at the 1st and 99th percentile of the distribution of dwellings value.

Set of controls:

- Surface in square meters (SUPAB).
- An indicator variable equal to one if two or more bathrooms are available in the dwelling (BAGNI). This variable is not available for the years 1991 and 1986.
- An indicator variable equal to one if an heating system is available in the dwelling (RISCALD). This variable is not available for the years 1991 and 1986.
- Year built (ANCOSTR). This variable contains the year of construction of the dwelling.
- House's locatio**n** (UBIC1). This variable indicates the position of the dwelling as follows: countryside, isolated area (code 1); town outskirts (code 2); area between outskirts and city center (code 3); city center (code 4); other (code 5); and hamlet (code 6). In 1991 and 1986 we used the variable (UBIC) rather than (UBIC1).
- Dwelling's category (CATABIT). The categories are: luxury (code 1); upscale (code 2); mid-range (code 3); modest (code 4); low-income (code 5); very-low income (code 6); rural (code 7); and other (code 8).
- Use status (USOIMM). The categories are: main dwelling (code 1); vacation residence (code 2); professional or commercial use (code 3); rented out to individuals or households during the whole year (code 4); rented out to companies during the whole year (code 5); rented out to individuals or households

in a part of the year (code 6); rented out to companies in a part of the year (code 7); not rented out (code 8); other (code 9).

In order to obtain rents in cities in 1986, 1991 and 2000, we regress the log of annual rent of all dwellings in the sample in each year on dummies for cities and the set of controls described above.

For each household, the interviewed can be either the tenant or the property owner. In the case the interviewed is the tenant, SHIW reports the actual rent paid by the tenant. If the interviewed is the property owner, SHIW collects the rent the owner charges. In both cases the variable of interest is called (AFFEFF). If the interviewed is the property owner but the dwelling is not rented or it is the family residence, SHIW reports her best estimate for the rent she could charge (AFFIMP).

Since the two conditions are mutually exclusive and in order to get a complete series of annual rents we combine the two variables. Our sample of annual rents is restricted to dwellings and it is trimmed at the 1st and 99th percentile of the distribution of rents.

We repeated the same procedure to calculate the house value and annual rents for LLMs.

C.3 Estimating the share of spending on housing.

Given the Cobb-Douglas form of the utility function, the expenditure function is $(\mathrm{Q_i}, \mathrm{P_i}, \overline{\mathrm{U}}) = \frac{\overline{\mathrm{U}}\mathrm{P_i}}{\gamma \mathrm{Q_i}}$. Taking logs and differentiating w.r.t. $\mathrm{P_i}$ yields:

$$\frac{d \log\ (E(Q_i,P_i,\overline{U}))}{d \log(P_i)} = (1-\mu) \qquad \text{(C.3)}$$

where we assumed that Q_i remains constant. The equation (C.3) suggests two ways to estimate the share of spending on housing, a parameter we need to calibrate the model shown in Appendix D.

In the first strategy we estimated $(1-\mu)$ by using micro-data in the SHIW survey. The archive (CONS) reports the total consumption for 15191 individuals. We match this dataset with the archives (COMP) which contains information about consumers' characteristics. We focus on the year 2000. We regress the log of the annual total consumption on the log of the annual rent[24]. Table (C.3.1) presents the results of this exercise. Column (1) shows an elasticity of 0.36 percent when the rental price is included as the only regressor. A one percent increase in the implicit price of land increases consumption expenditure by 0.36 percent. This elasticity becomes approximately 0.31 percent when we control for individuals' characteristics (column, 2).

The second way of estimating $(1-\mu)$ is to use a city-level price index and regress the log of this price index on the log of the rental price. ISTAT makes two price indices available for 70 large cities: the FOI (blue and white collar workers price index) and the NIC (based on the total population).[25] We use the FOI because it is the official price index used to adjust rents. Table (C.3.2) shows that a one percent increase of rental price raises the cost of living by about 0.33 percent (column, 1). As we argued in the paper, the rental price coefficients could be biased if there are some omitted characteristics of the dwellings or because of measurement error. To deal with these potential concerns and following Shapiro (2006), we use the housing price as instrument for the rental price. Column 2 in Table C.3.2 shows that the estimate increases to 0.427 percent consistent with the presence of measurement error in the first column.

Together, these two methods confirm that a reasonable estimate of the share of spending on non-traded goods lies between 0.31 and 0.43.

[24] We construct the series of the annual rents as explained in section A.2

[25] At the city-level, the FOI is available from 1996 onwards; the NIC from 1999 onwards. We combine 70 cities of our sample with the FOI dataset in the year 2000.

