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ABSTRACT

Does Work-Based Learning Facilitate the School to Work Transition? Evidence from an Italian Reform*

In 2015, school-work alternation programmes (alternanza scuola lavoro) became compulsory in all Italian high schools, with the purpose of enabling students to combine theoretical learning at school with work-based learning. A distinctive feature of this reform was that the intensity of school-work-alternation programs varied across school tracks, higher for technical schools and lower for academic schools. Using a difference–in–differences approach, we show that female students in more intensively treated tracks experienced a decline in the probability of employment during the year following high school graduation, relative to females in less intensively treated tracks. The decline was accompanied by an increase in full-time higher education. These results could be driven by the relatively unattractive conditions offered by the Italian labour market to high school graduates without college education.

JEL Classification: J60, J68
Keywords: work-based learning, employment, college enrolment, Italy

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Introduction

Work-based programmes, such as the dual vocational education and training (VET) systems prevailing in Germany, Denmark, Austria, Switzerland, the Netherlands and Norway, are recognised for effectively addressing youth unemployment and skill mismatch and for expediting the school-to-work transition of high-school graduates who choose not to attend college. These programmes integrate classroom education with on-the-job training and work experience, often in the form of apprenticeships. Involved students gain both transferrable skills from formal education and occupation-specific skills that enhance their employability with the training company or other employers (see Wolter and Ryan, 2011, Eichhorst et al., 2012, Muehlemann, 2016).

In contrast, school-based programmes focus mainly on theoretical learning, with a limited or non-existent interaction with the world of work. This complicates the transition from school to work after high school graduation in the countries where this approach is more prominent, such as Portugal, Spain, Greece or Italy – the country studied in this paper.

The Italian education system has historically been school based. The high youth unemployment rate and slow school-to-work transition (see for instance Quintini et al., 2007)[1] has encouraged over time efforts to reform the system with interventions aimed at promoting apprenticeships, facilitating the interactions between schools and the labour market, and adding elements of work based learning in schools as complements to theoretical learning (see for instance Cedefop, 2017, D'Agostino and Vaccaro, 2021, Rustico et al, 2020).

[1] Eurostat statistics for the European Union (EU-27) show that the average time in months for the transition from school to work was in 2009 5 months for college graduates and 10 months for junior high school graduates. In Italy, average time was respectively 10 and 14 months. See https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Archive:School-to-work_transition_statistics.

With Law 53/2003 and Decree 77/2005 Italy introduced, for the first time, a model of dual education combining formal education in schools and practical training at the workplace, known as "*alternanza scuola lavoro*" (school-work alternation, ASL hereafter), with the purpose of promoting spells of experience in the world of work (public or private) and the acquisition of practical skills by high school students. Originally, ASL was voluntary and organized by schools establishing agreements with public or private institutions (for instance firms, professionals, municipalities, non-profit organizations).

With the 2015 reform called "*La Buona Scuola*" (the Good School), ASL became compulsory for all upper secondary school students, irrespective of the school type. Students were required to engage in work-based learning for at least 200 to 400 hours during their last three years, which corresponds to about 6 to 12 percent of the total number of school hours, much less than in the German dual system, where students spend an important part of the school week at the training company.[2]

After only a few years, under the pressure of budgetary cuts and the discontent among academic high school teachers and principals, ASL underwent first a reduction in its intensity and then a shift in its focus, which was redirected towards counselling and student orientation and away from spells of experience in the world of work.

High school education curricula that combine school-based training with practical experience provide students with early opportunities to interact with the world of work. These interactions are likely to have two effects: on the one hand, they could facilitate the school-to-work transition and improve employment prospects after graduation by supplying practical skills and by

[2] See https://www.bmbf.de/bmbf/en/education/the-german-vocational-training-system/the-german-vocational-training-system_node.html.

establishing links and networks with the world of work. On the other hand, they could provide valuable insights into labour market prospects with a high school diploma and influence the decision to pursue further education, which could delay labour market entry.

Did ASL expedite the school-to-work transition in Italy? This seems a natural question to ask, but surprisingly there is - to our knowledge - no causal evaluation of the policy. Yet such an evaluation seems necessary to design future policies aimed at reducing youth unemployment and skill mismatches. One reason for the lack of studies is perhaps that, since ASL was compulsory, there is no obvious group of unaffected students (control group) that can be used to proxy the counterfactual in the comparison of outcomes between affected students (treatment group) and the same students in the absence of treatment.

In this paper, we recognize that all students are treated, but exploit two facts: first, the intensity of treatment is higher for students enrolled in technical than in academic high schools; second, compared to students in academic schools, the activities undertaken during ASL by students of technical schools are more likely to involve firms and similar organizations, mainly because technical schools have stronger links with local employer organisations and local firms.

Rather than investigating the extensive margin, i.e. whether ASL affected the school to work transition with respect to a counterfactual situation without ASL, we focus instead on the intensive margin. We ask whether students exposed to a treatment that is both more intense and more likely to involve firms have better employment prospects and a smoother school to work transition after graduation than students with a less intense treatment and fewer experiences with local firms. If the relationship between treatment and outcomes is linear, our investigation is informative also of the effects of introducing ASL.

In our evaluation, we consider the effects of ASL intensity on two outcomes: a) the probability of being employed in the year after graduation from high school; b) the probability of being a fulltime college student in the year after graduation. By so doing, we also investigate the effect of ASL on the residual outcome, which includes mainly - although not exclusively - the probability of being neither employed nor in education or training (NEET).

Using a differences – in – differences approach, we compare these outcomes in a group more intensively treated by ASL (students in technical schools with an economic curriculum) and a group less intensively treated (students in academic schools with a foreign-languages curriculum) before and after the 2015 reform, which made ASL compulsory but with different intensities of treatment. Our key identifying assumption is that the outcome trends observed for students graduating from academic schools are a good proxy of the counterfactual trends that treated students at technical schools would have experienced had they been exposed to a less intense treatment.

For female students, we find that a more intense treatment reduced by close to 8 percent the probability of employment and increased by close to 15 percent the probability of being a fulltime college student. In addition, the probability of being NEET *declined* by 9.2 percent. For males, our estimates are too imprecise to be meaningfully interpreted.

These findings do not support the view that, by increasing the intensity of practical learning and the interactions with the world of work, ASL facilitated the school to work transition after high school. Rather, a higher intensity of these activities encouraged female high school graduates to delay labour market entry by enrolling in college. We interpret our results by pointing out that a more intensive use of ASL provides more comprehensive information on the labour market prospects of high school graduates. If these prospects turn out to be below

individual expectations, these graduates – females in our case - could decide to postpone labour market entry by enrolling in higher education, with the hope that a higher degree could provide access to better economic conditions, either at home or abroad.

Our paper is related to two strands of literature. The first strand compares work-based with school-based vocational education, where the former typically includes apprenticeships, and finds that work-based systems improve the school to work transition (see Alfonsi et al, 2020, Bonnal et al, 2002, Cahuc et al, 2024, Parey, 2016, Riphahn et al, 2016 and Plug et al, 1998). The second strand considers work-based learning in tertiary education, which includes internships. Nunley et al, 2016, use experimental data from the US and find evidence that internship experiences improve employment prospects. Margaryan et al, 2020, use German data to show that graduates who completed a firm internship face a lower risk of unemployment during the first year of their careers. Finally, Bentolila et al, 2023, find that a Spanish reform introducing dual VET at the tertiary level led to a substantial improvement in the school-to-work transition.

