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A note on the effects of human capital policies in Italy during the Great Recession

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Abstract

Human capital policies can make labor supply more resilient to adverse shocks. This note provides evidence on the labor market effects of the progress of the EU cohesion policy funding projects on education and training in the Italian regions during the Great Recession. We find that where the EU funds were effectively transferred to the beneficiaries, the negative consequences of the recent crisis on employment were smoothed. No significant effects are registered when looking at the intensive margin, in line with theoretical predictions. We also document that the buffering action of human capital policies for regional labor markets is high in the regions with low educational attainment levels, by confirming the role of human capital policies for catching-up processes. The results control for cross-sectional dependence and endogeneity issues.

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Human capital policies can make labor supply more resilient to adverse shocks. This note provides evidence on the labor market effects of the progress of the EU cohesion policy funding projects on education and training in the Italian regions during the Great Recession. We find that where the EU funds were effectively transferred to the beneficiaries, the negative consequences of the recent crisis on employment were smoothed. No significant effects are registered when looking at the intensive margin, in line with theoretical predictions. We also document that the buffering action of human capital policies for regional labor markets is high in the regions with low educational attainment levels, by confirming the role of human capital policies for catching-up processes. The results control for cross-sectional dependence and endogeneity issues.

Keywords: human capital policies, EU funds, regional labor markets, Great Recession.
JEL classification: O3, R11, R12.

1. Introduction

Human capital policies can play a crucial role for sustaining economies both in the long- and the short-run, if used for the enhancement of current and prospect workforce.[1] Indeed, policies aimed at fostering the accumulation of human capital may contribute to improve productivity and the skill level of labor supply, and favor the matching between workers and firms (Gennaioli *et al.*, 2012). In addition, human capital is commonly considered as a key factor for understanding long-term growth divergences across and within regions (Vogel, 2015). In Italy, regional differences in human capital are used to explain the rooted divide between the North and the South of the country. Human capital policies, moreover, can support labor markets during recessions (Heckman and Carneiro, 2003). Investments in the acquisition of skills are likely to improve the ability of the workforce to react to economic shocks: using data on the US, Belfield (2015) documented that more educated and trained workers displaced less educated and trained workers during the recent crisis. It is not surprising, then, that the importance of human capital policies for the adaptation of European regions to the new challenges deriving from the Great Recession has been at the forefront of the public debate (EU Commission, 2017). Yet, evidence is required in order to support the role of human capital policies in times of crises, particularly in Italy where during the years 2007-2013 a large part of the cohesion funds was devoted to this policy area (Mazzola and Nisticò, 2016).

Using geo-referenced data on the EU cohesion policy in the twenty Italian regions (NUTS-2 level), this research note provides evidence on the short-term labor market consequences of regional human capital policies undertaken in Italy over the years 2007-2013. Specifically, we study if and to which extent the EU funds used by regional policymakers for financing human capital policies produced effects on regional labor markets during the recent crisis, as measured by variations in the extensive (i.e. employment) and intensive (i.e. job-insurance mechanism) margins. To capture the policy effects of the management of the EU funds, we define a region-specific financial progress indicator describing the ability of regional policymakers to transfer committed EU funds to the beneficiaries by means of effective payments. This measure, which is described in the next section, is one of the novel features of our work. Differently from other existing contributions, moreover, our analysis covers all the Italian regions and not only some geographical areas (Ciani and De Blasio, 2015). We also complement the analyses on the long-term effects of

[1] Human capital policies include different actions such as educational policies at different stages, active labor market policies, on- and off-the job training policies, and policies for skill formation (Heckman, 2000). In what follows, the term human capital policy takes into account all the possible set of policy actions.

human capital across Italy (Gagliardi and Percoco, 2011). In addition, our results contribute to the understanding of the temporary consequences of the EU cohesion policy during the recent crisis and can be of importance also for other countries showing regional disparities (Bachtler and Mendez, 2016). The results of this note are part of a research project undertaken by the authors on the estimation of the effects of the EU cohesion policy in the Italian regions during the Great Recession. A more detailed discussion on the data used here, which derives from the *Opencoesione* dataset available at http://www.opencoesione.gov.it/ can be found in Arbolino *et al.* (2017).