Table C.3.1. Estimating the share of spending on housing in total consumption (using house values), 2000.

Dependent variable: log (Total Consumption)

	(1)	(2)	(3)	(4)
Log (House value)	**0.351**	**0.307**		
	(0.007)***	(0.006)***		
Log (Rental price)			**0.365**	**0.312**
			(0.008)***	(0.008)***
Individual's Characteristics listed in section A.1	no	yes	no	yes
Observations	15191	15191	15191	15191
R-squared	0.215	0.320	0.217	0.323

Robust standard errors are reported in parenthesis. ***, ** , * denote significance at the 1%, 5%, 10% level respectively. Sources: see text.

Table C.3.2
Estimating the share of spending on housing (using rental prices), 2000.

Dependent variable: log (FOI cost of living index)

	(1)	(2)
Log (Rental price)	**0.334**	**0.427**
	(0.012)***	(0.019)***
Observations	70	70
R-squared	0.460	
Estimation method	OLS	2SLS

Robust standard errors are reported in parenthesis. ***, ** , * denote significance at the 1%, 5%, 10% level respectively. Sources: see text.

Appendix D.
Theoretical Framework. Distinguishing between productivity- and amenity-led growth.

We follow Shapiro (2006). Consider an economy partitioned in I non overlapping areas, indexed by i = 1, 2,…., I. Each area is endowed with a specific productivity factor which enters the production function (A_i) and quality of life which enters the utility function (Q_i). Firms are identical and assumed to be perfectly mobile across locations. Representative firm use a Cobb-Douglas technology and produce a homogeneous tradable good at the numeraire price of 1 by using land and labor. The production function in location i is $Y_i = A_i\,(L^F)_i^{1-\alpha} N_i^{\alpha}$, where L^F denotes the quantity of land used in production and N denotes the quantity of labor. Profit maximization and spatial equilibrium imply that the following condition must hold for all i :

$$\frac{\eta W_i^{\alpha} P_i^{1-\alpha}}{A_i} = 1 \qquad (1)$$

where $\eta \equiv \alpha^{-\alpha}(1-\alpha)^{\alpha-1}$. Because of constant returns to scale, firms make zero profit in equilibrium and equation (1) can be interpreted as a free-entry condition in the good market.

Consumers are identical and choose among a set of locations. They have Cobb-Douglas utility over the freely-tradable homogeneous good and land which is the non-traded good. Utility function in area i is given by $U_i = Q_i Y_i^{\mu} (L^c)_i^{1-\mu}$ and it is maximized under the budget constraint $W_i = Y_i + P_i (L^c)_i$. Here L^c denotes the quantity of land consumed. Spatial equilibrium requires that the indirect utility funcion must be constant across areas, therefore we have for all i and some constant $\overline{U}$:

$$\frac{\gamma Q_i W_i}{P_i^{1-\mu}} = \overline{U} \qquad (2)$$

where $\gamma \equiv \mu^{\mu}(1-\mu)^{1-\mu}$.

Area size, defined as the number of local workers, is endogenous. Optimization problem for firms located in area i implies that the demands for labor N and land L^F are given respectively by $N_i = \alpha\, Y_i/W_i$ and $L^F = (1-\alpha)\, Y_i/P_i$. In equilibrium labor demand must be equal to its local supply. We assume a fixed local supply of land $\overline{L_i}$ which must be equal to the total demand for land. The latter is given by the sum of land demanded by firms plus the land demanded by workers, that is $\overline{L_i} = (1-\alpha)\, Y_i/P_i + N_i\,(1-\mu)\, W_i/P_i$. Solving the model, we get the third equilibrium condition:

$$N_i = \theta P_i^{\mu} \qquad (3)$$

Where

$$\theta \equiv \left(\frac{\alpha}{1-\alpha}\right)\left(\frac{\mu}{1-\mu}\right)^{\mu}\left(\frac{\overline{L_i}}{\overline{U}}\right)$$

Equations (1), (2) and (3) determine simultaneously W_i, P_i and N_i . Our focus is on changes in the productivity level A_i and quality of life level Q_i and these are the only area-specific attributes that we allow to change over time. By totally differentiating (1) and (2) with respect to time and after some manipulations we get to the following expressions for the changes in land rents and wages:

$$\frac{d\log(P_i)}{dt} = \frac{\alpha}{(1-\alpha\mu)}\left[\frac{d\log(Q_i)}{dt} + \frac{1}{\alpha}\frac{d\log(A_i)}{dt}\right]$$

$$\frac{d\log(W_i)}{dt} = \frac{(1-\mu)}{(1-\alpha\mu)}\frac{d\log(A_i)}{dt} - \frac{(1-\alpha)}{(1-\alpha\mu)}\frac{d\log(Q_i)}{dt} \qquad (4)$$