Compared to this literature, our results are less optimistic about the short-term effects of work-based learning. In the longer run, however, our finding that more intensively treated female high school graduates are more likely to enrol in college than less intensively treated females may imply that treated students could end up with higher education and better labour market outcomes.

The paper is organized as follows. Section 1 presents the institutional setup. Section 2 describes the introduction of ASL and the 2015 reform. Section 3 introduces the data. Our empirical approach is described in Section 4 and results are shown in Section 5. Conclusions follow.

1. Institutional setup

In Italy, upper secondary education begins upon completion of lower secondary school, typically at age 14. It spans three to five years and is divided into academic and vocational tracks. The vocational track includes three- and five-year programs with a focus on technical training and comprises professional schools (*istituti professionali)* and technical schools (*istituti tecnici*). The academic track encompasses five-year high schools with a more general education, emphasizing theoretical, classical, scientific or linguistic and pedagogical studies (*licei*).

Vocational and academic tracks differ not only in orientation but also in learning objectives: academic schools specialise in a particular field (humanities, arts, or science), while also incorporating a comprehensive range of general subjects (e.g., mathematics, chemistry, physics and biology, history, geography, Italian language and literature); conversely, vocational schools concentrate more on technical and practical subjects (e.g., technology, informatics, engineering, construction and accounting), with a focus on developing industrial and administrative skills.

As shown by Agarwal et al., 2021, students graduating from vocational high schools are much less likely to complete college than those completing academic tracks (13.1 versus 53.7 percent in 2016). Although vocational high school graduates generally achieve lower final scores than their academic counterparts (77.1/100 vs. 79.9/100), the selected minority that enrols in college graduates with comparable scores (83.3/100 vs. 83.3/100).

2. *The introduction of ASL programmes*

Introduced in Italy in 2003, ASL allows high school students to integrate theoretical education with practical learning in real-world settings, such as firms, public sector and non-profit organisations. The incorporation of practical learning was initially optional, and schools were responsible for organizing

school-work-alternation programs. As a consequence, these initiatives were more frequent in schools that had established formal connections with firms and employers. Although the Decree 87/2010 made ASL compulsory for 12th and 13th graders in professional schools for a total of 132 hours, only a minority of students actually experienced ASL before the school year 2015/16. For instance, in the school year 2014/15, 18.5 percent of eligible high school students were involved in these programs.[3]

In 2015, Law 107 (also known as "*La Buona Scuola*") made ASL compulsory for all upper secondary students in grades 11, 12 and 13, irrespective of the track. However, the programme's intensity varied across tracks, with students in vocational and academic high schools required to complete respectively at least 400 and 200 ASL hours during their last three years.

The reform was phased in progressively, starting with 11th graders in the 2015/16 school year, continuing with 11th and 12th graders in 2016/17 and extending to the last grade during the 2017/18 school year. Therefore, the first cohort fully affected by the reform was the one graduating in 2018. By the end of the 2016/17 school year, 90% of all upper secondary schools activated ASL programmes, involving about 900 thousand students. Table 1 shows that the percentage of involved 11th and 12th grade students was close to 90 percent in all school tracks and curricula.

Table 2 shows the average total number of hours spent in ASL programmes by the cohort graduating in 2017, the last not directly affected by the reform, and the cohort graduating in 2018, the first directly affected. In the table, we only consider technical and academic schools. Using data kindly provided by the association *AlmaDiploma*, we estimate that the average number of hours spent by the 2017

[3] Source: Italian Ministry of Education, 2018.

cohort in optional ASL programmes was 157.17 and 82.06 in technical and academic tracks.

For the 2018 cohort, ASL became mandatory and the minimum number of hours to be spent in ASL, or intention to treat, was 400 for technical programmes and 200 for academic programmes. Compliance with the law, however, was not full. The actual average number of hours spent in ASL activities – or take up – by this cohort was 263.75 in technical tracks and 111.39 in academic tracks, well below the minimum required. Since the *AlmaDiploma* data exclude ASL activities organized in schools, the numbers reported in Table 2 under-estimate the intensity of the phenomenon. The size of the bias is likely to be small, however, because school activities cover about 10 percent of programmes, as reported below.

Table 2 indicates that the average intensity of the treatment introduced by the 2015 reform was significantly higher in terms of mandated number of ASL hours for students in technical tracks (≈+250) than for students in academic tracks (≈+120). Although compliance with the law was far from full for the first fully affected cohort, the differential intensity of the treatment shows up in actual hours too (≈+100 for technical school graduates and ≈+30 for academic school graduates).

Tables 3 and 4 report the average number of ASL hours by school curriculum, gender and area (North versus Centre-South). We detect little differences by gender. As expected, ASL hours are lower in the Centre-South than in the more industrialized North of the country.

A key challenge in organising school-work-alternation programmes has been securing the willing participation of employers (Gentili, 2018). Due to existing networks involving local industries, vocational schools, both professional and technical, have been better equipped to address this challenge than academic

schools, which, in most cases, had no contact with the world of work beyond the school context (Giancola and Salmieri, 2021).

Table 5 illustrates the distribution of hosting institutions for 11th and 12th grade students in the academic and technical tracks who were involved in ASL during the school year 2016/17. As expected, the importance of firms and private sector professionals as hosts is much higher for students in technical schools (59.3 percent) than for students in academic schools (40.7 percent). Public sector and non-profit organizations account instead for 21.6 and 35.7 percent of hosts of students in technical and academic tracks. Finally, about 10 percent of all programmes are implemented in schools, with a higher percentage among students in academic tracks.

In the 2018/19 school year, ASL programmes were downsized to cut expenses: the 2019 budgetary law (Law 145/2018) reduced both the expenses, and the hours devoted to ASL, setting a minimum at 210 hours for professional schools, 150 hours for technical schools and 90 hours for academic schools. In addition, mainly because of the strong opposition by academic schools, and starting from the 2019/20 school year (Decree 774/2019), ASL was re-designed to emphasize the development of transversal skills and orientation activities (PCTO, or *Percorsi per le Competenze Trasversali e l'Orientamento*), thereby losing its focus on facilitating the school-to-work transition.

A key implication of these changes is that the first cohort of high school students who was affected by the 2015 reform by graduating in 2018, was also the last, because younger cohorts of graduates experienced a treatment that was both less intense and with somewhat different contents.

3. *The Data*

We evaluate the impact of the 2015 reform by combining two sources of data:

1. Administrative data on the universe of students graduating from academic and technical high schools during the period 2012 to 2018 (source: *Anagrafe nazionale degli studenti*, Italian Ministry of Education). These data have information both on schools (unique identifying code, school type, private or public status, the municipality where the school is located) and on students (graduation year, gender, nationality, age and final grade, whether enrolled in college after high school graduation).
2. Administrative data on labour contracts (source: *Comunicazioni obbligatorie*, Italian Ministry of Labour) for the period 2012 to 2019, which contain information on all labour contracts, including the date of start and end, from September of the graduation year to September of the following year.

Unfortunately, these data contain no information on the number of hours spent in ASL programmes by each student, or on their contents. However, they allow us to compute three outcomes of interest for the current research: the probability of being employed in the year following graduation, the probability of being employed at least 6 months and the probability of being enrolled as a fulltime student in college in the year after graduation.

