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SKILL MISMATCH OF GRADUATES IN A LOCAL LABOUR MARKET¹

In this paper we first review the (potential and actual) role of the Universities for the local economies in which they operate, especially considering the implications deriving from the degree of skill mismatch (over-education) in a local labour market. Then, in the second part of the paper, we realise an empirical investigation based on administrative information of an Italian University matched with the data of the job centres of the local (provincial) labour market in order to reconstruct the characteristics of the university-to-work transitions of graduates. Our results have important policy implications, since for local development it is crucial, among other things, to make the best use of all human resources and especially those with the highest educational level.

Keywords: Local labour market, human capital, skill mismatch, over-education

1. Introduction

The role of education and human capital for economic development has been extensively investigated, both on a national scale and at regional or local levels. It has also been recognized in many policy programmes, at the national and international level, including the Lisbon Agenda and “Europe 2020” within the EU. However, the educational and productive systems can contribute to different degrees of “mismatch” between the knowledge acquired through formal education and the skills demanded by employers: this may cause either youth unemployment or skill-mismatch phenomena, including over-education. In this respect, the importance of appropriate school-to-work transition processes should also be underlined.

In this paper the phenomena of skill mismatch of graduates has been investigated for the case of an Italian local labour market. First of all it should be noted that, in the case of Italy, Alma Laurea provides information on the conditions of graduates (at 1, 3 and 5 years after graduation) of most Italian universities. However, the empirical investigation of the features of the transition to work of graduates of a particular University in a specific territory (like a Province) needs the use of the large databases created by the local “public job centres”².

In this paper, data from the job centres of the province of Perugia — since January 2004 to July 2009 — are matched with university’s data to reconstruct the features of the university-to-work transitions of graduates at the University of Perugia³ in the provincial labour market. By using this statistical information, a previous paper (Sciulli and Signorelli, 47) focused on some characteristics of University-to-work transitions (UTWTs).

In the present paper we complete the previous investigation by considering the characteristics of the skill mismatch. In particular, we focus on the incidence of “good job-matches” of Perugia graduates finding a job in the province of Perugia, and its incidence across some relevant individual characteristics. We define a situation of «good job-match» when a graduate is employed in a job attached to a “skilled profession” (identified on the basis of ISCO’s classification of occupations).

Our main findings are that the rate of “good matches” differs widely across faculties, also as a consequence of the structure of the local labour market. It also depends on the type of university

lic job centres» (usually there are several «job centres» in each Province) for the different forms of labour market flows (hiring and firing), type of contract (permanent, temporary, etc.) and for both worker and firm characteristics.

³ This is a middle-size Italian University. The overall number of graduates we consider is higher than 30,000 (around 5,000 each year). The average number of students enrolled at the University of Perugia was — in the considered period — near 30,000. The data allow distinguish according to different degrees, faculties, and many other individual and job characteristics.

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² According to Italian legislation, it is compulsory for firms to send complete and detailed information to the local «pub-

degrees (pre-reform degrees and post-reform second level degrees are associated with higher frequency), the degree mark (being graduated with the maximum score strongly increases the incidence), time of graduation (being delayed graduated slightly decreases the occurrence) and some other features (gender, nationality, place of residence, age at work, work experience). A two-way analysis based on the intersection of several characteristics is also presented. Our results have important policy implications, since for local development it is crucial, among other things, to make the best use of human resources.

After the literature review (Section 2), we shall illustrate the data base used and the key results of our investigations on Perugia's graduates (Section 3); then Section 4 concludes.

2. Literature Review

The role of education and human capital for economic growth has been extensively investigated in both theoretical and empirical works, especially in the last two studies.¹ The positive role of human capital has been detected also in many studies concerning local development. Human capital is a key driver of local and regional development not only because individuals with high skills and knowledge are more productive, but also because productivity of all workers tend to be higher in regions where their peers have high levels of human capital.

In this context, universities can provide an important contribution to regional development, not only in the field of higher education but also — through top level research centres — with respect to social and economic development. Creating knowledge and exchanging this knowledge are central factors for the success of a location, i.e. for a “learning region” (Florida, 20). A region's ability to learn and adapt is influenced by the networks and institutional conditions; “learning by interacting” becomes a key driver of innovations and growth.² A transfer of innovation and knowledge is beneficial to both the regional enterprises and the universities, also through the promotion of spin-offs and business start-ups. As a high education institution, the university can help to keep a highly qualified workforce in the region and not to migrate (the brain gain is fostered and the brain drain prevented); furthermore, it can provide ser-

vices for skill upgrading, that are so important at the local and regional level.³ Among other things, universities are location factors that influence the image and “location quality” of regions. A partnership between the university and the region is often advocated to favour the realization of learning regions within a knowledge-based society (see Strauf and Scherer, 48). In particular, innovation and internationalisation of local firms is fostered by the best practices of the higher education system in collaboration with the regional stakeholders.⁴

At the individual level, human capital is a prominent element in the effective transition of young people from school to the labour market, for the risk of unemployment they face, their performance at work, and the quality and stability of their position. Notwithstanding that education is a key component of human capital, starting from school and university education, many other elements⁵ — such as out-of-job training courses, on-the-job training (generic training, specific training, learning-by-doing) and life-long learning — may be important as well; the existence of a “youth experience gap” harms the employability of young people. In most countries, well-educated young adults exhibit higher employment and labour force participation rates, and lower unemployment rates.

The role of human capital for economic development has been recognized in many policy programmes, at the national and international level. The «Lisbon Strategy» (2000) considered the key importance of investment in human capital for creating «more and better jobs». The new “Europe 2020” plan also pays attention to youth labour and education problems: the share of 30–34 years youngsters having completed tertiary or equivalent education should reach at least 40 % at the

³ In fact, adult learners are less mobile than younger students, so skill upgrading provided by universities raises labour productivity and the performance of the local economy. Notice that skill upgrading, lifelong learning, re-skilling and flexible ways of learning are needed because of technical progress and rapidly changing skill requirements in working life, which is itself getting more extended (OECD, 37).