Given the form of the production function and of the utility function, α and $(1-\alpha)$ represent the share of labor and land in firm's cost function respectively, and $(1-\mu)$ is the share of land in the household's budget. Moreover, we assume that $d\overline{U}/dt = 0$. From equation (3) and by using (4), empl oyment growth can be written as

$$\frac{d\log(N_i)}{dt} = \frac{1}{(1-\alpha\mu)}\left[\frac{d\log(Q_i)}{dt} + \mu\,\frac{d\log(A_i)}{dt}\right] \qquad (5)$$

Equations (4) and (5) must hold for all areas i and they yield standard results in the urban literature. First, increases in urban productivity will raise rents, wages and employment; second, increases in the quality of life or consumption amenities will increase employment and rents, but reduce wages.

Let $H_{i,t}$ denotes the share of human capital in the area i at time t and let $X_{i,t}$ be a vector of measurable exogenous area characteristics. Assume that

$$log\left(\frac{A_{i,t+1}}{A_{i,t}}\right) = H_{i,t}\,\beta^{a} + X_{i,t}\delta^{a} + \epsilon^{a}_{i,t+1}$$

$$log\left(\frac{Q_{i,t+1}}{Q_{i,t}}\right) = H_{i,t}\,\beta^{q} + X_{i,t}\delta^{q} + \epsilon^{q}_{i,t+1} \qquad (6)$$

where $\epsilon_{i,t+1}^{j}$ for $j = a, q$ is an error term which has zero mean and is orthogonal to $H_{i,t}$ and $X_{i,t}$. From (4) and (5) and by substituting (6) we get

$$\log\left(\frac{N_{i,t+1}}{N_{i,t}}\right) = \underbrace{\left[\frac{1}{(1-\alpha\mu)}\beta^{q} + \frac{\mu}{(1-\alpha\mu)}\beta^{a}\right]}_{\hat{\beta}_{emp}} H_{i,t} + \left[\frac{1}{(1-\alpha\mu)}\delta^{q} + \frac{\mu}{(1-\alpha\mu)}\delta^{a}\right] X_{i,t} + \varepsilon_{i,t+1}^{N} \quad (7)$$

$$\log\left(\frac{W_{i,t+1}}{W_{i,t}}\right) = \underbrace{\left[\frac{(1-\mu)}{(1-\alpha\mu)}\beta^{a} - \frac{(1-\alpha)}{(1-\alpha\mu)}\beta^{q}\right]}_{\hat{\beta}_{wage}} H_{i,t} + \left[\frac{(1-\mu)}{(1-\alpha\mu)}\delta^{a} - \frac{(1-\alpha)}{(1-\alpha\mu)}\delta^{q}\right] X_{i,t} + \varepsilon_{i,t+1}^{W} \quad (8)$$

$$\log\left(\frac{P_{i,t+1}}{P_{i,t}}\right) = \underbrace{\left[\frac{\alpha}{(1-\alpha\mu)}\beta^{q} + \frac{1}{(1-\alpha\mu)}\beta^{a}\right]}_{\hat{\beta}_{price}} H_{i,t} + \left[\frac{\alpha}{(1-\alpha\mu)}\delta^{q} + \frac{1}{(1-\alpha\mu)}\delta^{a}\right] X_{i,t} + \varepsilon_{i,t+1}^{P} \quad (9)$$

where $\varepsilon_{i,t+1}^{s}$ for $s = N,\ W, P$ is an error term which has zero mean and is orthogonal to $H_{i,t}$ and $X_{i,t}$ because it is a linear combination of $\epsilon_{i,t+1}^{j}$. According to Shapiro (2006), expression (7) shows that a positive correlation between human capital and later employment growth can emerge because of productivity growth ($\beta^{a} > 0$), quality of life growth ($\beta^{q} > 0$), or for other possible omitted variables $X_{i,t}$. Given the data on employment, house prices and wages for a panel of cities, equations (7), (8) and (9) give us the possibility of determining the values of $\beta^{a}$and β^{q}.
From equation (7) it can be shown that the total impact of human capital on employment growth is $\frac{1}{(1-\alpha\mu)}(\beta^{q} + \mu\beta^{a})$, and **the fraction of the employment growth due to quality of life** is