In our sample, we have four groups of cohorts:

1. the cohorts graduating between 2012 and 2015, which were not exposed to the reform implemented in the school year 2015/16. These are the pre-treatment cohorts;
2. the cohorts graduating between 2016 and 2017, which were not *directly* exposed to the reform, but were in school after the reform, and may have therefore been *indirectly* affected by interacting with affected students in lower grades;

3. the cohort graduating in 2018, or post-treatment cohort, the first directly exposed to the reform. The students belonging to this cohort were in the 11rd grade in 2015/16, when the reform was introduced, in the 12th grade in 2016/17 and in the 13th grade in 2017/18, when the reform was extended to the highest grades;
4. the cohorts graduating in 2019 and 2020, for which the intensity and the contents of the treatment changed, and who were transitioning from school to work during the Covid-19 pandemic, the impact of which could have confounded the effects of ASL.

We exclude the cohorts graduating in 2016 and 2017, because they are only indirectly affected by the reform, as well as the 2019 and 2020 cohorts, exposed to a different treatment and to the pandemic. Therefore, our working sample includes the cohorts from 2012 to 2015 and the 2018 cohort.[4]

We also exclude from our sample the students at professional schools, for whom ASL was mandatory before the 2015 reform. For each year, we have data for five academic curricula (artistic, classic, scientific, foreign languages, and human sciences) and two technical curricula (economic and technological). We exclude the artistic track because of the relevant institutional changes affecting it during the period of our study. Table 6 shows for each curriculum some key characteristics (percent female and percent foreign) and outcomes in the year after graduation (percent employed, percent employed for more than 6 months and percent fulltime students). While the percentage of foreign graduates is generally low, the percentage of female graduates ranges from 15 percent in the technological curriculum to 91 percent in the human sciences curriculum. The percent of full-time students enrolled in college ranges from 28.8 percent among

[4] We exclude from our sample the small sub-sample of private schools, which are typically much smaller than public schools in terms of students enrolled.

graduates in the technological curriculum to 83.5 percent for graduates in the classical curriculum. Finally, the percent employed in the year after graduation ranges from 9.4 percent among graduates in the classical curriculum to 40.3 percent for graduates in the technological curriculum.

4. *The Empirical Strategy*

We evaluate the impact of the 2015 reform by comparing students graduating from high school curricula that are affected with different intensity by the reform. As discussed above, the reform affects technical and academic tracks differently by imposing a higher minimum number of ASL hours on the former than on the latter. These additional hours are also more likely to involve firms in the organization of practical learning.

The selected approach is difference – in – differences, which compares graduates of technical tracks (treatment) with graduates of academic tracks (control) before and after the reform. In this setup, the difference between treatment and control is not the presence versus the absence of treatment but the higher intensity of treatment assigned to technical tracks. To put it differently, we ask what the effect is of being treated for at least 400 hours of ASL, especially in firms, with respect to the counterfactual of being treated only 200 hours, and less extensively in firms. We capture the counterfactual with the outcomes of graduates of academic tracks, under the identifying assumption that these outcomes move over time in parallel with the unobserved counterfactual.

Since the treatment varies exclusively with the school track, and schools are sometimes re-organised (either by merging existing schools of by spinning off new schools from existing ones),[5] we collapse the original student-level data by municipality, track and year of graduation. By so doing, we can investigate the

[5] In our working sample, only 65.8 percent of schools are always present with the same identifier.

impact of the treatment of outcomes within the stable boundaries of a municipality.[6]

A key requirement of the difference-in-differences approach is that, in the pre-treatment period, the difference in outcomes between treatment and control units is constant (*parallel trends assumption*). Although this hypothesis is non-testable, its plausibility can be gauged by comparing pre-treatment trends in the outcome variables (pre-trends).

Panels a) to c) of Figure 1 show, by gender and track, the pre-treatment trends between 2012 and 2015 in the share of high school graduates who are *i)* employed in the year after the diploma; *ii)* employed for at least 6 months in the year after the diploma; *iii)* full-time students in the year after the diploma. The first two panels show significant deviations from the parallel trend hypothesis, and a gap in the percent employed between technical and academic tracks that widens over time.

We address this problem by adopting a two-fold sample selection strategy. First, we expect that the hypothesis of parallel trends is more likely to be verified when academic and technical tracks have similar observable characteristics. Therefore, we exclude from our working sample technical schools with a technological curriculum, because of the very high share of male graduates, and retain only technical schools with an economic curriculum as the treated sample. In a similar fashion, we choose as control sample the academic schools with a curriculum in foreign languages, which have characteristics that are more similar to technical schools with an economic curriculum (see Table 4).

[6] In the rest of the paper, by technical and academic schools we mean all the schools in a given track located in a municipality.

Second, deviations from the common trend can partly be ascribed to variations over time in the composition of the pool of technical and academic schools, and to asymmetries in the economic contexts where schools are located. We facilitate the comparison of trends across treatment and control school tracks by restricting our analysis to municipalities where both treated and control schools are present. By doing so, our final sample consists of 284 municipalities observed between 2012 and 2015, and in 2018.

Figure 2 replicates the pre-trend analysis in Figure 1 for our final sample. For both academic and technical curricula, employment exhibits a positive trend, reflecting the improvement in the macroeconomic conditions after the debt crisis of 2011 and 2012. Enrolment in college shows instead a negative trend for males and no detectable trend for females, independently of the high school curriculum.

Although trend divergence is attenuated compared to Figure 1, the parallel trends assumption does not appear to be satisfied in Figure 2. This is confirmed by the evidence reported in Appendix Tables A1 and A2, where we show – separately for males and females – the coefficients from a two-way fixed effects model that includes cohort and track-by-municipality fixed effects and interaction terms between cohort and treatment status (taking the 2015 cohort as the omitted reference category), estimated in the 2012-2015 sample. The coefficients are large and statistically different from zero, especially for the 2012 cohort, which is evidence against the unconditional parallel trends assumption.

Because of these findings, we rely on a conditional, rather than unconditional, parallel trends assumption for identification, and assume that trends are parallel only among schools with similar characteristics (see for instance Roth et al. 2023). We assume that trends are parallel between the technical (economic) and academic (foreign languages) tracks *conditional* on macro-area dummies and a set

of observable track-by-municipality covariates measured at the beginning of the study period (2012), that include the number of students, the share of native students, the average age at graduation and the average graduation mark. The plausibility of this assumption will be verified using the set of tests for parallel trends described below.

We implement conditional parallel trends by adopting the Sant'Anna and Zhao (2020, SZ hereafter) doubly-robust DID estimator.[7] Since SZ applies to the canonical 2x2 (two groups and two periods) DID, we first split the sample in many two-periods subsamples and then apply SZ to each 2x2 portion (see Callaway and Sant'Anna, 2021). The pairs 2012-2015, 2013-2015 and 2014-2015 are used to test the hypothesis of (conditional) parallel trends, while the 2015-2018 pair is used to produce the estimate of the causal effect.

In each pair, the double robust DID estimator is obtained for each outcome with the following steps:

1) the propensity score of the treatment for each unit is estimated, based on a logistic regression model and using the predetermined conditioning variables listed above.
2) For the control sample (academic track foreign language curriculum) the within-unit variation in the outcome over time is regressed on the set X of conditioning variables, weighting observations by the inverse of the propensity score estimated in step 1). This step estimates the relationship between track characteristics and the change in the outcome, absent the treatment.

[7] Adding predetermined controls in the canonical TWFE model, possibly interacted with time dummies or time trends, produces biased estimates if the effects of the treatment are heterogenous. In particular, if this heterogeneity depends on the controls, the included interactions will absorb part of the true effect of the treatment (Meyer 1995, Abadie, 2005 and Roth et al. 2023).