Our findings, which are robust to alternative econometric models (OLS and IV), suggest that in the regions where the EU funds for human capital projects where timely transferred to beneficiaries, the negative effects of the Great Recession on employment growth were smoothed. This is in line with theoretical predictions that suggested the buffering role of human capital policies during recessions (Capello and Lenzi, 2014), and with the evidence of recent studies focusing on the labor market effects of the cohesion policy in the Lombardy region (Porro and Salis, 2017). However, we do not find any significant effects when assessing the impact of human capital policies on the intensive margin. Two reasons can motivate this result. First, on theoretical grounds, human capital policies are less likely to influence labor demand than labor supply, particularly during economic crises (Keen and Nada, 2016). Second, we focus here only on the EU funds managed by regions, a limited share of cohesion funds for human capital policies in Italy: possibly, the policies activated by the central government are more suitable for explaining changes in worked hours than regional policies. We also provide supporting evidence on the fact that the returns of human capital policies are conditional to human capital levels, by confirming that such policies can contribute to the activation of catching-up processes in lagging regions (Heckman and Jacobs, 2010). Note that, we only consider the quantitative aspects of regional human capital policies, without looking at the quality of such policies, that is, the particular types of projects (Rodríguez-Pose and Garcilazo, 2015). Although we are not directly interested in the quality of human capital policies, we will provide information on the different regional policies undertaken in Italy when interpreting our results, whenever possible.

The remaining sections are organized as follows. Section 2 describes the data and the econometric methodology. The results are presented and discussed in Section 3. The final section proposes some policy implications.

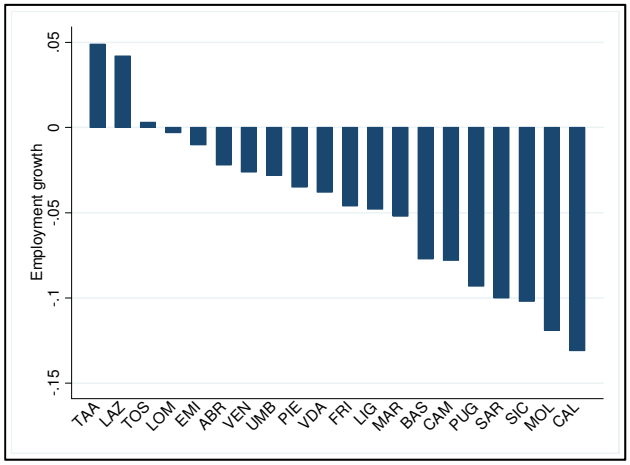
2. Data and Methods

2.1 Labor market indicators and human capital in the Italian regions

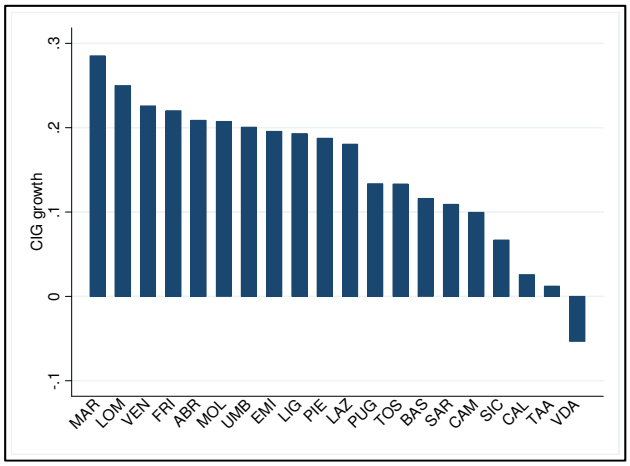
We describe regional labor markets by combining information on total employment (extensive margin) and the main job insurance mechanism present in Italy, namely the *'Cassa Integrazione Guadagni Ordinaria'* or CIGO (intensive margin). Workers benefiting from the CIGO are excluded from employment figures and, a decrease (an increase) of the CIGO can be read as the presence of better (worse) economic conditions following a rise (a drop) in labor demand (Tronti, 1991). The graphs in figure 1 report the average growth of total employment (figure 1a) and CIGO (figure 1b) registered in the Italian regions during the years of the Great Recession. Spatial differences emerge when looking at the distribution of the two variables on a regional level: the ANOVA Tests on the equality of the mean level reject the null hypothesis at 5% level of significance. High employment losses are registered in most of the Southern regions, where the effects of the recent crisis on occupation were more marked. The highest changes in the CIGO were observed in the Northern regions; this is a direct consequence of the concentration of the manufacturing sector in this area. The Italian regional labor markets experienced uneven reactions during the Great Recession: we are interested in exploring if such differences can be partially explained by the different ability of regional policymakers to mobilize the EU resources towards human capital policies.