⁴ In Italy the enduring success of industrial districts depends on the capacity to build broad networks involving universities, research centres, and financial institutions.

⁵ Thus, the generally adopted empirical measures of human capital, such as years of schooling or level of formal education completed (sometimes distinguishing between the different types of schools and universities) are only near “proxies” (a recent empirical investigation in the case of EU countries is in Marelli and Signorelli, 30). If possible, they should be integrated by the mentioned non-school components as well as by some other elements, like family networks and social background.

¹ See, among many others, Lucas (29), Benhabib and Spiegel (5), Krueger and Lindahl (26), De La Fuente and Ciccone (17).

² There are some links also with the “social capital” approach (Putnam, 41), according to which the relationships between individuals and social groups are fundamental for the economic development of a region or a community.

end of this decade. In general we can say that appropriate industrial or structural policies can raise the demand for graduated or highly educated workers, demand which is also affected by technical progress, the diffusion of innovations and new organisational methods, the tertiarisation of the economies, etc.

A well-known hypothesis in economic literature is that in the last three decades there has been an increasing demand of educated and skilled workers, because of structural change (e.g. tertiarisation and financialisation of economies) and a “skilled biased” technical change, due to the diffusion of new technologies: *ict*, internet, etc.¹ This shift in labour demand has damaged the relative position of unskilled workers, that in any case are hurtled also by other phenomena such as globalization (including trade with developing countries, FDI and de-localisations, immigration flows). The damage consists in lower or even declining (at least in relative terms) wages of unskilled workers in the United States and other “flexible” economies and in increasing unemployment in some “rigid” European labour markets. A more recent hypothesis refers to a likely polarization² of the employment and wage structures, since structural product and demand shifts have increased the relative demand for high and low skilled workers, shrinking the medium-skilled workers across many economic activities.³ In any case, the increase in the demand for skilled labour is not homogeneous in all industries and, particularly at the local level, might concern certain jobs and professions rather than the aggregate economy.

If we now turn to the supply side of education, in particular of higher education, we can notice that in many countries of the world there have been constantly rising investments in education, hence in the supply of educated and skilled workers. This is a consequence of a growth, in many countries, of families’ income but also of welfare expenditures, specifically devoted to education, training and human capital formation. Also reforms of education and university systems have often favored the enrollment of young people.

Regarding Europe, we should recall the “Bologna Process” started in 1999; the “Bologna Declaration” was signed in June 1999 at Bologna (Italy) by the ministers of 29 European countries and it calls for the establishment of a cycle system of study programmes and degrees: a first study programme called Bachelor — in the Anglo-Saxon world — and a second leading to a Master. In the majority of countries, the following reforms produced a three-year first level degree and a two-year second level degree (the doctoral studies are the third stage of the Bologna model).⁴ If we should judge about the success of this model, we must recognize that the realization of closer and better relationships between higher education and the world of work is a prominent objective (e.g. Teichler, 49). However for many aspects the Bologna Process is still ongoing, with significant country differences (European Commission, 18).

A possible cause of high youth unemployment and low quality employment of young people is still the mismatch between the knowledge acquired through formal education and the skills demanded by employers. Many young people are unemployed or cannot find jobs which are adequate to their educational path despite a medium-high level of formal education; a key reason is lack of experience (Pastore, 39). The characteristics of both educational systems⁵ and the university-to-work-transition (UTWT) institutions are relevant; of course, also propitious labour market institutions may favor the employability of young people.⁶

Schomburg and Teichler (45) present very recent and complete researches regarding the “employability and mobility” of graduates in Europe.⁷

⁴ In Italy a long and complex “reform phase” started with Law n. 509/1999 and was first implemented in 2001 with the “3plus2” track system. In short, the Italian system moved from a single four/five year degree to a two-tier system characterised by a three year degree (first cycle, “laurea triennale”) and an additional two year degree (secondary cycle, “laurea magistralis”). Notice that a persisting feature of the Italian system is the “legal” value of University degrees (e.g. Cappellari and Lucifora, 12).

⁵ As to the education systems in Europe, that can be classified according to their flexibility vs. rigidity and to their “dual” vs. “sequential” approach to training, see Caroleo and Pastore (13).

⁶ There are many definitions of “employability”. For example, the “Bologna Follow-up Group” defined employability as “the ability to gain initial employment, to maintain employment, and to be able to move around within the labour market”. As to the more general school-to-work processes and trends see Quintini et al. (42).

⁷ In addition to two general assessments of the Bologna Process, the volume includes country studies regarding Austria, the Czech Republic, France, Germany, Hungary, Italy, the Netherlands, Norway, Poland and the UK.

¹ Initially discussed in the ‘90s by Krugman, Katz, Murphy, Machin, and many other economists (see e.g. Nickell, 35).

² See Autor et al. (3), Goos et al. (21), Michaels et al. (33). The phenomenon has become common also in developing countries: see e.g. Helmy (23).

³ One explanation is the “routinization” hypothesis, according to which computers and new technologies complement both high skilled jobs and low skilled interpersonal tasks, but substitute for middle skilled (manual and clerical) tasks (Autor et al., 3). Another explanation is the privatization of some former “public” services and productions.

Some other researches investigated, in the European context and from different perspectives, the recent changes in higher education and the complex features of university-to-work transitions (e.g. Mora, 34; OECD, 36; Schomburg, 44; Schomburg and Teichler, 45; Teichler 49, 50; Little 28). In particular, Teichler (50) argues that even the more complex researches on the relationships between higher education and the world of work are not yet beneficial for a dialogue with practitioners about the future of higher education. A huge literature focus on individual countries and particular topics of the university-to-work transitions, e.g. examining the positive role of “university career services” or comparing the transitions from higher education to work in different countries.

