UNIVERSITY TO WORK TRANSITION

POLICY BRIEF 08

Employment Skills and Productivity in Italy
A Research Project coordinated by IGIER-Bocconi, in partnership with JPMorgan Chase Foundation
University to work transition

by Massimo Anelli (Bocconi University)\(^1\)

Policy Brief

I. Introduction

A university degree opens doors to many job opportunities; however, it is not always sufficient to guarantee employment, a good salary, and a successful career. Indeed, the choice of field of study plays indeed a critical role for a successful transition into the labor market. In a global economic environment that changes faster and faster, acquiring skills that are in demand is of crucial importance. When studying labor markets in which a substantial portion of the workers has a university degree, it is becoming more and more important to focus research and institutional efforts on tracking the differential employment outcomes across different university degrees and fields of study. These outcomes can provide crucial information about the relative demand for skills in the labor market and unveil mismatches between the quantity of skills offered to a labor market by university graduates and those demanded by employers.

Although Italy has the lowest number of university graduates in Europe, their employment outcomes are comparable to those of high school graduates. This is a clear sign of an inefficient transition from universities to work and of a higher education system that either provides skills in inefficient quantities, or skills that are not valued by the labor market. This policy brief leverages exceptional administrative data to study the labor market payoffs of graduates in different fields of study and sheds light on the roots of the Italian university-to-work transition inefficiencies.

II. Tertiary Education and Labor Market Outcomes in Italy and in Europe

After the Bologna Reform, the Tertiary Education system of continental Europe shares a rather homogenous institutional environment and increasing integration. However, the labor market outcomes of individuals completing tertiary education in different European countries remain very heterogeneous, especially when considering the Italian case. This section documents the evolution of some key statistics on tertiary education in Europe using Eurostat official data. I first compare the overall supply of university graduates in Italy with that of the other European countries and then focus on their labor market outcomes. I keep Germany as the main European benchmark because, given its industrial structure, it should have a demand for skills that is most similar to that of Italy. Finally, I explore the composition of graduates by field of study, and of employees by sector, in order to get a rough measure of the supply and demand of skills in Italy and Germany.

---

\(^1\) This policy brief is part of the “New Skills at Work” project of Bocconi University, financed by the JPM Foundation. A special thanks to INPS and to the staff of the visitINPS scholar program for making the data available and for the exceptional technical support.
university degree in the economy might be different (actually lower) from this, these numbers reflect the education composition of the new workforce potentially joining the labor market.

Figure 1 shows that Italy has an extremely low supply of university graduates compared to the European average and especially when compared to countries such as France that, historically, has had very high levels of human capital. If we focus on the dynamics, we can see that within Europe there has been much convergence in the past decade with the EU average getting closer and closer to the high human capital countries. Italy has also shown an encouraging positive trend in these last years, however it was just enough to keep up with the EU average, but not sufficient to close the gap.

When thinking of the supply and demand of skills, it might be more appropriate to compare Italy with countries that have a similar industrial structure reflecting similar levels of demand for skills. Germany is the most obvious candidate in this sense. Figure 3 shows employment shares by economic sector for Italy and Germany and gives a rough idea of how jobs are allocated across different sectors. It is reasonable to consider that the same sectors require similar skills and education levels in both countries. Hence, we can interpret Figure 3 as evidence that Germany is likely to have a demand for skills that is very similar to that of Italy. Going back to Figure 1, it is thus not surprising to see that the supply of university graduates in Germany is more similar to that of Italy than that of the European average. However, while the dynamic of the Italian and German supply of university graduates is closely correlated, Italy consistently lags 4 percentage points below Germany.