Figures 1a-b. Regional growth in employment and CIGO, years 2007-13

(a) Employment



(b) CIGO



Note: Employment (figure a) and CIGO (figure b) growth rates are calculated as average over the years 2007-13. ABR: Abruzzo, BAS: Basilicata, CAL: Calabria, CAM: Campania, EMI: Emilia-Romagna, FRI: Friuli VG, LAZ: Lazio, LIG: Liguria, LOM: Lombardia, MAR: Marche, MOL: Molise, PIE: Piemonte, PUG: Puglia, SAR: Sardegna, SIC: Sicilia, TAA: Trentino AA, TOS: Toscana, UMB: Umbria, VDA: Valle d'Aosta; VEN: Veneto.

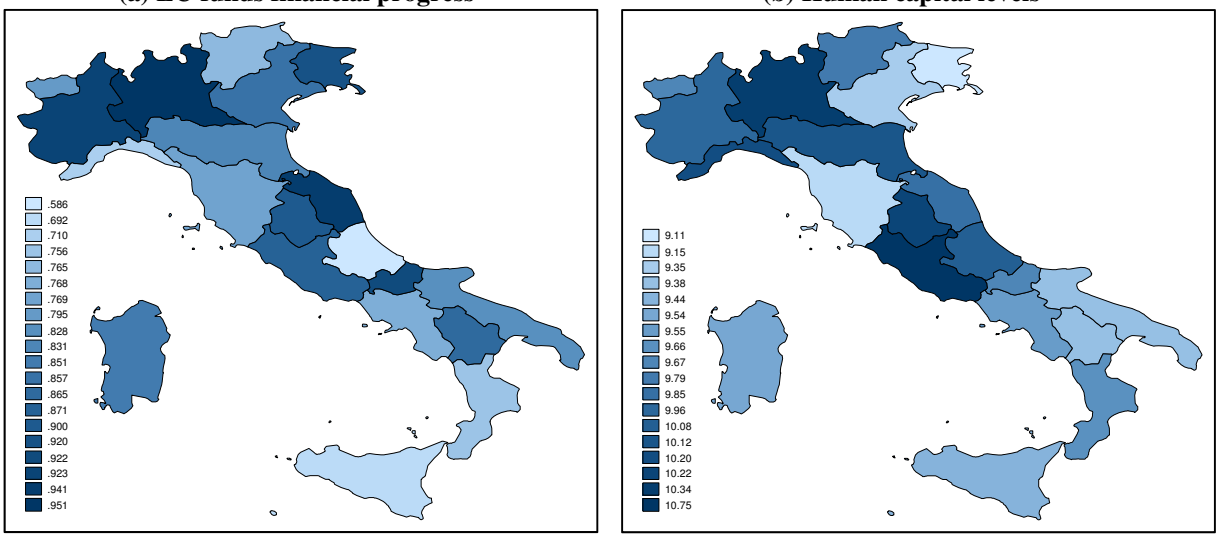
To measure the financial progress of the EU resources funding human capital policies in a given region *i*, we have constructed the following indicator on annual basis:

$$0 \leq EU\ financial\ progress_{it} = \left(\frac{EU\ payments}{EU\ available\ funds}\right)_{it} \leq 1. \qquad (1)$$

Data on payments refer to the EU expenditures (ERDF and ESF) within each Regional Operational Program (ROP) for the programming period 2007-2013. The attention is limited to resources allocated trough ROPs that are autonomously managed by regional policymakers. In this way, we rule out the effects of projects localized in a given region, but financed either through ROPs of other regions or national programs and, moreover, we are able to identify human capital policies directly activated by regional policymakers. The EU funds allocated to human capital policies represented approximately 10% of the total allocation of the EU cohesion policy in Italy over the observation period (about 10 billion euro), and they were used for very different projects such as: on- and off-job training activities; skill formation for different categories of individuals; specific training activities for unemployed and job seekers. The indicator in (1) ranges from zero to one, with values close to one indicating high financial realization of the EU funds for human capital policies.

Figures 2a-b. EU funds for human capital policies and human capital levels, Italian regions

(a) EU funds financial progress **(b) Human capital levels**



Note: The EU financial progress indicator (figure a) and the levels of human capital (figure b) are calculated as average over the years 2007-13.