$$\frac{\beta^{q}}{(\mu\beta^{a} + \beta^{q})}.$$

Using $\hat{\beta}_{emp}$, $\hat{\beta}_{wage}$ and $\hat{\beta}_{price}$ we can evaluate the importance of productivity and consumption amenities in generating local growth (for an intuition of this result, see Glaeser, 2008). In fact:

$$\hat{\beta}_{emp} = \frac{1}{1-\alpha\mu}\beta^{q} + \frac{\mu}{1-\alpha\mu}\beta^{a} \quad (10.1)$$

$$\hat{\beta}_{wage} = \frac{1-\mu}{1-\alpha\mu}\beta^{a} - \frac{1-\alpha}{1-\alpha\mu}\beta^{q} \quad (10.2)$$

$$\hat{\beta}_{price} = \frac{\alpha}{1-\alpha\mu}\beta^{q} + \frac{1}{1-\alpha\mu}\beta^{a} \quad (10.3)$$

This system of equations (10) allows us to calculate the parameters β^{a} and β^{q} as a function of $\hat{\beta}_{emp}$, $\hat{\beta}_{wage}$, $\hat{\beta}_{price}$, α and μ. After some manipulations we get to the following relationships:

$$\beta^{a} = \hat{\beta}_{price} - \alpha\hat{\beta}_{emp} = (1-\alpha)\hat{\beta}_{emp} + \hat{\beta}_{wage} \quad (11)$$

$$\beta^{q} = \hat{\beta}_{emp} - \mu\hat{\beta}_{price} = (1-\mu)\hat{\beta}_{emp} - \mu\hat{\beta}_{wage} \quad (12)$$

The system is over-identified and generates two solutions for β^{a} and two for β^{q}. Thus, the model gives us some degrees of freedom in computing β^{a} and β^{q}. Our strategy is to use the average of different possible solutions in order to obtain results that do not strictly depend only from a single estimation.

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2017

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BRONZINI R. and A. D'IGNAZIO, *Bank internationalisation and firm exports: evidence from matched firm-bank data,* Review of International Economics, **TD No. 1055 (March 2016).**

BURLON L., *Public expenditure distribution, voting, and growth,* Journal of Public Economic Theory, **TD No. 961 (April 2014).**

BUSETTI F., *Quantile aggregation of density forecasts,* Oxford Bulletin of Economics and Statistics, **TD No. 979 (November 2014).**

CESARONI T. and R. DE SANTIS, *Current account "core-periphery dualism" in the EMU,* World Economy, **TD No. 996 (December 2014).**

CESARONI T. and S. IEZZI, *The predictive content of business survey indicators: evidence from SIGE,* Journal of Business Cycle Research, **TD No. 1031 (October 2015).**

CONTI P., D. MARELLA and A. NERI, *Statistical matching and uncertainty analysis in combining household income and expenditure data,* Statistical Methods & Applications, **TD No. 1018 (July 2015).**

D'AMURI F., *Monitoring and disincentives in containing paid sick leave,* Labour Economics, **TD No. 787 (January 2011).**

D'AMURI F. and J. MARCUCCI, *The predictive power of google searches in forecasting unemployment,* International Journal of Forecasting, **TD No. 891 (November 2012).**

FEDERICO S. and E. TOSTI, *Exporters and importers of services: firm-level evidence on Italy,* The World Economy, **TD No. 877 (September 2012).**

GIACOMELLI S. and C. MENON, *Does weak contract enforcement affect firm size? Evidence from the neighbour's court,* Journal of Economic Geography, **TD No. 898 (January 2013).**

MANCINI A.L., C. MONFARDINI and S. PASQUA, *Is a good example the best sermon? Children's imitation of parental reading,* Review of Economics of the Household, **D No. 958 (April 2014).**

MEEKS R., B. NELSON and P. ALESSANDRI, *Shadow banks and macroeconomic instability,* Journal of Money, Credit and Banking, **TD No. 939 (November 2013).**

MICUCCI G. and P. ROSSI, *Debt restructuring and the role of banks' organizational structure and lending technologies*, Journal of Financial Services Research, **TD No. 763 (June 2010).**

NATOLI F. and L. SIGALOTTI, *Tail co-movement in inflation expectations as an indicator of anchoring,* International Journal of Central Banking, **TD No. 1025 (July 2015).**

RIGGI M., *Capital destruction, jobless recoveries, and the discipline device role of unemployment,* Macroeconomic Dynamics, **TD No. 871 July 2012).**

SEGURA A., *Why did sponsor banks rescue their SIVs?,* Review of Finance, **TD No. 1100 (February 2017).**

SEGURA A. and J. SUAREZ, *How excessive is banks' maturity transformation?,* Review of Financial Studies, **TD No. 1065 (April 2016).**