If Italy has a similar demand for university graduates to Germany, but a substantially lower supply, we should expect university graduates in Italy to have better job market prospects (better wages and lower unemployment rates) since the country should have a relative shortage of university graduates. However, Figure 2 shows that this is not that case. Indeed, while the unemployment rate of German university graduates has been stable between 2 and 4% in the past 15 years, the equivalent Italian statistic has fluctuated between 8 and 13%. One might think that these differences are due to average differences in the overall unemployment rate in the two countries. For a fairer comparison it is therefore important to consider also the unemployment rate of high school graduates as a benchmark. A relative shortage of university graduates in a country should be reflected in substantially lower unemployment rates for these workers. However, when considering these alternative numbers, the Italian picture becomes even more worrisome. While the German unemployment rate for high school graduates has been constantly higher than the unemployment rate of German university graduates in the past 15 years (up to the 2008 recession it was actually higher than for Italian high school graduates), the unemployment rate of Italian university graduates has been exactly the same (in terms of both levels and dynamics) as that of Italian high school graduates up to 2014. Only in past three years do Italian university graduates appear to have started doing relatively better.

Figure 2: Unemployment rates by educational attainment for individuals aged 25-39

Taken together Figures 1-3 represent a clear sign of high inefficiency in the market for high human capital. Although Italy has the lowest supply of university graduates in Europe, their job market outcomes are surprisingly bad. The potential structural causes of this inefficient equilibrium are two: either the Italian economy is characterized by an extremely low demand for university graduates, or the field of study composition of Italian university graduates does not match the demand. The first hypothesis is to be firmly excluded since it is unlikely that the Italian economic structure is dramatically different from the German one (as seen in Figure 3) and given the already lower supply of university graduates in Italy. To shed light on the second hypothesis it is important to go beyond the focus on the university vs high school human capital investment margin and to analyze the differences in supply of university graduates by field of study. Given the similar sectoral composition of Italy and Germany shown in Figure 3, one would expect demand for university graduates by field of study to be reasonably similar in both countries. While it is true that Italy has a larger touristic and cultural sector, we should consider that the employment shares of those sectors represent an extremely small portion of the overall employment. When focusing on the sectors that represent the bulk of the economy in terms of employment, Italy and Germany are likely to have a very similar demand for university graduates by field of study.

Figure 4 shows the other component of the market for high human capital skills in Italy and Germany: the supply of university graduates by field of study. The differences are striking and offer a clear hint as to the source of the Italian inefficiencies. Compared to Germany, Italy has only half of the supply of graduates in business, economics and engineering, and more than twice the supply of graduates in arts, humanities and social sciences. Particularly negative is the comparison of the supply of graduates in ICT, a sector that one would expect to play an important role in recent and future economic development. If the demand for skills in Italy and Germany is comparable, this enormous difference in the supply is not justifiable and is by far the top candidate in explaining the inefficient equilibrium in the human capital market described above.

Figure 3: Employment share by sector (NACE)

Source: Eurostat.

---

2 I compare only graduates of bachelor degrees.
Given the historical focus on arts and humanities in the “Bel Paese” one should expect a certain degree of specialization in these fields, but nowhere near as large as the one observed. While Italian public opinion is often focused on the low average economic returns to university degrees (which are likely to drive also the low level of human capital investment by Italians), so far there has been very little awareness of the inefficient supply of university graduates by field of study. The low average economic returns to university might however be the result of high returns in certain fields and very poor returns for the graduates of other degrees. Quantifying this heterogeneity in payoffs to different fields of study is the focus of the research summarized in the rest of this policy brief.

III. Payoff Differential across University Fields of Study and Labor Market Determinants

III.1 Estimating Causal Payoffs to the Choice of Field of Study

While the high school-university earning premium has been rising in the past decades in all developed countries (See Bound & Johnson (1992); Katz & Murphy (1992); Juhn, Murphy & Pierce (1993); Goldin & Katz (2007); Autor, Katz & Kearney (2008)), a growing number of recent studies have shown a high degree of heterogeneity in the payoffs (used hereinafter to indicate the economic returns to the educational choice) to different university fields of study in several countries (Hastings et al., 2014 for Chile; Altonji et al., 2016 for the US; Kirkeboen et al., 2016 in Norway). The returns to choosing the most rewarding fields is estimated to be comparable in magnitude to the high school-university wage premium (Altonji et al., 2012; Kirkeboen et al., 2016). This evidence, together with the growing share and relevance of university graduates in the labor market, justifies a shift of the academic focus towards the returns of the choice of university field as one of the main determinants of labor market outcomes. With work supported by JP Morgan (Anelli, 2018), I contribute to this literature first by providing evidence of differential field payoff for Italy and, secondly, by studying the mechanisms through which the payoffs to university fields of study are so heterogeneous. To do so, I matched individual level Italian administrative data from the high schools and universities of a large Italian city to social security records. This allowed me to track every single labor market episode of university graduates for up to 25 years following university graduation. In the case of the Italian Higher Education system, disappointing average labor markets outcomes can hide important payoff heterogeneity across graduates of different fields. I thus exploited the linked administrative data to estimate labor market payoffs to the choice of university field of study. As described in Box 1, in order to estimate causal payoffs to a field of