In the case of Italy, some key details on the Italian reforms and their consequences — e.g. on enrolment decisions and UTWTs — are discussed in Bratti, Broccolini and Staffolani (5), Brunello and Cappellari (9), Cappellari and Lucifora (12). As for the very recent researches, Cammelli et al. (11) highlight the mixed outcomes of the Bologna Process in Italy by using the well known Alma Laurea database, while the positive role played by Alma Laurea in favouring UTWTs has been investigated by Bagues and Sylos Labini (4). Moreover, Biggeri et al. (6) investigate the factors determining UTWTs by adopting a multilevel approach to the analysis of the time to obtain the first job.¹ Some other studies (mostly published in Italian language) refer to Italian graduates, at national or regional/local level.

An additional strand of literature that is worth to recall refers to the “overeducation” phenomenon, that describes the extent to which an individual possesses a level of education in excess of that which is required for her particular job (McGuinness, 31; Groot and van den Brink 22; Leuven and Oosterbeek, 27). Overeducation is potentially costly to the individual (who is less satisfied with her job and more likely to quit), the firm (because of lower productivity) and the (local) economy. At a macroeconomic level, national welfare is potentially lower than would be the case if the skills of overeducated workers were fully utilized. Individual overeducated workers, because of the fact that a proportion of their educational investment is unproductive, are likely to earn a lower return on their educational investment; overeducated workers are in some way less able relative

to their adequately matched counterparts, therefore, lower wages are a reflection of lower ability/productivity.

At a macro level, a reason of overeducation is the relative growth of supply of highly educated workers versus the growth in demand.² Overeducation can be assessed³ by comparing the required education on the basis of their job title (using information provided by classifications such as the Standard Occupational Classification System) and the individuals actual level of education. A recent meta-analysis shows that the mean value of the incidence of overeducation is about 22 %, i.e. 7 % below what results from subjective measures based on workers’ self-assessment (see McGuinness, 31); of course, different methods of measurement lead to different measures of overeducation. Moreover, in the mentioned study there are no indications that the incidence of overeducation has been rising over time. Regarding wages, the analysis highlight the lower returns to surplus education and an “overeducation penalty”.

A higher incidence of overeducation is found for the European countries — concerning specifically tertiary graduates — by Croce and Ghignoni (16), with the largest number of countries concentrated between 30 % and 40 % (but some of them including Germany are above 50 %). This study is also interesting since it shows that the increase of the supply of qualified labour does not cause per se overeducation, but there is an important role played by the demand for qualified labour; moreover, overeducation operates as a short-term adjustment mechanism following the economic cycle.

² It can also be caused by imperfect matching in the labour market due to a wrong distribution of educated workers by field of study, to spatial mismatch or to other imperfections (Croce and Ghignoni, 16). Notice that “horizontal overeducation” is likely in certain countries, due to the low degree of orientation of high school diploma students, the scant integration of the educational system with the labour market and — at least in Italy — the high share of graduates in humanities and other arts degrees. Also delayed graduation increases the chances of overeducation (Aina and Pastore, 1). According to McGuinness and Sloane (32), Italy exhibits one of the highest shares of both overeducated workers (23 % at the time of their first job) and “over-skilling” (21 %).

³ An alternative is to consider measures of “excess schooling”, i.e. overeducated are graduates who do a job for which the number of years of schooling required is lower than that completed. There are also subjective measures of overeducation, that have been criticized for different reasons. On the other hand, the occupational dictionary-based objective measures are open to the criticism that occupations may contain a number of skill levels, so people with the same job title may be doing very different jobs (see McGuinness, 31).

¹ Pozzoli (40) focuses on the transition from university to first job for Italian graduates, taking into account graduates’ characteristics (before the implementation of the Bologna Process) and the effects relating to degree subject.

It is remarkable to note that according to some research (e.g. Buchel and van Ham, 10) the risk of overeducation is higher for workers in small regional labour markets; this finding is obtained after controlling in the regressions for distance to work (workers living in rural locations are more likely to be overeducated). Thus spatial mobility is a potential way of avoiding overeducation; otherwise, in presence of spatial and other types of rigidities in the labour market (e.g. when employers are unwilling to modify their production processes to fully utilize the skills of their employees), if the supply of educated labour exceeds their demand, the risk of overeducation is real.

Finally, it is important to emphasize that skill mismatch may be one reason for the high youth unemployment rate. Notice that youth unemployment rates are generally higher than the adult ones (Blanchflower and Freeman, 8); in Europe, they are twice or three times as high as the adult rates, with significant differences across countries. Youth unemployment has further risen after the recent global and Eurozone crisis¹ (e.g. ILO, 24 and 25; European Commission, 19); also graduates experienced a general worsening in the transition to work processes, with significant country and regional differences (as for the Italian case, see AlmaLaurea, 2). Scarpetta et al. (43) highlight that the crises exacerbate a number of structural problems that affect the transition from school to work: the decline in GDP turns after some months into a reduction of labour demand; in this situation school-leavers are competing with more job-seekers for fewer vacancies, while the young people already in the labour market are generally among the first to lose their jobs, mainly due to the higher diffusion of temporary contracts² (see e.g. Choudhry, Marelli and Signorelli 15). Hence, youth unemployment rates are more sensitive to the business cycle than adult unemployment rates. O'Higgins (38) warns that the key problem is not only that young people are more vulnerable to the crises but also that these effects are likely to be more long-lasting for the young; long periods of unemployment erode the skills of young workers, reduce their employability, cause a permanent loss of human capital.

¹ In general, the impact on unemployment — specifically on youth unemployment — is greater in the case of financial crises (Choudhry, Marelli and Signorelli, 15).

