WHERE DO HUMAN CAPITAL EXTERNALITIES END UP?

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Abstract

Recent literature has aimed at evaluating human capital externalities by estimating the effect of human capital on wages at urban level. We argue that this methodology might not identify properly human capital spillovers. We consider a general equilibrium model based on Roback (1982) where both wages and rents are simultaneously determined at the local level. We show that human capital externalities cannot be identified unless the joint effect of local human capital on both wages and rents is considered. Empirically, we study the effects of local human capital on household-level rents and individual-level wages for a sample of Italian local labour markets. Our results show a positive and robust effect of local human capital on rents. This unambiguously demonstrates that the concentration of human capital at the local level generates positive externalities. As for the relative importance of consumption and production externalities, our results suggest that the two effects have a similar impact on wages.

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1. Introduction[1]

Even though there are many good reasons to argue in favour of schooling[2] externalities, cross-country evidence on human capital and growth has proved to be surprisingly mixed (see, for example, Mankiw et al., 1992, and Bils and Klenow, 2000). More recently, some literature has followed Lucas' (1988) suggestion that the ideal field for empirical research on human capital externalities should be local labour markets, such as metropolitan areas. Following this suggestion, Rauch (1993), Acemoglu and Angrist (2000), Moretti (2004), Ciccone and Peri (2003) have estimated Mincerian wage-equations[3], augmented with an average human capital term meant to capture the productivity externalities generated by schooling. But again, overall results do not provide strong evidence in favour of social effects from human capital.

The conclusion that social returns from human capital are negligible, however, may be flawed. With the exception of Rauch (1993), all the recent "Mincerian" evidence concentrates only on production externalities.[4] However, human capital can generate social benefits that go well beyond those on productivity: see, e.g., Weisbrod (1962) and Haveman and Wolfe (1984). Recently, Lochner and Moretti (2004) have shown that a considerable part of the social returns to education come from crime reduction.[5] Moreover, Glaeser, Kolko, and Saiz (2001) have suggested that high local levels of education are associated with a wide array of local amenities, ranging from consumer goods (such as restaurants and theatres) to good public services (such as good schools) and low crime. These findings suggest the presence of several mechanisms that may relate the local level of human capital to the quality of life.

As shown by Roback (1982), and emphasized by Rauch (1993), when human capital generates relevant consumption externalities, it will have an impact on the price of locally fixed factors, such as land. Not only. Local wages will depend not just on production externalities, but on consumption externalities as well. By developing a simple Roback-Rauch model we show that when firms and workers are mobile across areas and local human capital has positive externalities on both production and utility, average schooling will always have a *positive* effect on rents, while having an *ambiguous* effect on local wages.[6]

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[2] In this paper schooling, human capital and education are used interchangeably.

[3] Mincerian wage-equations represent cross-section regressions of earnings on worker's characteristics, such as experience, education and training, sex, race (even beauty and sexual orientation). See Mincer (1962, 1974). For a recent survey, see Manning (2003).

[4] An excellent survey of this literature can be found in Moretti (2003). A less technical review is provided by Duranton (2004).

[5] See also Lochner (2004).

[6] The main issue of our paper is closely related to Shaphiro (2003). Shapiro develops a dynamic version of Roback's model to analyze the effects of human capital on city growth. His evidence suggests that, while most of the literature has emphasized the impact of human capital on productive externalities, consumption externalities can be important as well. Shapiro's strategy is further developed by Glaeser and Saiz (2003), who find that human capital increases consumption amenities within metropolitan areas.

The reason is that local productivity and local utility have opposing effects on local wages. On the one hand, human capital spillovers raise local wages by increasing local productivity. But on the other hand, local wages tend to fall when human capital has positive spillovers on utility. The reason is that individuals may be willing to accept lower wages in order to live in areas where high average education significantly improves the "quality of life". We will show that the detection of a positive effect of local average schooling on local rents unambiguously points to the existence of human capital spillovers. By contrast, looking *only* at the relation between average local schooling and wages may lead to the mistaken conclusion that local human capital generates no social benefit! This result is central for our paper. In fact, we will argue that the Mincerian literature mentioned above may systematically understate the role of human capital externalities on productivity. In particular, human capital spillovers may not be properly identified when all the emphasis is put on wage equation estimation.

We study the effects of local human capital on household-level rents and individual-level wages for a sample of Italian local labour markets. Our results suggest that there is a strong correlation between local human capital and average rents after controlling for dwelling characteristics. This correlation is highly robust: it is not driven by spatially correlated omitted variables; it survives the introduction of dwelling- and territorial-level variables, for which one could think of plausible stories leading to the correlation we observe; it is robust to IV techniques that deal with local human capital endogeneity.[7] In our estimates, a unit increase in the local average level of years of schooling increases local rents from 6 to 24 per cent. As in the theoretical model, the positive impact of local schooling on rents shows that the concentration of human capital generates positive spillovers. On the other hand, the effect of local schooling on wages is less robust. In most cases, we find that it ranges from 2 to 3 per cent and in some specifications the impact of local schooling is statistically not different from zero. As for the relative importance of consumption and production externalities, our results suggest that these two forces offset each other in local wage determination.

Section 2 presents the Roback-type model, following the special version proposed by Ottaviano and Peri (2004). Section 3 provides the evidence, and Section 4 concludes.

2. A simple Roback type model

In what follows, we sketch a simple model to identify the effects of local human capital. The basic framework builds on Roback (1982), Rauch (1993) and Ottaviano and Peri (2004), and it postulates that both local firms' productivity and consumption amenities depend on a specific type of site characteristics, the local average level of human capital. The economy is partitioned in C non-overlapping areas, indexed by c=1,2,..C. Each individual possesses an education level h_i, works in the same area where he lives, and supplies inelastically one unit of labour. Moreover, workers and firms are assumed to be perfectly mobile across locations (that is, their cost of changing location is zero), while the supply of land, L_c, is fixed in each area. Land is used in both production and consumption, and landowners do not live in the economy we consider.[8]

[7] In our opinion, this wide set of robustness checks goes a long way to providing support for causality running from local human capital to rents.

[8] See Rauch (1993, p.383).