3) The ATT (average treatment effect on the treated) is estimated by removing from the actual change in the outcome given X - observed among the treated units - the change in the outcome given X predicted for these units by the model estimated in step 2). We compute standard errors of treatment effects that are robust to clustering at the municipality-by-school track level using asymptotic formulas (see Callaway and Sant'Anna, 2021). Finally, we satisfy the assumption of common support, which is required to implement this step, by dropping treated units with an estimated propensity score below the minimum or above the maximum values observed for control units.

5. Results

Table 7 shows, by gender, the summary statistics of outcomes and explanatory variables in the final sample, which is composed of two school types in each municipality, technical schools with an economic curriculum (the treated group) and academic schools with a foreign languages curriculum (the control group).

5.1 Baseline findings

Tables 8 and 9 present our main results, separately for males and females. Each table includes three columns, one for each selected outcome: the share of graduates employed in the year after graduation, the share employed for at least 6 months in the year after graduation, and the share of full-time college students in the year after graduation. The rows of the tables report treatment effects for different cohorts, with the reference pre-treatment cohort being the one graduating in 2015. The corresponding event study plots by gender and outcome are reported in Figure 3.

Table 6 shows that our estimates for males still suffer from parallel trends issues and are severely underpowered. Even when relying on a conditional – rather

than unconditional – parallel trends assumption, for males we estimate large but insignificant treatment effects for the pre-reform cohorts. For instance, the point estimate for the 2012-2015 effect on the share employed in the year after graduation is close to 6 percentage points, a very large deviation of close to 15 percent of the mean of the outcome for the treated in 2015, equal to 39 percentage points. However, since its standard error is almost as large, at 5.4 percentage points, the estimate not statistically different from zero. We conclude that, for the sample of males, we lack the power to uncover significant treatment effects of an acceptably small magnitude, and refrain from commenting results any further.

Things look better in Table 6, where we report the results for females. In this case, standard errors are almost half as small as those for males, and coefficients for the parallel trend tests are very close to zero, leading us to conclude that the hypothesis of conditional parallel trends is not rejected by the data. There is also evidence – see column (1) in Table 9 - that the treatment generated by the 2015 reform has had a statistically significant and *negative* effect on the probability of employment one year after graduation for treated high school female graduates relative to female graduates in the control group. Our estimates indicate that this probability decreased after the treatment by 8.4 percent, a sizeable effect that is exclusively concentrated on jobs lasting less than six months. The observed negative effect on the probability of employment implies that a more intense treatment – both in terms of mandatory ASL hours and in terms of work-based learning in private firms - has failed to improve the school-to-work transition of female high school graduates.

A candidate explanation of the uncovered negative effects of the reform on employment is that the higher number of hours spent outside schools and in the world of work could have induced many female graduates of technical schools to delay labour market entry and enrol in full time higher education. A key

contribution of spending longer hours – mainly in private institutions - could have been to enrich the information set available to female students and provide a better understanding of labour market opportunities both with a high school diploma and with higher education. Our estimates suggest that this explanation may hold. As shown in column (3) of Table 9, the treatment introduced by the reform increased the probability that female graduates enrol in college by a substantial 14.9 percent.

These findings imply that the percentage of high school graduates of technical schools (economic curriculum) who are neither employed nor in higher education decreased by 9.2 percent among females, relative to graduates of academic high schools (foreign languages curriculum). In our data, high school graduates who are neither employed nor in fulltime college education can be in one of the following three situations: a) NEET; b) enrolled in post-secondary education; c) employed or enrolled in higher education abroad.

Option b) applies to a tiny minority of high school graduates: according to UNESCO Statistics (http://data.uis.unesco.org), in 2021 total enrolment in high school in Italy reached 2.9 million students, total enrolment in tertiary education was slightly above 2 million and only 2,576 students were enrolled in post-secondary education.

It is difficult to obtain reliable estimates of the number of young Italians migrating abroad. According to the Italian Statistical Institute,[8] in 2022 close to 35 thousand Italians aged 25 to 34 migrated above, about half of which with a college degree. Assuming that the annual number of high school graduates is close to half a million and that the migrants without a college degree have a high

[8](https://www.ilsole24ore.com/art/laureati-l-8percento-sceglie-lavorare-all-estero-fuga-record-nord-che-recupera-sud-AEkicF6C

school degree, the estimated percentage of high school graduates migrating abroad is small at about 3.4 percent.

We conclude that option a) is likely to include the vast majority of those who are neither employed nor enrolled in higher education, and that the impact of the 2015 reform has been to significantly decrease the share of female NEET by increasing college enrolment rather than by raising employment.[9]

We stress that our results are informative about the effects of treating students in technical schools with 400 hours of ASL with respect to treating them with only 200 hours (the counterfactual). They could inform us of the effects of treating the same students with 200 hours of ASL with respect to treating them with no ASL only when the relationship between treatment and outcomes is linear. Without linearity, we cannot say much about the effects of introducing ASL with respect to a situation without ASL, simply because there is no group that can be used to proxy the counterfactual: all groups after the reform have positive hours of ASL.

We have also attempted to estimate heterogeneous effects by area, distinguishing between the North and the South of Italy, but the resulting estimates are too imprecise to be meaningful.

Conclusions

Programmes that facilitate the interaction of high school students with the labour market are likely to ease the school-to-work transition. However, by conveying useful information on labour market prospects, these programmes could also affect the choice of continuing into tertiary education, therefore delaying labour market entry.

[9] We have attempted to estimate heterogeneous effects by area, distinguishing between the North and the Centre-South of Italy, but the resulting estimates are too imprecise to be discussed here.

In 2015, school-work alternation programmes were made compulsory in all Italian high schools, with the view that students needed to combine learning at school with work-based learning. A distinctive feature of this reform was that the intensity and type of the treatment varied across school tracks. We have exploited this setup to evaluate whether differences in the intensity of the treatment produced differences in labour market outcomes after high school graduation, in particular employment, and whether they affected the decision to continue into tertiary education.

Using a difference–in–differences approach, we have shown that exposure to more hours of school–work alternation, especially in firms, reduced employment in the year after high school graduation for female graduates of technical high schools, compared to graduates of academic high schools. The estimated negative differential effect is sizeable (-8.4 percent), and focuses on short-term jobs. The estimated reduction of employment was more than compensated by the estimated increase of full-time college education. Consequently, the share of female high school graduates neither in employment nor in college decreased. Unfortunately, our estimates for males are too imprecise to be meaningfully interpreted, and so are the heterogeneous impacts by geographical area.

We have interpreted these results by arguing that a higher intensity of ASL activities – conducted especially in private firms - could have enriched the information set available to female high school graduates, inducing them to postpone labour market entry after college education, a fact that is possibly driven by the relatively unattractive conditions offered by the labour market to high school graduates without college education.

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Tables and Figures.

Table 1. Percent of students who experienced school-to-work alternation programs during the 11th and 12th grade. School year 2016/17.

	Third grade	Fourth grade
Academic track		
Classical curriculum	91.6	90.4
Scientific curriculum	92.1	91.2
Foreign languages curriculum	90.3	88.7
Technical track		
Economic curriculum	91.5	91.4
Technological curriculum	88.7	90.0
Professional track		
Industry	84.5	83.4
Services	85.9	84.1

Sources: Italian Ministry of Education

Table 2. Average hours spend in stages and ASL programmes involving stages, by graduation cohort and gender. Technical (economics and business) and academic (foreign languages) tracks.