² In the EU, just before the crisis in 2008, 41.8 % of young people were in temporary employment compared to 14.4 % for all employees. The incidence of youth in temporary employment has risen to 44.3 % after the crisis. In many countries (for example in Italy), practically all new employment opportunities in this period have been temporary (O'Higgins, 38).

3. Data and Descriptive Analysis

3.1. Data

Our empirical analysis is based on a matched-sample between the University of Perugia administrative information and the data from the job-centres of the province of Perugia. This allows us to reconstruct the UTWT of graduates at the University of Perugia since January 2004 to July 2009 that have found a job in the province of Perugia³. Our analysis includes both graduates that have obtained a pre-reform degree (PreRD) and graduates that have obtained a post-reform degree (both first level -PRFLD- and second level -PRSLD-, including both the unique cycle second level degree and the magistralis degree)⁴.

Tables 1a and 1b present information regarding the share of graduates of the University of Perugia, distinguishing according to the faculty and degrees, that have found at least a job in the province of Perugia in the period ranging from 2004 to 2009.

Looking at the table above, the percentage of graduates working in the province of Perugia is quite homogenous among faculties (with the exception of the faculties of Law, Medicine and Veterinary Science). Table 2 reports differences in employment rates in the province of Perugia according to the province of residence, showing relevant heterogeneities.

3.2. Skill matches of Perugia graduates in the Perugia labour market

This section provides descriptive evidence of incidence of good job-matches of Perugia graduates finding a job in the province of Perugia, and its incidence across some relevant individual characteristics. According to our definition, a good job-match exists if a graduate is employed in a job attached to a skilled profession. Skilled professions are identified by the categorization provided by the International Standard Classification of Occupations 1988 (ISCO-88) as reported in Table 3, that has been adopted by the International Labour Organization in 1987. Specifically, jobs attached to occupations classified in the first three levels (legislators, senior officials, managers, professionals, technicians and associate professionals) of the ISCO-88 skill classification, are identified as skilled jobs.

³ Since matches outside to the province of Perugia are not identifiable, durations of censored spells are likely to be over-estimated. This may have consequences in terms of timing comparison among faculties in case the placement of graduates from different faculties is heterogeneous across provinces.

⁴ Considering the timing of implementation of Law 509/1999, the post-reform degrees involved graduates enrolled at the University of Perugia since 2001.

Table 1a

Graduates at the University of Perugia and employed in the province of Perugia

	Pre-reform degree				Post-reform first level degree			
	Non-working in the province of Perugia	Working in the province of Perugia	Graduates	% Employed in the province of Perugia	Non-working in the province of Perugia	Working in the province of Perugia	Graduates	% Employed in the province of Perugia
Agriculture	266	188	454	41.41 %	250	136	386	35.23 %
Economics	870	551	1421	38.78 %	1282	671	1953	34.36 %
Pharmacy	440	197	637	30.93 %	80	32	112	28.57 %
Law	1409	343	1752	19.58 %	413	83	496	16.73 %
Engineering	956	704	1660	42.41 %	865	348	1213	28.69 %
Arts and Philosophy	2355	1251	3606	34.69 %	2247	743	2990	24.85 %
Medicine	1016	172	1188	14.48 %	683	669	1352	49.48 %
Veterinary Science	361	34	395	8.61 %	8	3	11	27.27 %
Education	459	450	909	49.50 %	771	340	1111	30.60 %
Mathematics, Physics and Natural Science	616	430	1046	41.11 %	765	284	1049	27.07 %
Political Science	404	260	664	39.16 %	797	303	1100	27.55 %
Total	9152	4580	13732	33.35 %	8161	3612	11773	30.68 %

Source: our elaboration on University of Perugia administrative information and Perugia job centres data.

Table 1b

Graduates at the University of Perugia and employed in the province of Perugia

	Post-reform second level degree				Total			
	Non-working in the province of Perugia	Working in the province of Perugia	Graduates	% Employed in the province of Perugia	Non-working in the province of Perugia	Working in the province of Perugia	Graduates	% Employed in the province of Perugia
Agriculture	88	73	161	45.34 %	604	397	1001	39.66 %
Economics	386	287	673	42.64 %	2538	1509	4047	37.29 %
Pharmacy	110	46	156	29.49 %	630	275	905	30.39 %
Law	313	65	378	17.20 %	2135	491	2626	18.70 %
Engineering	284	305	589	51.78 %	2105	1357	3462	39.20 %
Arts and Philosophy	571	301	872	34.52 %	5173	2295	7468	30.73 %
Medicine	436	68	504	13.49 %	2135	909	3044	29.86 %
Veterinary Science	111	8	119	6.72 %	480	45	525	8.57 %
Education	188	326	514	63.42 %	1418	1116	2534	44.04 %
Mathematics, Physics and Natural Science	171	111	282	39.36 %	1552	825	2377	34.71 %
Political Science	223	105	328	32.01 %	1424	668	2092	31.93 %
Total	2881	1695	4576	37.04 %	20194	9887	30081	32.87 %

Source: our elaboration on University of Perugia administrative information and Perugia job centres data.

Table 4 includes information about the descriptive statistics of the sample under analysis. It includes information about the characteristics of 7604 Perugia graduates employed in the province of Perugia, for a total of 28245 job relationships in the period January 2004 – June 2009. Specifically, we note that the incidence of good job-matches is about 56 %. In what follow we present the distribution of the incidence of good job-matches across the following characteristics: faculty, type

of degree, delayed graduation, degree mark, gender, province of residence, nationality, working age, and first job-experience after graduation.

The following Tables provide information about the incidence of good job-matches (I) for Perugia graduates in the period under analysis. It is interesting to note that the complementary values of the incidence (1-I) represents the over-education rate. This seems important in a comparative perspective with previous studies on this topic.