---

3 This unique linkage of administrative data has been possible only thanks to the exceptional contribution of many high schools, their principals, the ministry of education authorities and INPS
Average payoffs to the field of study are a rather imprecise measure of true causal payoffs. Indeed, average payoffs can depend on systematic differences across students choosing each field. For instance, the average academic quality of students graduating from certain fields might be substantially higher. In that case higher average payoffs might simply capture the fact that higher quality students have higher potential earnings in life (independent of the chosen field of study) and overestimate the true causal payoffs of attending a given field of study. For instance, in my data students attending engineering, math, physics, economics and business have substantially higher high school exit scores. This might be correlated with higher potential earnings independent of the university field of study. Consider an extreme and unrealistic scenario in which all good students with high earning potential choose engineering and all low performing students with low earning potential choose economics and business: the differences that we would observe when comparing the average earnings of graduates in these two fields would be due simply to this selection of students and not to the field of study itself.

A similar relevant systematic difference across students of different fields is along the family background dimension. Certain fields have a substantially higher share of students from families that were among the bottom 25% of the wealth distribution in the city under analysis. For instance, math, physics, ICT, engineering have a disproportionate share of disadvantaged students compared to fields such as architecture, design and law. Since earning potential is strictly linked to parental income, comparing average differences across fields in this context would lead to an underestimation of the payoffs of fields with a high proportion of disadvantaged students (in this case math, physics, ICT and engineering). Figure 5 clearly shows that systematic differences across students enrolling in different fields are present and quite substantial also in my sample. While students enrolling in engineering, math, physics and ICT tend to have better academic performance, students of law, architecture and engineering are for the largest majority not coming from disadvantaged families. A statistical analysis that does not take into account these differences will therefore provide distorted measures of the true payoff to different fields of study.

Moreover, estimating causal estimates of payoffs to the choice of field is challenging also because there is selection of students into fields based on comparative advantages: if only those who are best at math choose to attend mathematics, the average income for its graduates will most likely not be a good estimate of causal payoffs for students with a weaker comparative advantage in mathematics.

For all these compelling reasons, estimating true causal payoffs to field of study requires us to pursue a more complex econometric strategy that accounts for these structural differences across students of different fields. In particular I estimated Ordinary Least Square models controlling for many individual background characteristics (e.g. high school exit score and parental wealth background), and for high school, cohort and high school instructors fixed effects.

Moreover, I could control for the formal field of study suggestion that the team of high school instructors gave to each student at the moment of university enrolment. This in practice allowed me to compare the income of individuals choosing different fields of study, but who attended the same high school with the same group of teachers and classmates, obtaining the same exit score, having the same family background and having the same field suggestion. The result of this econometric strategy is presented in the following Figure. Simple income averages would end up substantially overestimating payoffs of fields such as law, economics and business, but would underestimate payoffs to engineering and math. All of the results presented in this policy brief reflect estimates of true causal payoffs obtained with this econometric estimation technique.

---

4 At the end of the secondary school cycle Italian students take an exit exam which is the same for all students across the country

5 The team of instructor had to suggest one specific choice of university fields such as “economics and business” or “medicine”.
study, it is important to take into account that students choosing certain fields have different studying abilities and socio-economic backgrounds. For example, a person might be of a particularly high academic quality or come from a particularly advantaged family background. All of the following results in this policy brief are estimated using econometric techniques that take these systematic differences into account and therefore provide the true causal effects on income of attending a given field of study.