Figure 2a shows the regional distribution of the EU financial progress indicator. In the regions localized in the Centre-North of Italy, the indicator is equal (on average) to 0.85, that is, for 1 euro of EU funds allocated to human capital policies, about 0.85 euro are transferred to beneficiaries by means of payments. In the Southern regions, where the progress of the EU

funds is relatively low, for each euro of EU resources funding human capital policies, about 0.78 euro are effectively paid to the beneficiaries. In every region, however, the EU funds have been used for different projects. In Lombardy, most of the funds were used for individual supporting measures like training voucher and scholarships; in Emilia-Romagna, most of the resources were used for financing educational infrastructures. In Calabria and Campania (South), a relevant share of the EU funds was used for purchasing of goods and services. Figure 2b maps the stock of human capital registered in the Italian regions, as measured by the average number of years of educational attainment of the regional population in a given region. This variable, which is calculated by weighing the educational attainment achieved by a fraction of the total population in school years with the corresponding duration in years of the specific educational level, is a common measure used in the literature (Barro and Lee, 2013). The regional distribution is not substantially different when using other measures of human capital.

2.2 Econometric methodology

We estimated the following panel relationship:

$$y_{it} = \alpha_i + \beta_1 EUFunds_{it} + \beta_2 Humcap_{it} + \beta_3 EUFunds * Humcap_{it} + X_{it} + \lambda_t + \varepsilon_{it}, \quad (2)$$

where the dependent variable y_{it} is the growth rate of employment/CIGO in region $i = 1, \dots, 20$ at time $t = 2007, \dots, 2013$. Regional fixed-effects (α_i) are used for taking into account time-invariant differences across units (Hsiao, 2014); time dummies are included for considering the presence of effects that are common across all regions like the advancement of the EU budget during the programming period (Elhorst, 2014). The choice of regional- and time-fixed effects has been supported after applying Likelihood Ratio tests. Preliminary tests results conducted for the error term (ε_{it}) confirm the presence of: heteroskedasticity, the null of homoscedasticity is rejected by the modified Wald test at 1% level of significance; serial correlation, detected after performing the Wooldridge test; cross-sectional independence, resulting from the rejection of the null hypothesis of the Pesaran (2004)'s test. Consequently, our estimates are obtained by using the Prais-Winsten estimator with heteroskedasticity-robust and panel-corrected standard errors (Beck and Katz, 1995).

From the relation (2), we can note that the (overall) labor market effects of regional human capital policies are equal to $\Delta y / \Delta EUfunds = \beta_1 + \beta_3 * Humcap$. The (partial) effects captured by the coefficient β_1, which is associated to the variable $EUfunds$ denoting

the EU financial progress indicator, have to be integrated with the effects of the interaction term $EUfunds * Humcap$ that allows for the consideration of human capital policies conditional on the endowments of human capital observed in the different regions (Jaccard and Turrisi, 2003). We expect that the labor market consequences of human capital policies financed by the EU cohesion policy will be high in the regions where the existing stock of human capital is relatively low, given the role of human capital policies for supporting catching-up processes across regions (Barro, 2001). Simply put, if properly activated, human capital policies can play a major role in lagging regions (OECD, 2009). The set of covariates X_{it} includes the (log of) the regional population as a standard control variable used in labor market models (Chodorow-Reich *et al.*, 2012), and the total allocation (in log) of the EU funds on a regional level to check for the differences in the amount of the EU cohesion policy the Italian regions. For the effects of additional control variables see Arbolino *et al.* (2017).

3. Results

3.1 Main estimates

Table 1 shows the estimates when the dependent variable is the employment growth rate. In models (a-c), the effect of human capital policies is contemporaneous; in models (d-f), the EU financial realization indicator is introduced with one year lag: this choice is justified by the fact that human capital policies are less likely to produce effects on labor markets in the same year when they are adopted, but with some delay (Crescenzi et *al.*, 2016). Note that, the negative labor market consequences of the recent crisis in Italy were smoothed in the regions where human capital policies benefited from funds allocated through the EU cohesion policy, with one year lag (models d-f). From model (f), we find that, in a region showing an average level of human capital, the effect of the advancement of the EU funds for human capital policies on employment growth was equal to 0.0195=0.3294+(-0.0317*9.77), with 9.77 denoting the average years of educational attainment in Italy. In other words, during the Great Recession, a 10% increase in the EU payments for regional human capital policies produced a positive variation of employment of 0.195 standard deviation from the mean employment growth. The F-test rejected the null hypothesis of joint not significance of the coefficients β_1 and β_3, with p-value=0.0332. Following Wooldridge (2009), we have calculated the standard error of the estimated coefficient $\widehat{\beta_1} + \widehat{\beta_3} * \overline{Humcap}$ that is equal to 0.0074, meaning that the coefficient is significant at 5% level. The goodness of the estimates is confirmed by the Wald statistics and the R-squared; the results of the other controls are in line with those of the existing literature (Becker *et al.*, 2010). Additional results, not reported here, show that our