	2017	2018 – Intention to treat	2018 – Take up
Technical track	157.17	400	263.75
Academic track	82.06	200	111.39

Source: our elaborations on AlmaDiploma data

Table 3. Average hours spend in stages and ASL programmes involving stages, by graduation cohort and gender. Technical and academic tracks.

	2017 Males	2017 Females	2018 – Males. Intention to treat	2018 – Females. Intention to treat	2018 – Males. Take up	2018 – Females. Take up
Technical track						
Economics and business	140.21	149.64	400	400	245.91	258.13
Technological	171.59	164.09	400	400	276.24	267.61
Academic track						
Classical	73.47	74.26	200	200	95.50	95.29
Scientific	90.46	85.05	200	200	90.46	100.50
Foreign languages	96.56	92.28	200	200	115.36	116.44
Artistic	78.17	73.05	200	200	126.22	130.55
Human Sciences	78.18	83.99	200	200	143.10	134.53

Source: our elaborations on AlmaDiploma data

Table 4. Average hours spend in stages and ASL programmes involving stages, by graduation cohort and area. Technical and academic tracks.

	2017 North	2017 Centre-South	2018 – North. Intention to treat	2018 – Centre-South. Intention to treat	2018 – North. Take up	2018 – Centre-South. Take up
Technical track						
Economics and business	163.17	112.87	400	400	266.77	229.82
Technological	186.65	135.70	400	400	277.74	269.98
Academic track						
Classical	58.80	112.82	200	200	94.70	96.22
Scientific	91.69	77.71	200	200	111.83	86.96
Foreign languages	103.09	78.13	200	200	123.68	103.23
Artistic	75.66	69.83	200	200	126.13	136.14
Human Sciences	78.09	91.31	200	200	133.81	141.85

Source: our elaborations on AlmaDiploma data

Table 5. School – work alternation (ASL) programmes in 2016/17, by type of host. Only students in grades 11 and 12. Academic and technical tracks.

Host	Academic Track	Technical Track
Firms and professionals	40.7	59.3
Schools	10.5	8.2
Public sector and non-profit organizations	35.7	21.6
Other	13.1	10.9
Total	100.0	100.0

Source: Italian Ministry of Education

Table 6. Main characteristics and outcomes in the year after graduation. High school graduates in 2012-15 and 2018. National averages. By type of school.

	Share females	Share foreign students	Share employed in the year after graduation	Share employed for more than 6 months in the year after graduation	Share fulltime students in the year after graduation
Academic tracks					
Classic	0.714	0.010	0.094	0.010	0.835
Foreign languages	0.857	0.044	0.201	0.053	0.641
Scientific	0.498	0.020	0.127	0.021	0.791
Human sciences	0.910	0.024	0.219	0.066	0.581
Technical tracks					
Technological	0.150	0.042	0.403	0.232	0.288
Economic	0.593	0.058	0.380	0.199	0.336
Total	0.573	0.035	0.250	0.109	0.540

Table 7. Summary statistics of the variables in the final sample. By gender and track. Cohorts graduating in 2012-15 and 2018.

	Academic - foreign languages. Males	Technical - economic. Males	Academic - foreign languages. Males	Technical - economic. Males
Share employed in the year after graduation	0.216	0.381	0.212	0.391
	(0.206)	(0.156)	(0.118)	(0.159)
Share employed at least 6 months in the year after graduation	0.059	0.190	0.056	0.211
	(0.113)	(0.119)	(0.050)	(0.130)
Share of fulltime students	0.598	0.366	0.639	0.359
	(0.235)	(0.137)	(0.132)	(0.125)
Average number of students	59.518	64.670	131.89	75.338
	(95.952)	(71.599)	(113.020)	(94.419)
Share of Italian students	0.959	0.955	0.951	0.936
	(0.092)	(0.064)	(0.051)	(0.069)
Average age	18.896	19.018	18.792	18.936
	(0.328)	(0.220)	(0.135)	(0.197)
Average graduation final score	75.994	73.059	77.942	75.421
	(5.438)	(3.274)	(3.105)	(3.216)
Share in the South	0.333	0.341	0.300	0.341
	(0.471)	(0.474)	(0.458)	(0.474)
Share in the Centre	0.234	0.225	0.217	0.214
	(0.423)	(0.418)	(0.412)	(0.411)
Share in the North	0.193	0.191	0.235	0.200
	(0.395)	(0.393)	(0.424)	(0.400)

Table 8. Doubly-robust difference–in–differences estimate of the effect of ASL on employment and college enrolment. Treatment (technical high school graduates – economic curriculum) versus control (academic high school graduates – foreign language curriculum). Males.

Dependent variable	Employed in the year after graduation	Employed at least 6 months in the year after graduation	Full-time college student in the year after graduation
Pre-trend testing			
Treated x cohort 2012	0.057	0.053	-0.036
	(0.054)	(0.036)	(0.061)
Treated x cohort 2013	-0.056	0.024	-0.001
	(0.059)	(0.023)	(0.039)
Treated x cohort 2014	0.044	0.022	0.005
	(0.052)	(0.034)	(0.043)
Treatment effect estimation			
Treated x cohort 2018	-0.029	-0.019	-0.013
	(0.029)	(0.024)	(0.046)
Observations	2,310	2,310	2,310
Percent effect of treatment	-0.074	-0.099	-0.036
Pre-treatment mean for the treated	0.391	0.191	0.359

Notes: each cell reports the doubly robust SZ difference-in-differences estimate obtained by comparing the cohort reported in the first column with the 2015 cohort. Standard errors robust to clustering at the school-by-municipality level are reported in parenthesis. Pre-treatment controls included in the estimation are the school track-by-municipality share of Italian students, the average age at graduation, the average score at graduation, the number of students, and dummies for the macro area where the municipality is located (Northeast, Centre, and South – Northwest is the omitted reference category). One, two and three stars for statistical significance at the 10, 5 and 1 percent level of confidence.

Table 9. Doubly-robust difference–in–differences estimate of the effect of ASL on employment and college enrolment. Treatment (technical high school graduates – economic curriculum) versus control (academic high school graduates – foreign language curriculum). Females.

Dependent variable	Employed one year after graduation	Employed at least 6 months in the year after graduation	Full-time college student one year after graduation
Pre-trend testing			
Treated x cohort 2012	0.006	0.013	0.026
	(0.026)	(0.016)	(0.024)
Treated x cohort 2013	0.008	0.001	0.040
	(0.035)	(0.014)	(0.026)
Treated x cohort 2014	-0.001	0.024	0.012
	(0.021)	(0.008)	(0.030)
Treatment effect estimation			
Treated x cohort 2018	-0.032***	0.009	0.055***
	(0.012)	(0.011)	(0.016)
Observations	2,570	2,570	2,570
Percent effect of treatment	-0.084	0.047	0.149
Pre-treatment mean for the treated	0.382	0.191	0.367

Notes: each cell reports the doubly robust SZ difference-in-differences estimate obtained by comparing the cohort reported in the first column with the 2015 cohort. Standard errors robust to clustering at the school-by-municipality level are reported in parenthesis. Pre-treatment controls included in the estimation are the school track-by-municipality share of Italian students, the average age at graduation, the average score at graduation, the number of students, and dummies for the macro area where the municipality is located (Northeast, Centre, and South – Northwest is the omitted reference category). One, two and three stars for statistical significance at the 10, 5 and 1 percent level of confidence.