Table 2

Graduates at the University of Perugia, residence and employment

	Not residents in the province of Perugia				Residents in the province of Perugia			
	Non-working in the province of Perugia	Working in the province of Perugia	Graduates	% Employed in the province of Perugia	Non-working in the province of Perugia	Working in the province of Perugia	Graduates	% Employed in the province of Perugia
Agriculture	403	121	524	23.09 %	201	276	477	57.86 %
Economics	1,694	271	1,965	13.79 %	844	1238	2082	59.46 %
Pharmacy	485	73	558	13.08 %	145	202	347	58.21 %
Law	1,327	118	1,445	8.17 %	808	373	1181	31.58 %
Engineering	1,139	289	1,428	20.24 %	966	1068	2034	52.51 %
Arts and Philosophy	3,875	670	4,545	14.74 %	1298	1625	2923	55.59 %
Medicine	1,279	116	1,395	8.32 %	856	793	1649	48.09 %
Veterinary Science	368	20	388	5.15 %	112	25	137	18.25 %
Education	993	184	1,177	15.63 %	425	932	1357	68.68 %
Mathematics, Physics and Natural Science	868	173	1,041	16.62 %	684	652	1336	48.80 %
Political Science	858	147	1,005	14.63 %	566	521	1087	47.93 %
Total	13289	2182	15471	14.10 %	6905	7705	14610	52.74 %

Source: our elaboration on University of Perugia administrative information and Perugia job centres data.

Table 3

Classification of occupations ISCO-88 and job-matches for graduates

Occupations ISCO-88	Skill classification	Job-Match
Legislators, senior officials and managers	1	Good
Professionals	2	Good
Technicians and associate professionals	3	Good
Clerks	4	Bad
Service, shop and market sales workers	5	Bad
Agricultural and fishery workers	6	Bad
Craft and related trade workers	7	Bad
Plant and machine operators and assemblers	8	Bad
Elementary occupations	9	Bad

Source: International Standard Classification of Occupations 1988

Table 5 presents the incidence of good job-matches according to the relevant characteristics. Figure 1 graphs the information contained in Table 5, where the central value is set to the average incidence (56.37 %). It follows that histograms lying on the left of the central value refer to characteristics associated to lower incidences, while histograms lying on the right of the central value refer to characteristics associated to higher incidences, i.e., respectively, characteristics poten-

tially decreasing the probability of being in a good job-matches and vice-versa.

Table 5 also provides the *T*-tests for the equality of proportions between the specific sub-group under analysis compared with the remaining observations. According to the faculty variable, Pharmacy (57.55 %) determines an incidence very close the average value, while Maths, Physics and Natural Science (62.30 %), Engineering (66.76 %) and, overall, Medicine (70.27 %) and Education (77.76 %), are associated to higher incidences. Conversely, Arts and Philosophy (50.86 %), Agriculture (46.15 %), Veterinary Science (41.28 %), Law (38.63 %), Economics (37.48 %) and Political Science (36.44 %), are associated to lower incidences, indicating higher risk of over-education. Among the underlying motives possibly explaining this strong heterogeneity in the incidence at faculty level, the structure of the local labour market is likely to play a relevant one.

The type of degree also determines a relevant heterogeneity in terms of incidence of good job-matches. Pre-reform degree (PreRD) and, overall, Post-reform second level degree (PRSLD) are associated to higher incidence with respect to the average value, respectively 61.75 % and 70.95 %. Indeed, not surprisingly, the Post-reform first level degree is associated to a lower incidence (44.90 %). This is possibly indicative that first-level graduates are more prone to accept unskilled jobs or, alternatively, that employers tend to associate to this type of degree a lower skill content (negative signaling) that reduce the op-

Table 4

Descriptive Statistics

	Mean	Std Dev.
Skilled job	0.56	0.50
Agriculture	0.03	0.18
Economics	0.12	0.33
Pharmacy	0.03	0.16
Law	0.05	0.22
Engineering	0.09	0.28
Arts and Philosophy	0.27	0.44
Medicine	0.08	0.27
Veterinary Science	0.00	0.06
Education	0.18	0.39
Maths, Physics and Natural Science	0.08	0.28
Political Science	0.06	0.24
Pre-reform degree	0.51	0.50
Post-reform first level degree	0.38	0.49
Post-reform second level degree	0.11	0.31
Delayed graduation	0.73	0.44
Maximum degree mark	0.30	0.46
Male	0.32	0.47
Perugia	0.81	0.39
Italian	0.98	0.14
Working age less than 30	0.69	0.46
First job	0.27	0.44
Year of graduation 2004	0.20	0.40
Year of graduation 2005	0.23	0.42
Year of graduation 2006	0.23	0.42
Year of graduation 2007	0.19	0.39
Year of graduation 2008	0.12	0.32
Year of graduation 2009	0.03	0.18

Source: our elaboration on University of Perugia administrative information and Perugia job centres' data.

portunity for graduates of being employed in a skilled job.

Being delayed graduated slightly decreases the incidence, 55.16 % against 59.66 % for not delayed graduates. Even if it is small, this difference is statistically significant. Moreover, this finding agrees with those of Aina and Pastore (2012). Much stronger is the difference in the incidence of good job-matches according to the degree mark. Being graduated with the maximum score strongly increases the incidence: 68.53 % against 51.07 %, indicating that "better" students are more likely to be employed in skilled jobs. Quite surprisingly gender matters, favoring females. Specifically, the incidence of good job-matches is higher for females rather than males (60.24 % against 48.05 %). This seems to indicate that males would accept unskilled jobs to work, while females are more selective.