Figure 6 in the box presents the main aggregated estimates for payoffs to the choice of field for the first 26 years after university graduation. Income has been adjusted for inflation (it is measured in 2016 euros). Although adjusting differences in student composition across fields of study substantially reduce the heterogeneity, the payoffs, remain considerably different across fields. Economics and Business (the highest payoff field) guarantees an average gross yearly income of around 60,000 euros in the first 26 years of labor market experience, and pays more than double that of Humanities (the lowest payoff field). Also Engineering, Medicine and Law have causal payoffs that are between 70 and 90% higher than that of Humanities. All other fields tend to have payoffs closer to those of Humanities (but still higher).

I also explore how this abnormal heterogeneity in payoffs across fields changes over the life-cycle of university graduates. Figure 7 reveals very interesting heterogeneities in the income trajectories of different fields. We can identify three main patterns. Payoffs to Economics & Business remain always above those of other fields, while payoffs to Humanities are always the lowest. The trajectory of Math & Physics (Figure 7a) is somewhat in the middle between these two extremes. In the long-run, payoffs to Architecture/Design, Social Sciences and Natural Sciences appear to converge with the Math & Physics trajectory. However, they remain well below the trajectories of the high-payoff fields. An interesting fact emerging from Figure 7b is the different trajectories over time of some high-payoff fields. For instance, Engineering which does very well right after university graduation (and is for this fact notoriously considered one of the highest payoff fields) has quite a flat trajectory over time. On the contrary, Law and Medicine start off substantially lower than Engineering and have initial payoffs similar to Social Sciences, but have very steep trajectories (almost linear) in the first 20 years on the labor market. Their trajectories cross that of Engineering between the 7th and the 12th year after university graduation.
III.2 Why Are Payoffs so Different across Fields?

Labor Market Determinants

In this section, I explore which labor market events can explain such large differentials in payoffs to fields. In Figure 8, I study whether some fields grant some sort of lottery-ticket effect by yielding a higher probability of reaching the top 1% of the Italian income distribution. While only 5% of individuals choosing Humanities reach the top 1% by the twentieth year on the labor market, this probability is substantially higher for Economics, Business and Law (around 25%) and 15% for Engineering. For all other fields, the probability is a few percentage points higher than Humanities. This evidence is consistent with the exceptional performance of Law, Economics & Business, especially in the long-run and with the flatter trajectory of Engineering that appears to deliver a less generous lottery effect. In the data the probability of reaching the top 1% of the income distribution is strictly linked to the probability of becoming a top manager. On the opposite side of the income distribution, individuals in certain fields might experience higher probabilities of facing very negative labor market outcomes. Figure 9 explores the probabilities by field of observing labor market spells with income below the poverty line. This analysis depicts a rather negative situation for individuals choosing low-payoff fields, with Humanities and Architecture yielding on average a 20% probability of having income below the poverty line in the first years on the labor market. This probability decreases rapidly with experience on the labor market, but remains substantially higher than that of graduates from all other fields. The highest payoff fields are those that guarantee the smallest probabilities of having income below the poverty threshold. It is particularly striking that the probability of having income below the poverty threshold for graduates of humanities 15 years after graduation is substantially higher than that of graduates of Medicine, Economics, Business and Engineering in the very first years after graduation. The main cause of such low payoffs for certain fields appear strictly related to career stability.
Figure 10 shows the trajectory of the probability of having a temporary contract job by field of study. With the exception of medicine (which has unusually high probability of having temporary contracts in the early-stage career and very low after the first ten years on the labor market when physicians find tenured jobs in hospitals and clinics), all other trajectories strictly mirror those of Figure 9. Architecture and Humanities have the highest probabilities of working with temporary contracts throughout the entire career, with the probability remaining around 40% in the long run. Also, the dynamics show that when the temp-contract probability declines, the probability of very low income decreases as well. This points to a causal role of discontinuous careers in determining very low payoffs.