Figure 1. Outcome trends, by gender and track. Full sample.

Panel a. Share employed in the year after graduation, by gender and track.

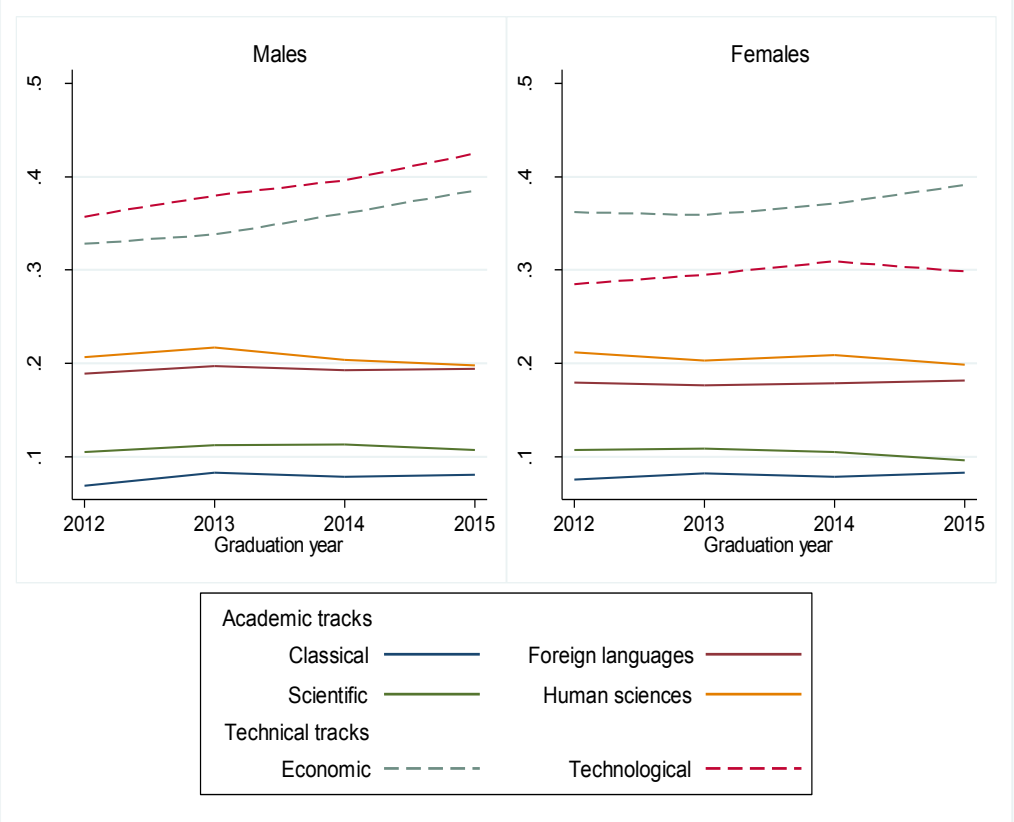


Figure 1. Outcome trends, by gender and track. Full sample.

Panel b. Share employed for at least six months in the year after graduation.

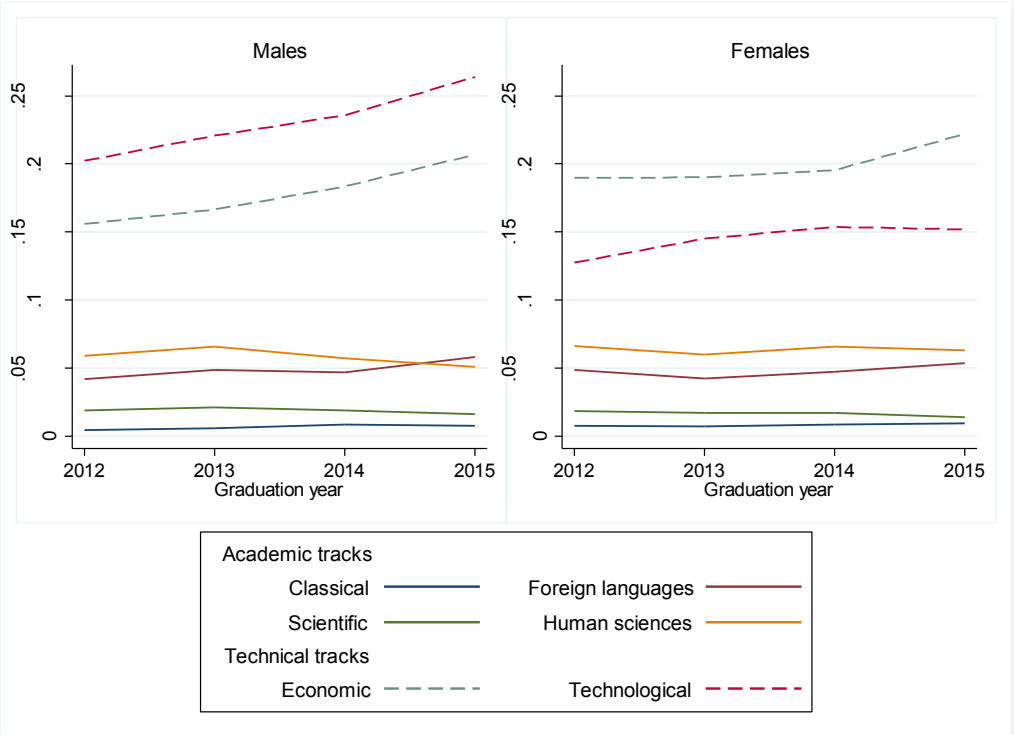


Figure 1. Outcome trends, by gender and track. Full sample.

Panel c. Share of full-time students in the year after graduation.

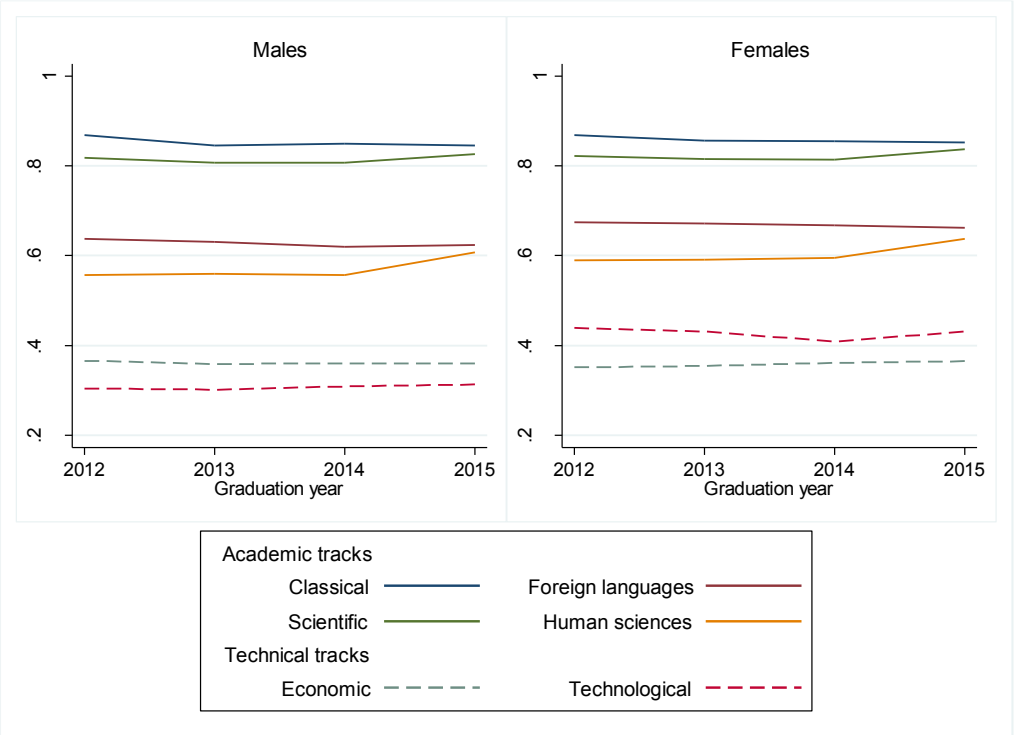


Figure 2. Outcome trends, by gender and track. Academic (foreign languages curriculum) and technical (economic curriculum). Only municipalities with both tracks.