Also being resident in the Perugia province is associated to a higher incidence (58.11 % against

Table 5

Skill matches by characteristics

		I	T-test
Observed percentage of being in a good job-match		56.37 %	
Faculty	Agriculture	46.15 %	6.55
	Economics	37.48 %	24.41
	Pharmacy	57.55 %	-0.65
	Law	38.63 %	14.25
	Engineering	66.76 %	-10.83
	Arts and Philosophy	50.86 %	11.31
	Medicine	70.27 %	-13.83
	Veterinary Science	41.28 %	3.18
	Education	77.76 %	-34.89
	Maths, Physics and Natural Science	62.30 %	-6.04
	Political Science	36.44 %	17.38
Type of degree	Pre-reform degree	61.75 %	-18.78
	Post-reform first level degree	44.90 %	30.87
	Post-reform second level degree	70.95 %	-17.40
Delayed graduation	No	59.66 %	
	Yes	55.16 %	6.77
Degree mark	Less than maximum	51.07 %	
	Maximum	68.53 %	-27.57
Gender	Female	60.24 %	
	Male	48.05 %	19.36
Province of residence	Out of Perugia	49.02 %	
	Perugia	58.11 %	-12.14
Nationality	Out of Italy	29.33 %	
	Italy	56.96 %	-13.54
Working age	Age at least 30	64.80 %	
	Age less than 30	52.66 %	19.07
First job	No	57.49 %	
	Yes	53.35 %	6.22

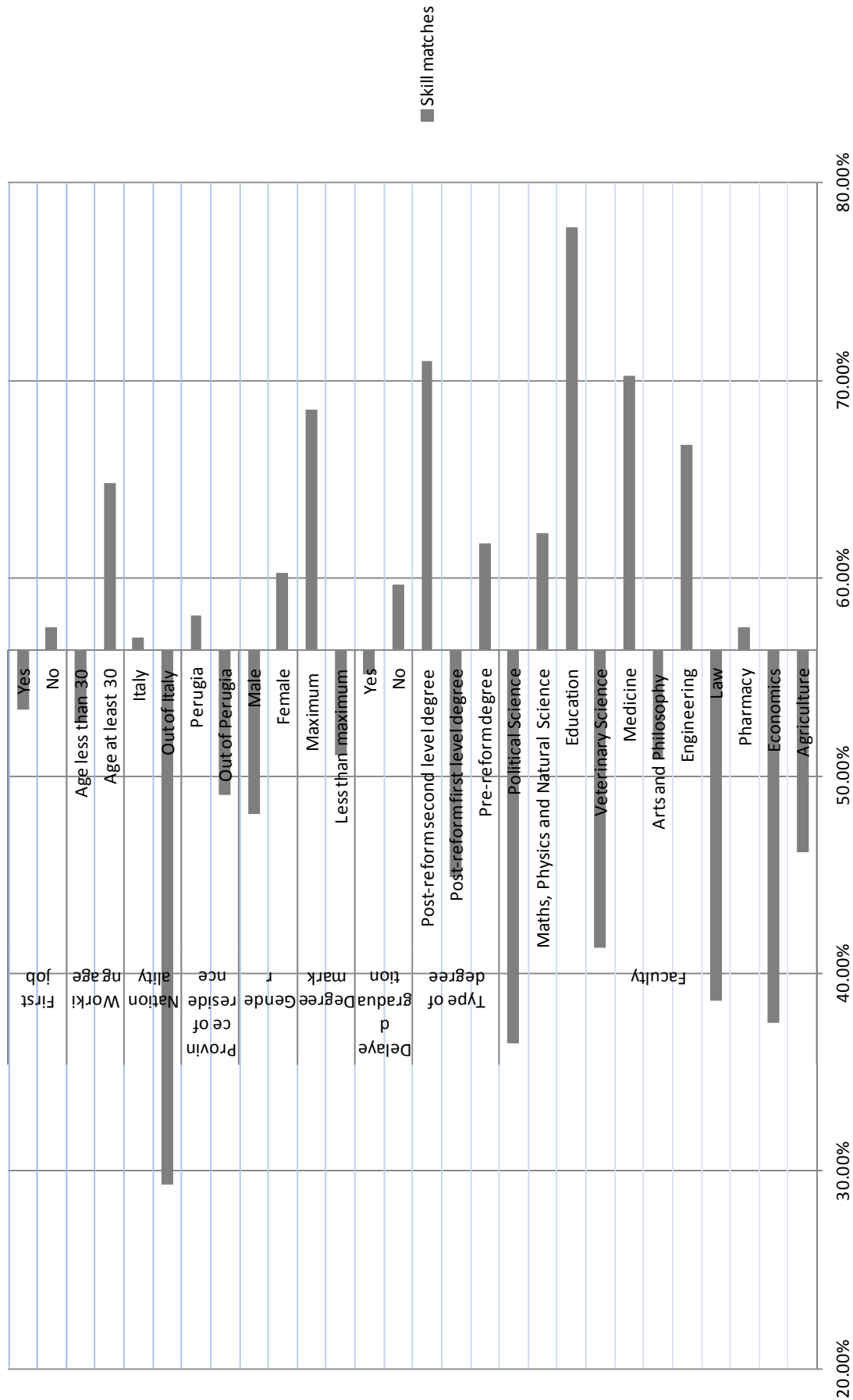
Source: our elaboration on University of Perugia administrative information and Perugia job centres' data.

Note. T-tests refer to the difference of the average of a sub-group with the average of other sub-groups considered as a whole.

49.02 %). Among others, a possible explanation to this result is related to the role of social/informal networks in finding a (better) job. Similarly, being Italian slightly increases the incidence (56.96 %), while being a foreign graduate strongly decreases the incidence of good job-matches (29.33 %). This specific characteristic is associated to the lowest incidence, among those found here.