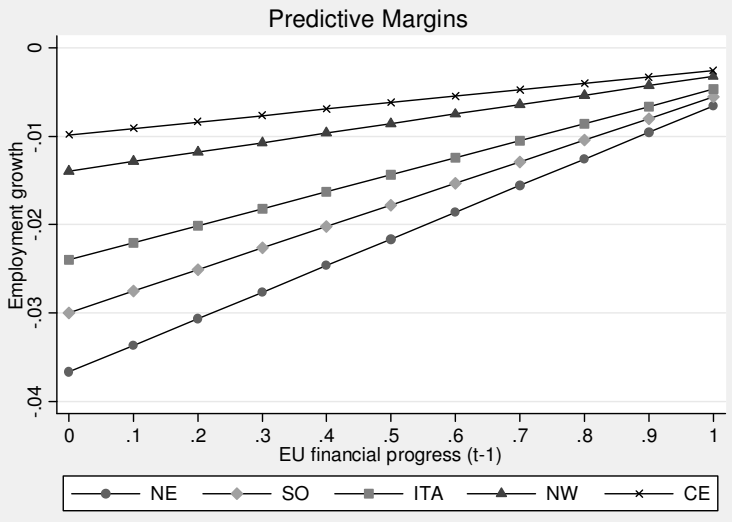
main findings are not substantially affected when controlling for pre-observation period employment and CIGO growth rates (Arbolino *et al.*, 2017).

Table 1. EU funds for human capital policies, employment estimates

EU Funds indicator:	***Time t***			***Time t-1 (lagged)***		
Explanatory variables	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**
EU Funds	-0.0075	-0.0079	-0.0554	0.0152**	0.0149**	0.3294*
	(0.0063)	(0.0061)	(0.1498)	(0.0071)	(0.0070)	(0.1767)
Human capital	-	0.0125	0.0084	-	0.0074	0.0372*
		(0.0128)	(0.0172)		(0.0148)	(0.0218)
*EU Funds*Hum. capital*	-		0.0047	-	-	-0.0317*
			(0.0148)			(0.0176)
Population (log)	0.3085***	0.2905**	0.2975**	0.3577***	0.3343**	0.2715**
	(0.1154)	(0.1176)	(0.1186)	(0.1250)	(0.1296)	(0.1323)
Tot. EU funds (log)	0.0031**	0.0030*	0.0030*	0.0074***	0.0069***	0.0064**
	(0.0016)	(0.0016)	(0.0016)	(0.0025)	(0.0025)	(0.0024)
Observations	140	140	140	120	120	120
R^2	0.66	0.66	0.66	0.70	0.70	0.71
Wald statistics	271.97	271.33	272.12	308.71	299.02	311.75
$(\chi^2_{(k)})$	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]

Note: Estimates include regional and time effects. Errors are robust to heteroskedasticity, autocorrelation and cross-section dependence. *, **, *** denote significance at 10%, 5%, 1%. Figures in brackets are p-values.

Figure 3. EU funds and human capital, interaction effects



Note: Estimates refer to model (e) for employment (table 1). ITA (Italy); NW (North-West); CE (Centre); NE (North-East); SO: South.