Similarly to Roback (1982), we assume that individuals gain utility through the consumption of a commodity, local residential land and local site characteristics, which here are made dependent on the local average level of human capital. The idea is that, besides the amenities that affect the local "quality of life", individual utility largely depends on the consumption of reproducible commodities, as well as on the use of local goods – such as land – which exhibit inelastic supply. In particular, the utility of an individual *i* who lives and works in area *c* has the following form:

$$U_{ic} = A_U(H_c) \cdot L_{ic}^{1-\mu} \cdot Y_{ic}^{\mu} \qquad (1)$$

and is maximized with respect to $\{Y_{ic}, L_{ic}\}$ under the budget constraint $h_i \cdot w_c = r_c \cdot L_{ic} + p_c \cdot Y_{ic}$, with $\mu \in (0,1)$. L_{ic} denotes worker i's consumption of land, and Y_{ic} denotes his consumption of a freely-tradable homogeneous good. The local price of land is r_c, while w_c denotes the local wage as measured in per-education units. The price of the good is taken as the numeraire: p_c=1. The shifter $A_U(H_c)$ picks the effect of local average human capital H_c on utility. In particular, if $\frac{dA_U(H_c)}{dH_c} > 0$, a higher local level of education will increase the welfare of residents.[9] By maximizing utility (1) under the budget constraint, one obtains the following indirect utility function, as expressed in education units:

$$v_{ic} = \eta \cdot A_U(H_c) \cdot \frac{w_c}{r_c^{1-\mu}} \qquad (2)$$

where $\eta = (1-\mu)^{1-\mu}\mu^{\mu}$. "Free-mobility" of workers implies that worker *i* must receive the same utility (per unit of individual education) across locations, which is:

$$v_{ic} = v_{ic'} = v, \quad for\ any \quad (c,c') = 1,2,..,C \qquad (3)$$

Firms are competitive and produce good *Y* by using both land and labour with a constant-returns technology. The production function of firm *j* in area *c* is:

$$Y_{jc} = A_Y(H_c) \cdot L_{jc}^{1-\alpha} \cdot (h_j N_{jc})^{\alpha} \qquad (4)$$

where $\alpha \in (0,1)$ and $(h_j N_{jc})$ denotes the labour input of firm *j* expressed in efficiency units.[10] The term $A_Y(H_c)$ captures the effect of human capital spillovers on productivity in area *c*. In other words, $A_Y(H_c)$ measures the productivity advantage that a firm will enjoy when locating in *c*. Conversely, the cost of locating in area *c* will depend on the price of land, r_c. Each firm *j* chooses land and efficiency units of labour, $\{L_{jc}, h_j N_{jc}\}$, to maximize its profit. It follows that $Y_{jc} = \frac{r_c L_{jc}}{1-\alpha} = \frac{w_c (h_j N_{jc})}{\alpha}$, so that expression (4) can be manipulated into the following condition:

$$1 = \xi \cdot \frac{A_Y(H_c)}{r_c^{1-\alpha} w_c^{\alpha}} \qquad (5)$$

[9] For example, if higher average schooling reduces criminality, the welfare of residents will be greater.

[10] The production function implies that workers of different education are perfectly substitutable. In this case, the "composition" problem emphasized by Ciccone and Peri (2003) would not arise.

where $\xi = (1-\alpha)^{1-\alpha}\alpha^{\alpha}$. With p_c=1, condition (5) implies that price equals marginal cost. Because of constant returns to scale, firms make zero profit in equilibrium and expression (5) can be interpreted as a "free-entry condition" in the product market.

By combining expressions (2) and (3) and exploiting expression (5), we obtain a system of two equations in (w_c, r_c) such that, given the level of local human capital H_c across locations, no firm and no worker will have an incentive to migrate. By log-linearizing and solving the system, we obtain the following equilibrium expressions for (the log of) local rents and wages:

$$\log r_c = \frac{\log\xi + \alpha\log\eta - \alpha\log v}{1-\alpha\mu} + \frac{\log A_Y(H_c) + \alpha\log A_U(H_c)}{1-\alpha\mu} \qquad (6)$$

$$\log w_c = \frac{(1-\mu)\log\xi - (1-\alpha)\log\eta + (1-\alpha)\log v}{1-\alpha\mu} + \frac{(1-\mu)\log A_Y(H_c) - (1-\alpha)\log A_U(H_c)}{1-\alpha\mu} \qquad (7)$$

Expressions (6) and (7) allow us to identify the effects of human capital externalities on local factor prices.

Under the assumption that human capital has non-negative effects on productivity and utility, that is, $A_Y'(H_c) \geq 0$ and $A_U'(H_c) \geq 0$, equation (6) implies that human capital spillovers have an unambiguous positive effect on rents. Households and firms will be willing to pay higher rents to locate in areas rich in human capital.

By contrast, equation (7) implies that the effect of human capital on wages is ambiguous. Human capital drives local wages up by increasing productivity, since $A_Y'(H_c) \geq 0$. However, households are willing to accept lower wages (and pay higher rents) to live in areas where human capital raises the "quality of life", since $A_U'(H_c) \geq 0$.

In conclusion, the model shows that a positive effect of local average schooling on local rents unambiguously points to the existence of human capital spillovers. By contrast, equation (7) emphasizes that – by looking *only* at the relation between average local schooling and wages – one might mistakenly conclude that local human capital generates no externality.

The main predictions of the model are summarized by the following:

Remark. (I) When $A_Y'(H_c) \geq 0$ *and* $A_U'(H_c) \geq 0$, *it must hold that* $\frac{d\log r_c}{dH_c} > \frac{d\log w_c}{dH_c}$. *Moreover,*

(II) The relative effects of production and consumption externalities generated by local human capital are identified as follows:

(i) If the production externality $A_Y'(H_c) \geq 0$ *dominates, then* $\frac{d\log r_c}{dH_c} > 0$ *and* $\frac{d\log w_c}{dH_c} > 0$.

(ii) If the consumption externality $A_U'(H_c) \geq 0$ *dominates, then* $\frac{d\log r_c}{dH_c} > 0$ *and* $\frac{d\log w_c}{dH_c} < 0$.

Thus, estimation of equations (6) and (7) can assess the net impact of production and consumption externalities.

The identification problem can also be illustrated by a simple diagram (see Figure 1). In the figure, wages and rents are measured along the horizontal and vertical axes respectively. For given H_c, the downward sloping curve represents the firm's iso-cost and the upward sloping curve denotes the consumer indifference curve. The equilibrium factor prices are given by the intersection of the two curves (point A). Consider now what happens when local human capital increases. First, there is an upward shift of the iso-cost curve due to production externalities. The new intersection (point A') is now featured by higher wages and rents. This is the mechanism exploited by the previous literature, which has tried to identify human capital externalities by looking at the correlation between local schooling and wages. Does point A' represent an equilibrium? As we argue above, this is unlikely. Whenever there are consumption externalities, the consumer indifference curve will also shift up. Thus, the new equilibrium (point B) will unambiguously be characterized by higher rents. That is, the positive effect of human capital on rents holds irrespective of the relative strengths of production and consumption externalities. But what happens to wages in the new equilibrium? The answer depends on relative role of production and consumption externalities. In particular, when there are strong consumption externalities combined with relatively weak production externalities, a higher level of local human capital may lead to a new equilibrium characterized by higher rents and lower wages (in Figure 1, the new wage level corresponding to point B is very close to the old wage level corresponding to point A).