Panel a. Share employed in the year after graduation, by gender and track.

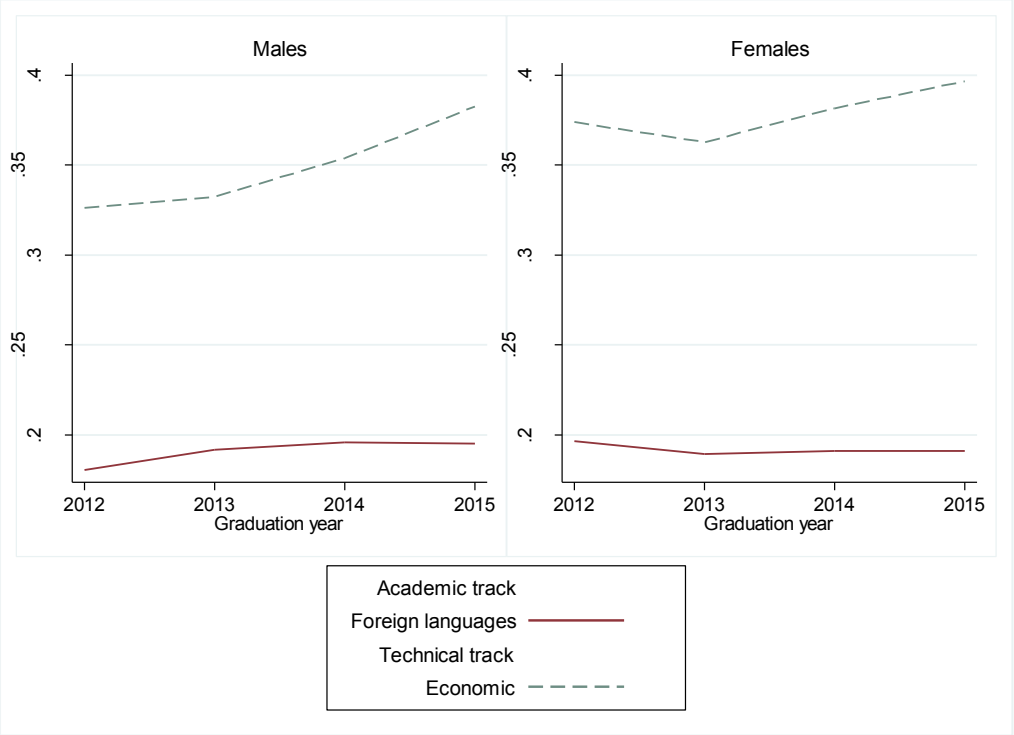


Figure 2. Outcome trends, by gender and track. Academic (foreign languages curriculum) and technical (economic curriculum). Only municipalities with both tracks.

Panel b. Share employed for at least six months in the year after graduation.

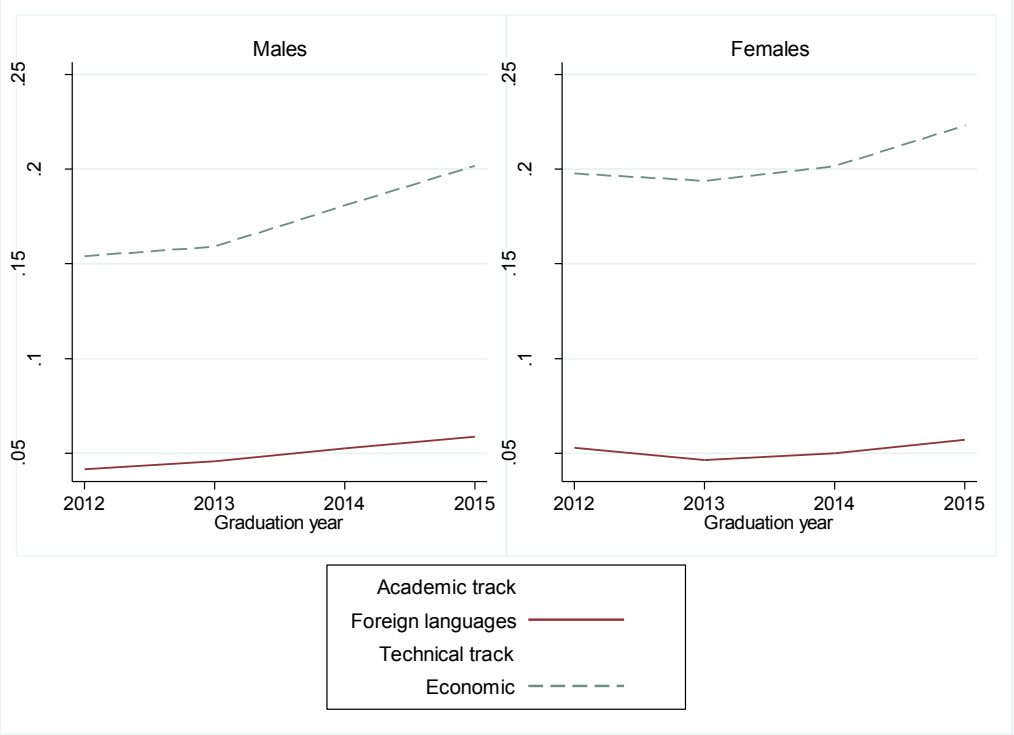


Figure 2. Outcome trends, by gender and track. Academic (foreign languages curriculum) and technical (economic curriculum). Only municipalities with both tracks.

Panel c. Share full-time students in the year after graduation.