The graph in figure 3 shows the effects of the progress of regional human capital policies funded by the EU cohesion policy on the predicted employment growth rates, conditional to the different levels of human capital endowments registered in the Italian macro-regions. We find that regional human capital policies produced positive effects in all the Italian macro-regions. But, in the some parts of Italy line in the South, were educational attainment levels are relatively low, labor markets would have benefited more from the advancement of the EU funds for human capital than in other regions if effective payments had been higher than they actually were. This result confirms that, when adequately used, the

effects of the cohesion policy are more market in the regions that need and receive a large amount of resources, which generally show low levels of human capital (Rodríguez-Pose and Garcilazo, 2015). Table 2 reports the estimates when the dependent variable is the CIGO growth rate. Despite the coefficients of the main variables of interest show the expected signs they are not statistically significant, by denoting that the progress of regional human capital policies funded by the European resources does not seem to play a role for explaining variations in CIGO. This is in line with the discussion developed in the Introduction: human capital policies mostly influence the extensive margin, not the intensive one.

Table 2. EU funds for human capital policies, CIGO estimates

EU Funds indicator:	***Time t***			***Time t-1 (lagged)***		
Explanatory variables	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**
EU Funds	-0.3164	-0.2993	-0.4837	-0.3643*	-0.2662	-5.9874
	(0.1937)	(0.1982)	(5.4407)	(0.1912)	(0.1961)	(5.2561)
Human capital	-	0.2289	0.2164	-	-0.1370	-0.6679
		(0.3019)	(0.6030)		(0.4324)	(0.6524)
*EU Funds*Hum. capital*	-	-	0.0188	-	-	0.5790
			(0.5594)			(0.5327)
Population (log)	5.9620**	5.2944**	5.3255**	4.1261	-1.0755	-0.3901
	(2.5458)	(2.5111)	(2.5731)	(3.3966)	(3.3253)	(3.4580)
Tot. EU funds (log)	0.0755**	0.0612	0.0607	-0.1389*	-0.1576**	-0.1493*
	(0.0317)	(0.0377)	(0.0381)	(0.0716)	(0.0764)	(0.0772)
Observations	140	140	140	120	120	120
R^2	0.77	0.76	0.77	0.77	0.73	0.73
Wald statistics	454.93	452.24	452.34	429.40	337.17	341.49
$(\chi^2_{(k)})$	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]

Note: Estimates include regional and time effects. Errors are robust to heteroskedasticity, autocorrelation and cross-section dependence. *, **, *** denote significance at 10%, 5%, 1%. Figures in brackets are p-values.

3.2 IV results

When using variables that describe the level of human capital among the covariates of regional growth regressions, Acemoglu *et al.* (2014) pointed out to check for the presence of omitted variables bias. The authors observed that current human capital endowments can be the by-product of past events influencing institutions that, if properly included in growth regressions, can improve the validity of the effects of human capital levels for explaining the growth of regional economies. In our case, endogeneity can be also due to reverse causality: fast-growing regional labor markets can attract more educated workers (Faggian and McCann, 2008). In effect, in the employment specification, the results of the Hausman test robust to heteroskedasticity for the covariate $Humcap$ reject the null hypothesis of exogeneity at 1% level of statistical significance. This also implies that the interaction term constructed starting from the covariate for human capital can be affected by endogeneity (Angrist and Pischke, 2010). Therefore, we decided to adopt a two-stage instrumental variable (IV) strategy where historical variables available for Italy are used as instruments in order to obtain results that are

not affected by inconsistency (Wooldridge, 2009).[2] More precisely, a regional adaptation of the Di Liberto and Sideri (2015)'s set of instruments based on the duration (in years) of the dominations present in the Italian regions between 1100 and 1800 is used for instrumenting the variable *Humcap*. These instruments rely upon the idea that past events produce consequences on the Italian regional labor markets through their permanent influence on regional institutions and human capital (D'Adda and De Blasio, 2015). In Italy, nine main different dominations occurred between 1100 and 1800: the Normans, the Swabians, the Anjou, the Spanish, the Bourbons, the Papal State, the Republic of Venice, the Austrians, and the Savoy. Interestingly, the set of instruments used here allows for the introduction of some spatial variability among Southern regions, and shows correlation with the covariate *Humcap*, about 0.50 in absolute value, and limited correlation with the other main covariates.