3. Empirical findings

In this section, we study the effects of local human capital on household rents and individual wages for a sample of Italian local labour markets. We start by estimating baseline rent and wage equations: see Section 3.1. Then, we adopt three strategies to substantiate our results. First, in Section 3.2, we check the robustness of the baseline estimates by including additional household/individual controls. Second, we test whether the estimated effects of local schooling are robust to the inclusion of additional territorial variables that, in principle, may represent factors omitted from the baseline equations (see Section 3.3). Finally, in Section 3.4 we tackle omitted variable and endogeneity problems by instrumenting local schooling.

3.1 Baseline Regressions

Our main data source is the Survey of Household Income and Wealth (SHIW). This survey is conduced every two years by the Bank of Italy on a representative sample of about 8,000 households: see Brandolini and Cannari (1994) for details. The SHIW collects detailed information on Italian households. For each member of the family it gathers data on demographic features and economic behaviour including wage, age, sex, marital status, work status, schooling, work experience, and employer's branch of activity. Moreover, at the household level, the survey collects data on dwellings, including both the main family's house of residence (whether owned or rented) and other property owned. For each dwelling, the SHIW collects several characteristics: rent and house price, surface, location, year of construction, and additional information such as number of bathrooms and presence of a heating system. Since from 1993 the survey has maintained the same structure, we pool data from the last four waves (1993, 1995, 1998, and 2000). Table 1 presents the descriptive statistics.

Our dataset includes 27,931 dwelling observations and 23,371 worker observations (the sample is restricted to workers aged between 15 and 65). Dwellings and workers are distributed over 238 local labour markets (LLMs).[11] All regressions below are based on appropriate weighted data.[12]

The confidential version of the SHIW we use here reports each individual's area of residence. This allows us to augment our regressions, based on individual observations, with variables defined at territorial level. The main territorial variable we use is an indicator of local human capital, as measured by average years of schooling of the population residing in the local labour market. This measure is obtained from the 1991 Population Census by the National Institute of Statistics (ISTAT). It averages 9.88 years of schooling and exhibits a standard deviation of .73.

Column 1 of Table 2 reports the baseline OLS results on the effects of local human capital on house rents. The dependent variable is the log of annual rent.[13] The regression includes a number of standard controls: see, for example, Berger at al. (2003) and Gyourko et al. (1999): the surface area and the age of the dwelling, and dummies for the presence of two bathrooms and a heating system. The regression also includes a set of dummies for the location of the dwelling within the LLM. The SHIW classifies location by six categories: isolated area, countryside; town outskirts, between outskirts and town centre, town centre, other, hamlet. Finally, we include a dummy for families residing in the South of Italy.

Our results show that local human capital significantly affects rents: a unit increase in the local average level of schooling years increases local rents by 17.2 per cent. The effects of the other variables on rents are quite obvious: rents are higher for larger and newer houses and for dwellings endowed with more than one bathroom and a heating system. Location dummies enter with high significance: compared with dwellings located in the countryside, rents for the houses in the town centre are 27 per cent higher (point estimates are not reported in the Tables).

As is well known, the South of Italy differs from the Centre-North in a number of respects: the South is generally poorer and less endowed with infrastructures. The South also has a lower quality of local institutions and less property-right protection. To make sure that local human capital is not just picking up differences between the Centre-North and the South of Italy, we control for the southern location of the dwellings. This dummy is associated with a 15 per cent discount in rents. In Column 2, we re-estimate our baseline regression using a finer partition of the territory into 20 regions: the results confirm the previous findings. Finally, Column 3 exploits a finer partition that uses 103 province

[11] LLMs are aggregations of two or more neighbouring municipalities based on daily commuting flows from place of residence to place of work (Istat, 1997) as recorded in the 1991 Population Census. LLMs are thus characterized by "self-contained" labour markets, in the sense that both the share of resident LLM employees in total LLM employees and the share of resident LLM employees in total LLM residents must be at least 75 per cent. As emphasized in OECD (2002), labour mobility within local labour markets is by construction very high, while mobility from and to other local labour markets is low.

[12] Our coefficient estimates, however, are not sensitive to weighting or not weighting the regressions.

[13] The interviewees can be either property owners or tenants. In the first case, the SHIW collects the rent the owner charges (or, if the dwelling is not rented or it is the family residence, the best estimate for the rent that could be charged) and the price that could be set for the dwelling. In the second case, the tenant reports both the actual rent and the best estimate of the dwelling's price. For the sake of brevity, we report in the text only the results for the rents. House prices provide remarkably similar results.

dummies.[14] This amounts to identifying the effects of local human capital on rents through the variation across LLM within each province. It represents an extremely conservative specification, since the LLMs within the same province are quite similar and we are probably eliminating a lot of the LLM variation needed to identify the results. Remarkably, the positive effect of local human capital still persists, and its point estimates are similar to those of previous specifications.

Column 1 of Table 3 provides the baseline OLS results of the effects of local human capital on wages. Individual log earnings (hourly wage rate) are the dependent variable. The baseline specification includes the standard Mincerian set of individual characteristics: labour market experience, its squared value, number of years of schooling, and two dummies for sex and marital status. As for the rents, the baseline specification includes a dummy for workers residing in the South. The results are in line with previous studies based on the SHIW: see Cannari and D'Alessio (1995) and Colussi (1997). We find that each individual year of schooling increases hourly wages by 6 per cent.[15] Experience increases wages up to approximately 42 years of experience. Wages of women are 8.6 per cent lower than men's wages. Married workers enjoy an 8.2 per cent premium.[16] Southern workers suffer from a 6.4 per cent discount. Local human capital enters the earning equation with a positive and statistically significant coefficient. A unit increase in LLM average education is associated with a 2.3 per cent increase in local wages. This result is robust to specifications where the South dummy is replaced with region and province dummies.

The fact that local human capital refers to 1991 while the micro-data extend over the 1993-2000 period could be a reason for concern. If the distribution of human capital across LLMs changes during the 1990s, the 1991 proxy will turn out to be a very poor indicator for local schooling at the end of the decades. However, Table 4 shows that this is not the case. By estimating rent and wage equations for each single survey year, we find that the coefficient for local human capital is remarkably similar over time.[17] We are also concerned that our sample contains some repeated observations. Although rents and wages change over time, the residuals might be correlated across observations of the same individual. This correlation is unlikely to be a problem: it is confined to only a subset of the observations and among these to pairs of observations. In any case, we re-estimated (not reported)[18] all the regressions by restricting the sample to the first observation of every household. All the results remain the same.[19]

According to the theoretical model in Section 2, when there are positive spillovers from education, equation (6) implies that the semi-elasticity of rents to human capital must be positive. Thus, our results from estimation of the rent equation provide significant

[14] As suggested by Ciccone (2002), the introduction of increasing detailed spatial fixed affects allows us to control for spatially correlated omitted variables.