I interpret the high willingness to accept temporary contracts even in later career stages (e.g. around 35% of graduates in humanities do it 20 years after university graduation) as a sign of an excess supply of graduates in a given field. For fields that are not strictly related to self-employment and professional jobs, I managed to elaborate a more direct measure of excess supply of skills linked to the concept of “overeducation”. I tracked the sector and occupation in which each employer-based graduate worked in each year after university graduation. I then took data from the OECD PIAAC survey of adult skills (the Italian subsample) and calculated for each sector-occupation “cell” how many survey respondents answered that a college degree was required for that “cell” and flagged cells as requiring a university degree when 100% of the PIAAC respondents answered that a university degree was required. I then used this flag variable as outcome in my analysis for every year after graduation. Results in Figure 11 show that in the long-run graduates in low-payoff fields are substantially less likely to work in jobs that require a university degree. This is a straightforward sign of excess supply of graduates in those fields, since they tend to cover job positions that do not strictly require a university degree.

Figure 10: Probability Temporary Job - trajectories

Note: “Model: fixed effects and controls for teacher suggestion” “Outcome measured with 5-year moving avg.” Source: Anelli (2018) and INPS.

IV. Summary and Policy Implications

The evidence can be summarized as follows:

1. The Italian university to work transition shows clear symptoms of inefficiency. Although Italy has the lowest supply of university graduates in Europe, the unemployment rate of university graduates is the same as that of high school graduates.
2. Comparing Italy to Germany, a country with a similar sectoral composition of employment and likely a similar demand for skills, Italy shows an extremely inefficient supply of university graduates by field of study. This is the top candidate in explaining the disappointing transition of Italian university graduates to the labor market, and potentially of the great economic and productivity stagnation of the past two decades.
3. The strongest candidate for this disappointing outcome is the skill/field of study composition of university graduates. When compared to countries with a similar demand for skills, Italy has by orders of magnitude a disproportionate supply of graduates from arts, humanities and social sciences and a shortage of graduates from Engineering, Business, Economics and ICT.
4. The disappointing labor market outcomes of university graduates on average hides a great deal of heterogeneity in outcomes across fields of study with graduates of Economics, Business, Law, Medicine and Engineering having on average between 70 and 100% higher payoffs than Humanities over the lifecycle.
5. When exploring the roots of such dramatic differences in payoffs, the higher probability of reaching the top 1% of the income distribution for high-payoff fields and career instability for the low-payoff fields are the strongest determinants of the estimated differentials.

6. Extreme heterogeneity in payoffs across fields, a high incidence of temporary contracts in jobs that do not require a college degree for graduates of low-payoff fields such as those in humanities are strong signs of excess supply for graduates for those fields and skill mismatch on the labor market.

Given the extent of skill mismatch shown by this research and the crucial role of the skill composition of university graduates in fostering productivity, focusing policy intervention on the higher education market should be of first order importance for expanding Italian growth potential. Policy makers should wonder why the large majority of students choose university degrees in the fields of arts, humanities and social sciences and too few choose Engineering, Business and Economics. Lack of public and reliable information on the payoffs and labor market prospects of each field is the first candidate to explain such an inefficient choice process. In the absence of information on payoffs by field and in an institutional setting in which university tuition fees are highly subsidized, students might choose fields based solely on individual preferences for specific disciplines. Given that the Italian university system is by a large majority State-run, it should be fairly inexpensive to aggregate information on payoffs and labor market prospects by fields and provide it to students, families and high school teachers at the time of enrollment at university. In the much more complex US higher education context, the government has invested considerable resources to produce a college score card that reports median income information for graduates of each university with the objective of “helping students choose value for their tuition dollars”. Fondazione Agnelli and the Ministry of Education have collaborated to create a similar score card for the high school Italian education context. The study presented in this brief has put together data that are already available to the public administration to construct a pilot of this university score card for one city. Moreover, this study improves on methodology by taking into account differences in student academic quality composition across fields. A national Italian university score card will not hinder students’ passions and intellectual interests for certain subjects. However, thanks to such policy students will be free to weigh their personal interests with the labor market perspectives of each field and to take a better decision for their future.

V. References