Looking at the age in which the job relationship begins, we find that the incidence is lower for graduates aged less than 30 years old (52.66 %) rather than for those aged at least 30 years old (64.80 %). Finally, graduates at their first job experiences after graduation come across a lower inci-

Skill matches



Source. Our elaboration on University of Perugia administrative information and Perugia job centres' data.
Fig. 1. Skill matches by characteristics (Average value: 56.37 %)

Table 6a

Skill matches and faculties, by characteristics

Faculty	Gender		Degree Type			Delayed graduation		Degree mark	
	Female	Male	PreRD	PRFLD	PRSLD	No	Yes	No Max	Max
Agriculture	52.16 %	39.57 %	54.77 %	35.08 %	63.16 %	61.75 %	40.75 %	39.87 %	56.08 %
Economics	37.89 %	36.92 %	49.91 %	29.88 %	41.69 %	40.59 %	35.95 %	35.72 %	44.74 %
Pharmacy	55.33 %	64.02 %	60.14 %	32.08 %	75.36 %	61.35 %	56.48 %	54.09 %	64.73 %
Law	44.71 %	24.61 %	36.53 %	43.64 %	56.70 %	51.56 %	37.42 %	38.08 %	44.12 %
Engineering	63.77 %	67.64 %	75.30 %	52.90 %	74.38 %	68.15 %	66.45 %	64.67 %	75.37 %
Arts and Philosophy	55.60 %	34.60 %	59.08 %	33.25 %	51.96 %	41.88 %	53.50 %	41.66 %	66.71 %
Medicine	73.43 %	65.09 %	52.22 %	72.18 %	71.30 %	74.56 %	61.55 %	61.75 %	83.00 %
Veterinary Science	56.06 %	18.60 %	29.69 %	60.00 %	50.00 %	64.29 %	37.89 %	29.51 %	56.25 %
Education	80.40 %	50.00 %	81.96 %	52.38 %	92.22 %	82.91 %	76.03 %	76.22 %	80.41 %
Maths, Physics and Natural Science	62.05 %	62.71 %	70.07 %	50.77 %	74.14 %	70.25 %	60.23 %	58.72 %	70.81 %
Political Science	41.82 %	24.86 %	37.64 %	35.06 %	37.76 %	41.34 %	34.67 %	34.53 %	43.43 %

Source. Our elaboration on University of Perugia administrative information and Perugia job centres' data.

Table 6b

Skill matches and faculties, by characteristics

Faculty	Nationality		Perugia		Working age		First job	
	Foreign	Italian	No	Yes	Over 29	Less 30	No	Yes
Agriculture	25.00 %	46.24 %	47.04 %	45.75 %	56.00 %	41.23 %	44.13 %	50.85 %
Economics	13.02 %	38.71 %	32.05 %	38.59 %	46.35 %	35.27 %	34.55 %	43.91 %
Pharmacy	36.36 %	57.87 %	58.86 %	57.19 %	63.67 %	54.32 %	59.96 %	53.21 %
Law	23.08 %	39.19 %	20.39 %	45.60 %	41.52 %	35.81 %	38.21 %	39.71 %
Engineering	52.94 %	66.86 %	70.00 %	66.03 %	71.81 %	63.96 %	67.03 %	66.35 %
Arts and Philosophy	44.21 %	50.94 %	44.21 %	52.73 %	63.89 %	45.82 %	52.28 %	46.39 %
Medicine	52.27 %	71.01 %	53.50 %	72.32 %	79.44 %	67.13 %	70.04 %	70.70 %
Veterinary Science	—	41.28 %	41.67 %	40.82 %	35.56 %	45.31 %	41.27 %	41.30 %
Education	14.29 %	78.20 %	75.19 %	78.15 %	84.30 %	74.77 %	80.66 %	61.93 %
Maths, Physics and Natural Science	45.95 %	62.57 %	61.57 %	62.50 %	69.17 %	57.75 %	62.43 %	61.97 %
Political Science	19.57 %	37.39 %	34.80 %	36.85 %	37.40 %	36.06 %	35.65 %	38.33 %

Source. Our elaboration on University of Perugia administrative information and Perugia job centres' data.

dence (53.35 %) when compared with other graduates (57.49 %). Both results associated at the age and the first-job variables are possibly indicative that young workers (in terms of age and job experiences) are more prone to accept unskilled jobs to enter in the labour market.

Tables 6a, 6b, 7a and 7b repeat the analysis presented above, but they propose a deeper investigation by using two-way tables. The role of faculties (6a and 6b) and of the types of degree (7a and 7b) have been emphasized. For the sake of brevity, we just focus on sub-groups diverging significantly from patterns emerged above.

In this view, from a gender perspective, we find that males and females show a similar incidence of good job-matches if they are graduated in Economics and Engineering, while the incidence is higher for males in case they are graduated in Pharmacy. From a type of degree perspec-

tive, we find a bad performance for graduates in Law in the pre-reform period, while the post-reform first level degree is not associated to a negative incidence rate (compared with other degrees) for the faculties of Veterinary Science and Political Science. Delayed graduation is associated to a relevant lower incidence rate for graduates at the faculties of Agriculture, Law, Medicine and Veterinary Science (from -13 % to -27 % when compared with not delayed graduation). Conversely, delayed graduation is associated to a higher incidence rate for graduates at the faculty of Arts and Philosophy. Being graduated with the maximum degree mark strongly increases the incidence rate for graduates at the faculties of Medicine and Arts and Philosophy.

Being a foreign graduate determines a very strong disadvantage for graduates at the faculty of Education (the incidence rate is 14.3 %) when

Table 7a

Skill matches and degree type, by characteristics

Degree Type	Gender		Delayed graduation		Degree mark	
	Female	Male	No	Yes	No Max	Max
Pre-Reform Degree	65.16 %	52.87 %	63.71 %	61.61 %	57.25 %	72.30 %
Post-Reform First Level Degree	47.39 %	41.04 %	51.91 %	40.08 %	40.87 %	59.10 %
Post-Reform Second Level Degree	74.22 %	61.14 %	72.90 %	65.76 %	69.74 %	71.72 %

Source. Our elaboration on University of Perugia administrative information and Perugia job centres' data.