[15] We also estimate a model in which private returns to education are non-linear in the years of schooling. For this purpose, we replace individual human capital with dummies for the highest educational attainment obtained by the individual. This has negligible effects on the estimates of local human capital returns.

[16] A wage premium on marriage status is common in the labour literature. For some alternative explanations of this finding see, for example, Korenman and Neumark (1991) and Loh (1996).

[17] This is not surprising. Labour survey results and Ministry for Higher Education data point out that the distribution of human capital across Italian territories remained almost unchanged during the 1990s.

[18] The results, which are not reported for the sake of brevity, are available upon request.

[19] Regressions were also re-estimated by correcting for the potential clustering of the residual at the individual (household) level. Once more, results were very similar to those presented in the text.

evidence on the existence of schooling externalities. Moreover, equation (7) implies that the semi-elasticity of wages to human capital has an ambiguous sign, depending on which source of externality prevails. Since we find that local schooling has a positive and significant effect on wages, production externalities seem to dominate consumption externalities in wage determination: see the Remark. In what follows, we check the robustness of these conclusions.

3.2 Robustness: Additional Household and Individual Controls

Table 5 reports estimates of rent and wage regressions with additional controls on both dwellings and individuals.[20]

As for rents, we add two subjective ratings of the dwelling. In the SHIW, the interviewees are asked to provide their own evaluations of the quality of both the house and its location. In the first case, they have to answer to the question "How do you rate this dwelling" by picking one of the following answers: luxury, upscale, mid-range, modest, low-income, very-low income. In the second case, the question is "How do you rate the area in which this dwelling is located?" and the potential answers are recorded respectively as: upscale, run-down, neither upscale or run-down, other. The two subjective measures are clearly correlated with the observable characteristics of the houses and their location, which represent our standard controls in Table 2. This implies that their inclusion will reduce the coefficients on the observables. However, the two individual ratings are also likely to be correlated with unobservable house and location characteristics. For instance, higher human capital LLMs might display higher house quality even after controlling for surface, age, bathrooms and heating. Similarly, higher human capital LLMs might have suburbs of superior quality. Thus, the inclusion of the two subjective ratings can provide a robustness check for the effect of local human capital with respects to these unobservable features. As shown in the first column of Table 5, adding the two subjective ratings increases the explanatory power of the regression from 37 per cent to 48 per cent. As expected, the two ratings are highly significant and their inclusion reduces the estimated effects of the observables. More important, the change in the coefficient of local human capital is very small.

Turning to wages, we add three additional sets of individual controls. We include seven industry dummies for eight branches of activity (agriculture; manufacturing; building and construction; wholesale and retail trade, lodging and catering services; transport and communications; services of credit and insurance institutions; real estate and renting services, other professional, business activities; general government and other private and public services). We also add six dummies for seven classes of employer's size (up to 4; from 5 to 19; from 20 to 49; from 50 to 99; from 100 to 499; 500 or more; not applicable - public-sector employee). Finally, we include three dummies for the individual job qualification (for the following four categories: blue-collar worker or similar; office worker or school teacher; junior manager; manager, senior official). Again, it is debatable whether to include or not these controls. Duranton and Monastiriotis (2002) argue that - to the extent that the additional controls are likely to be determined simultaneously with the labour market outcome - their inclusion can lead to an underestimation of the true differences between areas characterized by different levels of local human capital. We find that controlling for

[20] The inclusion of these additional controls reduces the rent and wage samples respectively to 27,904 and 23,252 observations. As we checked, these reductions are not relevant for the results obtained before.

industries, firm sizes, and job qualifications[21] reduces the coefficient of local human capital from 2.3 per cent to 1.3 per cent, making it non-significant even at the 10 per cent level.

In sum, our robustness checks with respect to additional controls for dwelling and individuals confirm the evidence in favour of the presence of human capital spillovers. As for the relative importance of consumption and production externalities, these results suggest that the two forces tend to offset each other.

3.3 Additional Territorial Controls

Next, we check the robustness of our findings when additional territorial variables are included. Table 6 presents the results for the coefficient of local human capital when the regressions (2.1) and (3.1) include additional territorial variables that, in principle, could affect the concentration of human capital, as well as local rents and wages. Consistently with the theoretical model of Section 2, we control for potential omitted variables concerning both local productivity and local amenities. The additional territorial variables refer to the beginning of the 1990s (see the Appendix for details).

We start (Table 6, line 2) by augmenting the individual and household-level regressions with a measure of economic development, measured by per capita GDP in the province. It averages 14,370,000 lira and exhibits wide variations (standard deviation 3,980,000 lira). The inclusion of this control might underestimate the effect of human capital. If human capital is a precondition, rather than a consequence, of economic development, then some of the effects of human capital will be reflected in per capita income. Per capita GDP enters positively and with high significance in both rent and wage equations.[22] Consistently with this interpretation, the impact of human capital becomes smaller when per capita GDP is included. Its coefficient goes down to 14.4 per cent for rents, and to 1.2 per cent for wages. Crucially, the impact of local schooling on wages becomes not statistically different from zero.

The correlation of education with both rents and earnings might also be affected by the distribution of unemployment across LLMs. If better-educated individuals are less likely to be unemployed, then average human capital might pick up the effect of the unemployment rate. When the ISTAT LLM-specific unemployment rate is considered (Table 6, line 3), however, the local human capital coefficient remains essentially unchanged. Local unemployment enters (with a negative sign and high significance) only in the wage equation.

We then consider physical capital. Due to capital-skill complementarities,[23] local human capital might pick up the contribution of physical capital. We include an index of physical capital in the private sector, calculated as the ratio between stock of capital (valued at the replacement price) and value added in each LLM. This variable is taken from the Cannari-Signorini dataset.[24] The index of physical capital never enters significantly and the estimates of local human capital remain unchanged (Table 6, line 4). Next, we control for the local level of infrastructures. This variable is measured as the ratio between kilometers of roads and LLM's surface in square kilometers. Our results show that the infrastructure index

[21] In Table 5, all additional controls are introduced simultaneously. The introduction of only (i) industry, (ii) firm-size, (iii) job qualification controls reduce the coefficient of local human capital respectively to (i) 1.8% (ii) 2.1%, and (iii) 1.5%.

[22] For the sake of brevity, point estimates for the control variables are not reported in the tables.

[23] See, for example, Goldin and Katz (1998).