Table 3. The employment effects of human capital policies, IV estimates

II stage results				
EU funds indicator:	***Time t***		***Time t-1 (lagged)***	
Explanatory variables	**(b)**	**(c)**	**(e)**	**(f)**
EU Funds	0.0019	-0.0453	0.0249***	0.3188*
	(0.0075)	(0.1588)	(0.0080)	(0.1858)
Human capital (TSLS)	0.1525***	0.1509***	0.5788***	0.5350***
	(0.0567)	(0.0567)	(0.1985)	(0.1971)
*EU Funds*Hum. capital (TSLS)*	-	0.0047	-	-0.0297*
		(0.0158)		(0.0186)
Population (log)	-0.1025***	-0.1013***	-0.4175***	-0.3850***
	(0.0376)	(0.0376)	(0.1409)	(0.1400)
Tot. EU funds (log)	-0.0042	0.0044	0.0048**	0.0045*
	(0.0029)	(0.0029)	(0.0024)	(0.0024)
Diagnostics				
F-Statistics I Stage	43.50	44.92	46.95	48.25
	[0.000]	[0.000]	[0.000]	[0.000]
Kleibergen-Paap rk LM stat.	66.47	66.73	57.61	53.77
	[0.000]	[0.000]	[0.000]	[0.000]
Hansen J statistics	13.69	11.52	14.69	10.90
	[0.090]	[0.173]	[0.065]	[0.207]
Observations	140	140	120	120
R^2	0.66	0.66	0.70	0.71
F-Statistics II stage	298.94	299.83	496.01	525.00
	[0.000]	[0.000]	[0.000]	[0.000]

Note: Estimates include regional and time effects. Errors are robust to heteroskedasticity, autocorrelation and cross-section dependence. *, **, *** denote significance at 10%, 5%, 1%. Figures in brackets are p-values.

The IV estimation has proceeded as follows. In the first-stage, the variable *Humcap* is regressed in nine out of ten historical covariates representing the instruments; the covariate describing the independent states has been excluded for avoiding collinearity problems. In the second-stage, the predicted values of the first-stage regression are used for the level of regional human capital and for constructing the interaction term. Results are robust to

[2] A more deep discussion on the endogeneity issues in the relation (2), the IV strategy adopted for solving these problems and the particular set of instruments can be found n Arbolino *et al.* (2017), where additional robustness checks are also presented.

heteroskedasticity, serial correlation, and cross-sectional dependence. In table 3, we report second-stage coefficients for the models (b-c) and (e-f) when the dependent variable is the employment growth rate, and the main IV post estimation diagnostics. CIGO estimates are not reported because they are still not significant. The main findings of this study are confirmed also when checking for the presence of endogeneity of human capital endowments. From the IV estimates of model (f), the overall effects of regional human capital policies funded by the EU resources on employment growth are equal to 0.0285=0.3188+(-0.0297*9.77). The joint not significance of the coefficients β_1 and β_3 is rejected by the results of the F-test (p-value=0.0027); the standard error of the estimated coefficient $\widehat{\beta_1} + \widehat{\beta_3} * \overline{Humcap}$ that is equal to 0.0073, implying that the coefficient is significant at 5% level. In addition, the covariate describing the regional levels of educational attainment is always statistically significant when adopting the IV strategy. We interpret this as an improvement of the robustness of our results: now the effects of human capital levels for employment growth are in line with the literature. The F-statistic of the first-stage is higher than ten, by suggesting that set of instruments seems quite appropriate. The null hypothesis of the Sargan-Hansen's J statistic that the instruments are valid is not rejected, and the results of the Kleibergen-Paap rk LM statistics reject the null hypothesis of under-identification.

4. Concluding remarks

Two main policy implications derive from our analysis. First, human capital policies can work for smoothing the negative consequences of economic shocks on labor markets. In the case of Italian regions, we have documented that the EU funds used for projects on training and education can sustain regional labor supply, when they are timely transferred to beneficiaries. Our findings indirectly support the actions of policymakers in some regions (Lombardy and Emilia-Romagna), which decided to recalibrate the EU cohesion policy towards human capital and knowledge-based innovation policies during the Great Recession. Among other factors, this can motivate why labor markets in these regions registered a better reaction to the recent crisis than the rest of Italy. Interestingly, both regions have recently requested to the central government to obtain more autonomy regarding the organization of human capital policies. Second, the discussion on the reform of the EU cohesion policy has to take into account the possible usage of the cohesion funds for achieving countercyclical objectives, if needed (Camagni and Capello, 2015). The cohesion policy is the main source of financial support for place-specific interventions in the EU, and its future design has to be necessarily projected by remembering that the EU funds can contribute to enhancing the

resistance and recoverability of regions. In future works, we will try to improve our knowledge on the labor market effects of human capital policies when: the qualitative aspects of policies are also considered, and regional policies are interacted with national ones. These questions are left for future research.

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