Table 7b

Skill matches and degree type, by characteristics

Degree Type	Nationality		Perugia		Working age		First job	
	Foreign	Italian	No	Yes	Over 29	Less 30	No	Yes
Pre-Reform Degree	27.49 %	62.16 %	54.68 %	63.51 %	64.33 %	59.53 %	64.32 %	53.99 %
Post-Reform First Level Degree	27.98 %	45.49 %	38.34 %	46.34 %	54.48 %	43.67 %	42.80 %	49.72 %
Post-Reform Second Level Degree	41.18 %	71.62 %	56.21 %	74.48 %	86.28 %	66.21 %	72.67 %	65.76 %

Source. Our elaboration on University of Perugia administrative information and Perugia job centres' data.

compared to Italian graduates (78.2 %). The advantage in terms of incidence rate for graduates resident in the province of Perugia is stronger for those graduated at the faculties of Law and Medicine. This result seems to suggest the relevance of social/informal networks for specific professions (intergenerational transmission of professions). Being young is associated to a higher incidence for graduates at the faculty of Veterinary Science, while being at the first job experience is particularly negative in terms of incidence of good- job-matches for graduates at the faculty of Education.

About the intersection of degree types and other relevant characteristics, sub-groups diverge in a relevant way from the standard patterns showed above in the following cases. While the disadvantage of males in terms of good job-matches is quite constant across degree types, we note that being delayed graduated is associated to lower incidences for the post-reform degrees, while it seems to be less relevant for pre-reform degree graduates. On the other side, the maximum degree mark seems to be quite irrelevant for post-reform second level degree graduates in terms of incidence of good job-matches.

Differences in incidence associated to nationality is less relevant for post-reform first level degree graduates, while being resident in the Perugia province seems to be most relevant in terms of incidence for the post-reform second level degree graduates. Being youth (less than 30 years old) penalizes more in terms of incidence for post-reform graduates, while being at the first job is associated to a higher incidence for post-reform first level degree graduates, a finding countervailing results in other sub-groups.

4. Conclusions and policy implications

In this paper we reviewed the literature about the importance of human capital for economic growth and also for local development. In this context, the role played by universities in creating or supporting a "learning region" has been stressed. The benefits of high human capital, however, can be reaped if there are good matches between the skills acquired at school, in particular at the university level, and the characteristics of jobs. But in some instances a skill mismatch can occur, even causing the "overeducation" phenomenon. All this can also contribute to high and persistent youth unemployment rates, that have recently grown as a consequence of the financial and economic crisis.

In the empirical part of the paper, we have produced original results on the university-to-work transitions (UTWTs) in the case of Perugia, as University institution and as provincial labour market, focusing on skill mismatch. University administrative information and data from the job centres of the province have been matched to reconstruct some characteristics of the UTWTs of graduates since January 2004 to July 2009. In the analyzed period about 33 % of graduates of the University of Perugia have found a job in the province of Perugia.

In particular, we have focused on the incidence of "good job-matches", of Perugia graduates finding a job in the province of Perugia, and its incidence across some relevant individual characteristics. A good job-match exists if a graduate is employed in a job attached to a "skilled profession" (identified on the basis of ISCO's classification of occupations). The mean incidence of good job-matches is about 56 %.

Our main detailed findings are the following. First of all, the rate of “good matches” differs widely across faculties, also as a consequence of the structure of the local labour market: it is higher for Education, Medicine, Engineering and Maths, Physics and Natural Sciences; it is lower for Political Sciences, Economics, Law, Agriculture, Veterinary Science, and Arts and Philosophy.

It also depends on: (i) the type of university degrees: pre-reform degrees and post-reform second level degrees are associated with higher frequency; (ii) the degree mark: being graduated with the maximum score strongly increases the incidence; (iii) time of graduation: being delayed graduated slightly decreases the occurrence. Some other relevant features are the following: (iv) gender: females perform better than males; (v) nationality: foreign graduates present the highest incidence of bad matches; (vi) place of residence: good matches are higher for residents in Perugia's province; (vii) age at work: young graduates (less than 30 years old when work begins) behave better; (viii) work experience: there is a slight advantage for experienced graduates. A two-way analysis based on the intersection of several characteristics is also presented and allows to highlight further empirical evidence.

Our results have important policy implications, since for local development it is crucial to make the best use of human resources. There are two fundamental ways to reduce the incidence of the skill mismatch in a small region such as the Province of Perugia (but similar hints can be provided for many other middle-sized provinces in Italy). First of all, the transition from university to

local economic activities should be supported by appropriate public and private services (orientation, guidance, placement, UTWT agencies, etc.); in general, there is a need for developing more fertile links between universities and the local labour market; in addition, an adequate monitoring of the (local and general) UTWT processes is necessary also for designing a better «teaching supply». Secondly, spatial mobility should be encouraged when specific professions and skills — acquired at local universities — cannot be matched by adequate jobs “in loco”, while the local government should assist the incoming skilled workers (through transport, housing and other public services); extending this conclusion to the overall Italian case, we can state that the “brain drain” would not be a big problem if we could attract — at least in certain professions or for particular jobs — a flow of skilled workers from abroad.

A more general key policy implication (especially for the national government but also for regional/local authorities) regards the need to favor a better evolution of the productive specialization of the Italian economy in order to increase the quantity and quality of the labour demand of graduates, taking also into account of the role of globalization in shaping the «international division of labour». In this respect, fiscal policies promoting higher and better (private and public) R&D investment — driving the quality of the innovation processes — are of crucial importance, and they have to be accompanied with measures encouraging a significant dimensional growth — in both «value added» and «skilled employment» — of the SMEs.

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