[24] The Cannari-Signorini dataset is derived from a variety of sources (Census; Company Account Data Service; ISTAT's Surveys on Export, Value added, Labour Force, Capital Stock): see Cannari and Signorini (2000) for details.

enters with a positive (negative) sign in the rent (wage) regression. More important, the coefficient associated with local human capital is unaffected (Table 6, line 5).

The effects of local human capital on rents and wages could also reflect agglomeration effects: see Ciccone and Hall (1996). Suppose first that agglomeration effects are adequately captured by the size of the local population. If the density of economic activity makes workers more productive, as in Glaeser and Maré (1999), one would expect controlling for population to reduce the impact of average human capital on wages. At the same time, population might be a consumption disamenity: see Rauch (1993) and Adamson et al. (2004). In this case, one would expect controlling for population to increase the impact of local schooling on rents. Our results do not support these predictions. The coefficient of (log of) population is significant and positive in the rent equation, while non-significant in the wage equation. As for our variable of interest, controlling for population halves the effect of local human capital on rents, while increasing the effect on wages by 1/3 (Table 6, line 6).[25] On the other hand, the number of inhabitants may be a poor proxy for agglomeration effects. Henderson (2003) argues that external effects derive from the number of plants, rather than from population, in a given territory. Thus, we include a measure of plant intensity (number of plants over square kilometers in an LLM) from the Cannari-Signorini dataset. This variable makes local human capital not significantly different from zero in the wage equation, while it remains highly significant in the rent equation (Table 6, line 7).[26]

Next, we include all the controls considered above (from line 2 to line 7) simultaneously. We find (Table 6, line 8) that the effect of local schooling on rents remains significant while that on wages is not statistically different from zero.

Local human capital may also be correlated with omitted variables that have amenity value and determine the local quality of life. Such a correlation would bias upwards (downwards) the estimate coefficient on local education in the rent (wage) equation. An obvious candidate for an amenity that is correlated with local human capital is cultural facilities. We include two additional variables, which are taken from the ISTAT DEMOS dataset[27]: the province-level ratios of (i) number of theatre shows, and (ii) number of cinema halls over resident population. These two variables enter significantly with positive signs in the rent equation, while only the cinema density enters significantly (and positively) the wage equation. Our estimates are consistent with the presumption that cultural facilities are important determinants of a locational equilibrium (Table 6, line 10): the effect of local schooling on rents goes down to 15.8 per cent, and the effect on wages goes up to 2.7 per cent.

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[25] Replacing (log)population with (log)employment or population density produces similar results.

[26] We report here only a subset of robustness checks that have been performed. Following de Blasio and Nuzzo (2003), we also controlled for the local endowments of social capital. In the tradition of Glaeser, Kallal, Scheinkman and Shleifer (1992), we controlled for local competition, as measured by the ratio between average firm-size in the LLM and the average size at national level. Moreover, we controlled for indexes of the LLM sector composition of economic activity. Results were only marginally different from those of the baseline case.

[27] The ISTAT DEMOS dataset provides an array of demographic and socio-economic variables for areas of Italy. Since information from this source is not available at the LLM-level, the ISTAT DEMOS indicators that we use in the paper refer to the province-level. The ISTAT DEMOS dataset does not provide figures for the provinces created after 1995 (Biella, Verbania-Cusio-Ossola, Lodi, Lecco, Rimini, Prato, Crotone and Vibo Valenzia). For this reason reason, the rent and wage samples reduce respectively to 27,413 and 22,977 observations.

Another variable that could be correlated with local education is the crime rate. As suggested by Lochner (2004), human capital increases the opportunity cost of crime for foregone work and expected costs associated with incarceration. The ISTAT DEMOS province-level crime rate enters with a positive sign in the rent equation and a negative sign in the wage equation. Its inclusion reduces the estimated coefficient for local education on rents while increasing its impact on wages (Table 6, line 11). Since crime is supposed to be bad for both production and consumption, these results can hardly be justified. One potential explanation for these findings is that the crime rate is based on crimes reported to the police. In cases where crime is high and police-effectiveness low, citizens may have few incentives to report a crime to the police. If this is the case, then the local crime rate could be a proxy for the efficiency of the local police (and judiciary) rather than a measure of the local number of crimes.[28]

According to Downes and Zabel (1999), local school characteristics explain a good deal of the variation in U.S. house prices: all else being equal, houses in better school districts are more expensive. Differently from the U.S. where the education system is mostly financed at the local level, the Italian schooling system is very centralized and egalitarian, with low variability in the quality of education across areas. This, however, does not apply to nurseries for infants of 0-3 of age, which are funded by local authorities or are private. The local availability of nurseries may be correlated with local schooling. For instance, skilled workers might care more for the local availability of nursery schools either because skilled parents might both be working (Costa and Kahn (2001)) or because educated parents care more about a getting better education for their children. Ideally, we would like to control for an index of availability of nurseries for infants from 0 to 3. Unfortunately, this information is not available. Therefore, we use the number of public nurseries for children aged 0-5 over local population of the corresponding age group from the ISTAT DEMOS source. This index never enters significantly in our equations. The effect of average human capital (Table 6, line 12) remains unchanged for wages and goes moderately up for rents.[29]

The local health system represents another key factor for the quality of life. In Italy local (regional) authorities manage the public health system, and big differences arise in the effectiveness of health services. We proxy the quality of the local health system with two variables: (i) the number of doctors, and (ii) hospital beds in public hospitals over local population. The two indexes enter with high significance and the expected signs, that is, positive for rents and negative for wages. As far as local education is concerned, the inclusion of these variables (Table 6, line 13) does not alter our results.[30]

We then include all the "quality of life" controls together (Table 6, line 14). As a result, the estimated coefficient for local human capital falls to 16.2 per cent in the rent equation, while it rises to 3.4 per cent in the wage equation. Finally, line 15 includes all the

[28] This potential explanation receives some empirical support. If we control for an index of judicial efficiency at the local level, then the crime rate does not enter significantly either in the rent or wage equation. Moreover, its inclusion does not alter the coefficient of local schooling. We thank Armanda Carmignani for providing us with the data on judicial efficiency at the local level.

[29] We also used proxies for the quality of local nurseries (such as the existence of playgrounds, school buses, and availability of extra-hours), without implications for our results.

[30] Again, only a subset of robustness checks accomplished has been reported. We also controlled for natural amenities, such as climate variables (average temperature and average days of rain). Moreover, we controlled for cancer and cardiovascular mortality rates, which proxy for environmental quality. Compared with the baseline of raw 9, results were only marginally affected.

additional territorial controls at the same time (controls from line 2 to 7 and from line 10 to 13). We find that the effect of local schooling remains positive and significant in the rent equation. By contrast, local schooling has no significant impact on wages.

All in all, the results in this section allow us to conclude that human capital spillovers do exist. As for the relative importance of consumption versus production externalities, the results are not definitive. In most of the cases, production externalities seem to dominate, since there is a positive impact of local schooling on wages. However, this result is not robust to all sensitivity checks.[31]

3.4 IV Estimates

Notwithstanding the robustness checks performed above, one cannot rest assured that the correlation of local human capital with rents and wages can be interpreted as a causal relation running from local schooling to local prices. There might still be some omitted determinants of rents and wages that are correlated with local human capital. Moreover, areas characterized by high rents and wages might be able to afford or prefer higher human capital. In this case, there will be a reverse causality problem.[32,33] These problems can be tackled when we have an instrument for local human capital, which must account for the observed variation in local human capital but not be correlated with rents and wages. On the other hand, instrumental variable strategies are not foolproof: their advantage is that a valid instruments isolates the effect of exogenous changes in local human capital on rents and wages; the disadvantages, however, are that valid, exogenous instruments are rare. In this section, we use two instruments that have been extensively used in the literature on human capital externalities, so as to check the robustness of our previous conclusions.

We first use the LLM lagged demographic structure as an instrument.[34] Because of the compulsory schooling system, the 1981 local demographic structure is strongly related to 1991 local education but, at the same time, it is unlikely to be correlated with real estate and

[31] The results reported in the text have also been checked by using Seemingly Unrelated Regression (SUR) techniques. In the theoretical model of section 2, wages and rents are simultaneously determined. This implies that there might be correlation between unobservable shocks to wages and rents. In this case, SUR estimates are more efficient, while OLS are still consistent and unbiased. SUR estimates (not reported) confirm previous findings. For instance, in the benchmark case of line 1, the estimated coefficient for local human capital rises to 18.2 per cent in the rent equation, and 2.4 per cent in the wage equation. As for the robustness checks with additional household/individual or territorial controls, in all cases SUR estimates are very similar to the OLS results reported in the text.

[32] A potential source of endogeneity is represented by "selective migration" of talented workers across local markets. In particular, it might happen that workers with high (unobserved) ability tend to move to areas that are characterized by high average levels of schooling. In this case, the correlation between wages and local human capital may partially reflect unobserved ability, rather than true schooling externalities. We find, however, that selective migration is not an issue for our results. We exploit the confidential SHIW data on the birthplace of workers. This information is at the level of the 103 Italian provinces that cover the country. While this is certainly not ideal, we should still be able to detect selective migration through the different outcomes for those who work where they were born (the 'stayers') and the others (the 'movers'). By interacting our explanatory variables with a dummy variable equal to one for the movers, we find that the interaction between workers' characteristics and local human capital, on the one hand, and the dummy for movers, on the other hand, is never significant.

[33] Further, measurement error problems might be present as well: see Krueger and Lindahl (2001).

[34] Demographic instruments are very popular in the literature on human capital externalities: see Moretti (2004) and Ciccone and Peri (2002).

labour markets during the 1990s.[35] LLMs with a larger share of residents who where younger than 5 in 1981 experienced, in 1991, an increase in the share of residents who completed elementary school (five years of schooling, starting from age 6) and a -less pronounced- increase in the share of residents who completed middle school (additional three years of schooling, starting from age 11). Since average schooling in 1991 was above eight years, a larger share of residents under the age of 5 in 1981 will tend to reduce the 1991 local human capital level.

On the other hand, LLMs which exhibited a large share of population between the age of 5 and the age of 10 in 1981 experienced, later in 1991, an increase in the share of residents who: (i) completed middle school, and (ii) completed high school (additional five years of schooling, which are fulfilled by the age of 18). Thus, these LLMs experienced an increase in their local human capital.

Table 7, Panel A, shows the results of the 2SLS estimates that exploit the LLM 1981 age 0-5 share, and the 1981 age 5-10 share of the population as instruments for local human capital. As expected, these two shares are highly correlated with local human capital. The first-stage *R*-squared is equal to 51 and 54 per cent, respectively for rents and wages. The two instruments are highly jointly significant[36], and they exhibit the expected signs. The IV estimates of the effects of local education are higher than the corresponding OLS estimates (reported for convenience at the top of Panel A). In the rent equation, the coefficient goes up from 17.2 per cent to 24.3 per cent, while in the wage equation it raises from 2.3 per cent to 3 per cent.

Still, it is very difficult to take these estimates as conclusive. As emphasized in Angrist and Krueger (2001), a problem with interpreting IV estimates is that, in general, instruments do not affect observations in the same way. In case of heterogeneous responses, this technique provides an estimate that is mostly related to the specific group of people whose behaviour is sensitive to the instrument itself: see also Imbens and Angrist (1994). In our context, the demographic instrument is particularly relevant to those who are likely to quit school early, with little or no effect on those who are likely to go on to college. With regard to people who decide whether to attain college education, cost-benefit comparisons are likely to matter most. Thus, we would like to check the robustness of the 2SLS estimates by using an alternative instrument which is likely to be relevant to a different group of people. As suggested by Arkes (2003), the lagged youth unemployment rate is a reasonable instrument for those who decide whether to go beyond compulsory schooling. Past local unemployment affects one's education attainment both through income and substitution effects. The income effect is such that, when unemployment is high, household income is lower. Thus, some families may push their teenage children to quit school to help support the family. Also, low family income can make college unaffordable. On the other hand, the substitution effect implies that high unemployment rates are associated with low wages and few job opportunities for teenagers. Poor labour market conditions reduce the opportunity costs of

[35] Some implications of this identification assumption can be tested. Finding that the 1981 demographic structure predicts housing and labour market outcomes other than local education would cast some doubts on the exogeneity of the instruments. In this vein, we checked whether past demographics is correlated with labor force participation (conditioning out the control variables that appear in the wage equation) and found no support for such a claim. As for the housing market, a potential concern is that the demographic pressure could have impact on rents through difference in the quality of the dwellings that are not captured by the SHIW proxies.

[36] The p-value of the F-statistic is always zero at the first four decimals.

attending school and, thus, increase educational attainment. It turns out that, in our data, the substitution effect dominates. This is consistent with the evidence provided by Rossi (1997) who finds that, also because of low fees, a large fraction of Italian college students is made up of youngsters who were not able to get jobs. We use the LLM-level youth unemployment rate as an instrument. This variable is measured by the number of first-job seekers within the 15-24 age group. As for the demographic instruments used above, this variable refers to 1981.[37] Thus, we exploit the fact that youngsters who lived in areas characterized by high youth unemployment in 1981 were more likely to enroll in higher education.

Table 7, Panel B, reports the results.[38] The first stage shows that past youth unemployment rate is highly correlated with local education (the *R*-squared is equal to 39 (40) per cent in the rent (wage) equation, and the *p*-value of the *F*-statistic is always zero in the first four decimals). The estimates of the effects of local schooling are, however, quite different from the previous ones. While the estimated coefficient remains highly significant and positive in the rent equation, the estimated coefficient in the wage equation turns out to be not significantly different from zero.

Finally, in Table 7, Panel C, we use at the same time both the demographic shares and past youth unemployment as instruments. The results confirm that human capital is not significant in the wage equation.

Overall, our results show that different instruments for local human capital generate different conclusions about wages. On the other hand, the positive effect on rents is always confirmed. We interpret this finding as evidence that schooling generates important consumption externalities. In particular, consumption externalities have an impact on local wages that is similar to that generated by production externalities.

4. Conclusions

Where do human capital externalities end up to? Since local average schooling is non-significant in augmented wage equations, much literature has concluded that human capital does not generate production externalities. As we argued here, this conclusion is far from granted, if human capital also generates relevant consumption externalities. Indeed, according to the simple Roback-type model we developed, one should conclude that human capital produces no spillover only if average schooling is non-significant in the *rent* equation. On the contrary, we do find that human capital always has a positive and significant effect on rents. This finding is robust to several alternative specifications and persists under instrumental variable strategies. Thus, human capital spillovers matter. For what concerns the sources of spillovers, wage equation estimates suggest that the impact of productivity externalities is similar to the impact of consumption externalities. This finding implies that human capital generates relevant externalities on firms' productivity.

[37] Alberto Baffigi reconstructed first-job seekers at the province level in 1981. These data do not include the provinces created after 1995 (see footnote 17). We thank Andrea Brandolini for providing us these data. The 15-21 age group was obtained from ISTAT 1981 Census.

[38] A main concern when using 1981 youth unemployment as an instrument is that this variable is very likely to be correlated with 1991 unemployment and, hence, correlated also with wages and rents. Similarly to Cameron and Taber (2004), we deal with this problem by controlling for the local 1991 unemployment in the rent and wage equation. Under this specification, the crucial assumption justifying the instrument is that, conditional on current labour market conditions, 1981 youth unemployment is unrelated to the error term.

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Figure 1

THE IDENTIFICATION PROBLEM: AN ILLUSTRATION

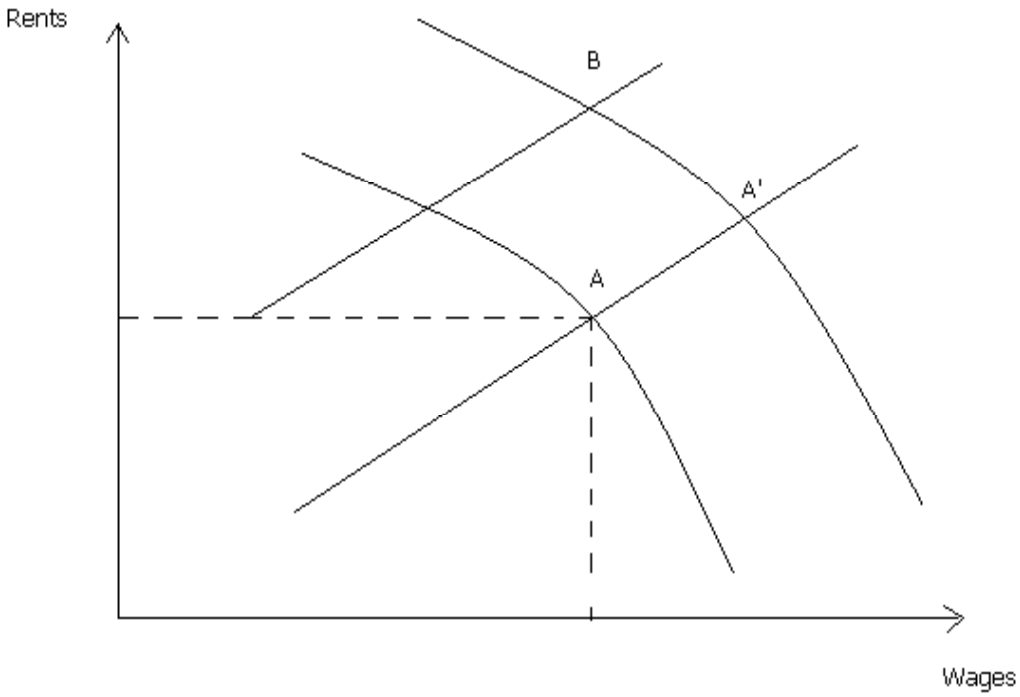

Table 1

SUMMARY STATISTICS

	Mean	Std. Dev.	Obs.
(Log) Rents	8.712	.709	27,931
(Log) Wages	2.464	.406	23,371
Local human capital	9.877	.727	27,931
Surface area	103.721	52.144	27,931
Age of the house	50.206	74.662	27,931
Bathrooms	.350	.484	27,931
Heating system	.816	.387	27,931
South	.349	.477	27,931
Individual human capital	10.875	3.888	23,371
Experience	21.538	11.442	23,371
Per capita GDP	14,369.53	3,979.989	27,931
LLM unemployment rate	.103	.058	27,931
LLM physical capital	170.914	10.283	27,931
LLM infrastructures	116.640	42.994	27,931
LLM (log) population	12.191	1.415	27,931
LLM plant intensity	.056	.069	27,931
Theater	195.337	103.205	27,413
Cinema	6.359	2.916	27,413
Crime	4004.174	1767.987	27,413
Nurseries	943.078	70.494	27,413
Doctors	108.378	80.703	27,413
Hospital beds	.506	.143	27,413
1981 share of population 0-5	.056	.016	27,931
1981 share of population 5-10	.074	.014	27,931
1981 youth unemployment rate	.311	.144	27,413

Notes.- The description of the variables is in the Appendix. To save space, the table does not report summary statistics for the following categorical variables: House location, Subjective house rating, Subjective location rating, Job qualification, Industries, and Firm size.

Table 2

RENTS: BASELINE SPECIFICATIONS

	(2.1)	(2.2)	(2.3)
Local Human Capital	.172 (.022)	.223 (.024)	.186 (.019)
Surface area in m2 (X100)	.410 (.022)	.408 (.022)	.416 (.021)
Age of the house (X100)	-.059 (.010)	-.063 (.008)	-.062 (.008)
Dummy for two bathrooms	.218 (.017)	.218 (.016)	.214 (.015)
Dummy for heating system	.361 (.020)	.363 (.017)	.364 (.016)
P-value for house's location	[0.0000]	[0.0000]	[0.0000]
Dummy for south	-.155 (.022)	-	-
Dummies for regions	-	YES	-
Dummies for provinces	-	-	YES
Time dummies	YES	YES	YES
Intercept	5.947 (.232)	5.312 (.255)	5.713 (.206)
R2	.37	.40	.51
No. Obs.	27,931	27,931	27,931

Note.- OLS estimates. The White robust standard errors reported in parentheses are corrected for the potential clustering of the residual at the local labour market level. Regressions are weighted to population proportions.

Table 3

WAGES: BASELINE SPECIFICATIONS

	(3.1)	(3.2)	(3.3)
Local Human Capital	.023 (.010)	.018 (.007)	.027 (.010)
Individual Human Capital	.060 (.002)	.061 (.002)	.061 (.002)
Experience	.031 (.001)	.031 (.001)	.031 (.001)
Experience squared (X100)	-.037 (.003)	-.037 (.003)	-.037 (.003)
Dummy if female	-.086 (.008)	-.087 (.009)	-.089 (.009)
Dummy if married	.082 (.008)	.083 (.008)	.082 (.008)
Dummy for south	-.064 (.014)	-	-
Dummies for regions	-	YES	-
Dummies for provinces	-	-	YES
Time dummies	YES	YES	YES
Intercept	1.088 (.105)	1.126 (.077)	1.029 (.105)
R2	.40	.41	.41
No. Obs.	23,371	23,371	23,371

Note.- OLS estimates. The White robust standard errors reported in parentheses are corrected for the potential clustering of the residual at the local labour market level. Regressions are weighted to population proportions.

Table 4

RENTS AND WAGES: SINGLE SHIW WAVE REGRESSIONS

	Rents	Wages
SHIW wave: 1993	.179 (.024)	.026 (.010)
No. Obs.	7,175	6,061
SHIW wave: 1995	.184 (.025)	.021 (.010)
No. Obs.	7,400	6,002
SHIW wave: 1998	.155 (.026)	.020 (.012)
No. Obs.	6,870	5,391
SHIW wave: 2000	.176 (.0031)	.024 (.009)
No. Obs.	6,486	5,917

Note.- OLS estimates. Each entry represents the coefficient on the local human capital. The specification is analogous to (2.1) for Rents and (3.1) for Wages. The White robust standard errors reported in parentheses are corrected for the potential clustering of the residual at the local labour market level. Regressions are weighted to population proportions.

Table 5

RENTS AND WAGES: ADDITIONAL HOUSEHOLD/INDIVIDUAL CONTROLS

	Rents	Wages
Local human capital	.168 (.022)	.013 (.008)
Surface area in m2 (X100)	.306 (.017)	-
Age of the house (X100)	-.035 (.008)	-
Dummy for two bathrooms	.157 (.013)	-
Dummy for heating system	.212 (.019)	-
P-value for house location	[0.0000]	-
P-value for subjective house rating	[0.0000]	-
P-value for subjective location rating	[0.0000]	-
Individual human capital	-	.037 (.002)
Experience	-	.024 (.001)
Experience squared (X100)	-	-.030 (.002)
Dummy if female	-	-.085 (.007)
Dummy if married	-	.067 (.007)
P-value for job qualification		[0.0000]
P-value for industries	-	[0.0000]
P-value for firm size	-	[0.0000]
	-	
Dummy for south	-.136 (.039)	-.076 (.012)
Time dummies	YES	YES
Intercept	6.436 (.232)	1.252 (.083)
R2	.48	.48
No. Obs.	27,904	23,252

Note.- OLS Estimates. The White robust standard errors reported in parentheses are corrected for the potential clustering of the residual at the local labour market level. Regressions are weighted to population proportions.

Table 6

RENTS AND WAGES: ADDITIONAL TERRITORIAL CONTROLS

	Rents	Wages
(1) Basic	.172 (.022)	.023 (.010)
(No. obs = 27,931 for Rents and 23,371 for Wages)		
(2) Including provincial per capita GDP	.144 (.023)	.012 (.009)
(3) Including LLM unemployment rate	.173 (.022)	.024 (.009)
(4) Including LLM physical capital	.173 (.023)	.022 (.010)
(5) Including LLM infrastructures	.172 (.022)	.023 (.010)
(6) Including LLM (log of) population	.088 (.029)	.032 (.013)
(7) Including LLM plant intensity	.142 (.024)	.018 (.011)
(8) Including from (2) to (7)	.059 (.030)	.013 (.012)
(9) Basic	.170 (.022)	.022 (.010)
(No. obs = 27,413 for Rents and 22,977 for Wages)		
(10) Including provincial culture variables	.158 (.023)	.027 (.009)
(11) Including provincial crime index	.123 (.023)	.032 (.011)
(12) Including provincial nursery variables	.193 (.024)	.021 (.009)
(13) Including provincial health system indexes	.172 (.021)	.023 (.009)
(14) Including from (10) to (13)	.162 (.024)	.034 (.010)
(15) Including from (2) to (7) and from (10) to (13)	.078 (.028)	.015 (.014)

Notes.- OLS estimates. Each entry represents the coefficient on the local human capital. The White robust standard errors reported in parentheses are corrected for the potential clustering of the residual at the local labour market level (however, the correction for the clustering of the residual at the province level will no make any difference). Regressions are weighted to population proportions.

Table 7

RENTS AND WAGES: 2SLS ESTIMATES

	Rents	Wages
Panel A: Past Demographic Shares as Instruments		
OLS results		
Local human capital	.172 (.022)	.023 (.010)
2SLS results		
Local human capital	.243 (.042)	.030 (.015)
First stage for local human capital		
1981 share of population 0-5	-77.773 (.869)	-98.841 (1.016)
1981 share of population 5-10	87.859 (.828)	102.584 (.957)
No. Obs.	27,931	23,371
Panel B: Past Youth Unemployment as Instrument		
OLS results		
Local human capital	.170 (.021)	.025 (.008)
2SLS results		
Local human capital	.186 (.089)	-.012 (.024)
First stage for local human capital		
1981 youth unemployment rate	.021 (.001)	.030 (.001)
No. Obs.	27,413	22,977
Panel C: Past Demographic Shares and Past Youth Unemployment as Instruments		
OLS results		
Local human capital	.170 (.021)	.025 (.008)
2SLS results		
Local human capital	.237 (.039)	.022 (.014)
First stage for local human capital		
1981 share of population 0-5	-74.756 (.850)	-91.896 (.987)
1981 share of population 5-10	84.632 (.818)	94.835 (.945)
1981 youth unemployment rate	.016 (.000)	0.022 (.003)
No. Obs.	27,413	22,977

Notes.- The White robust standard errors reported in parentheses are corrected for the potential clustering of the residual at the local labour market (however, the correction for the clustering of the residual at the province level will not make any difference). Regressions are weighted to population proportions.