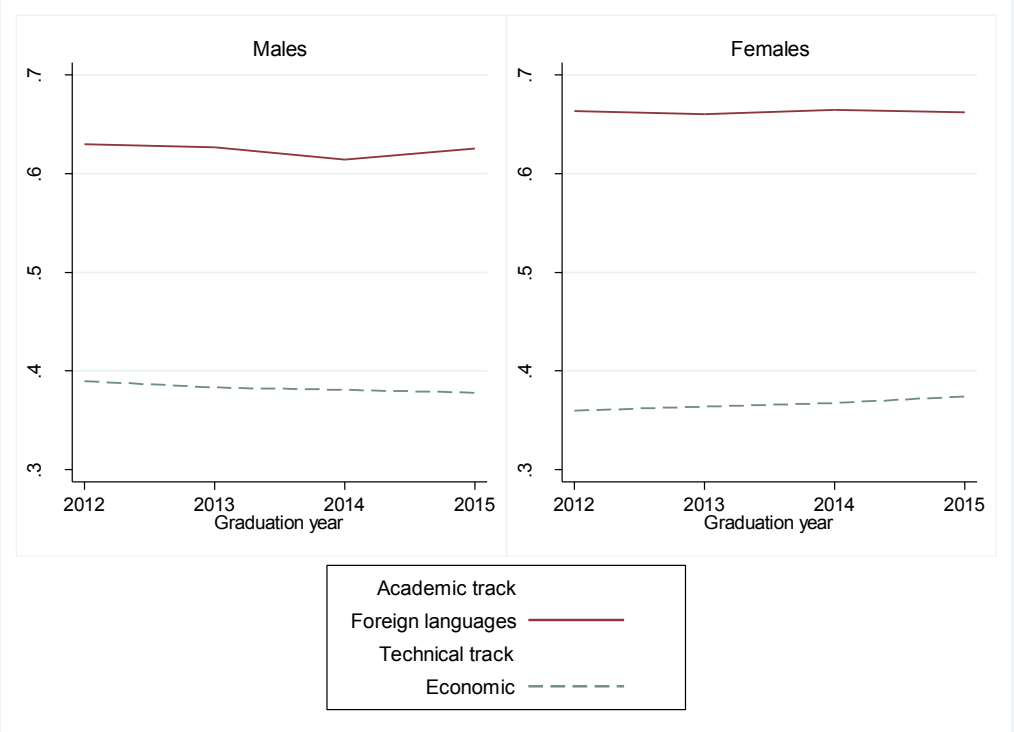
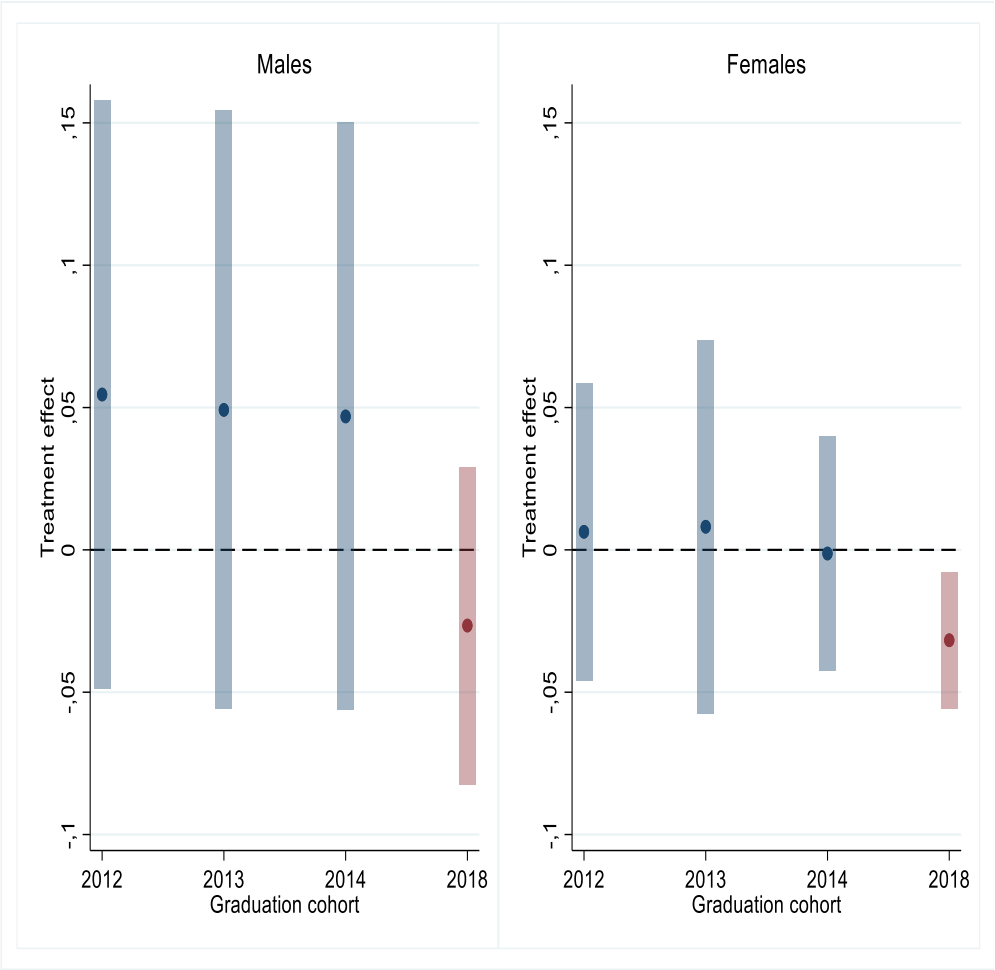
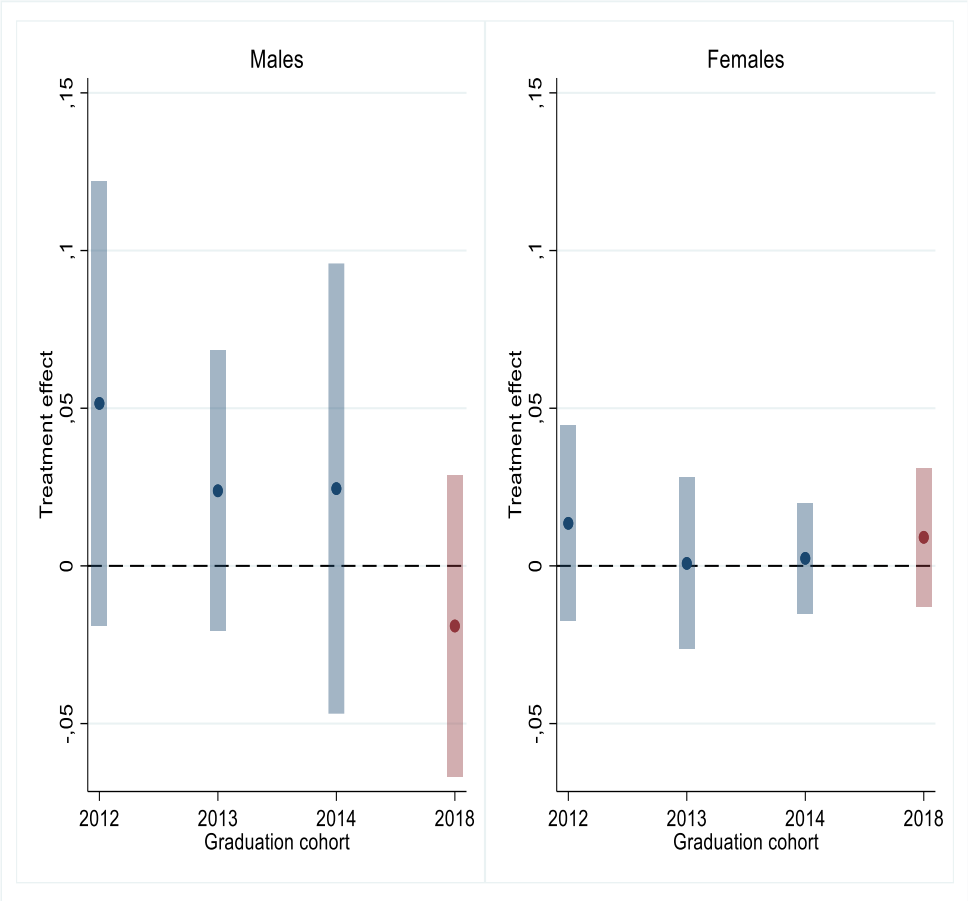


Figure 3. Event study plots, by gender, with 95 percent confidence intervals.

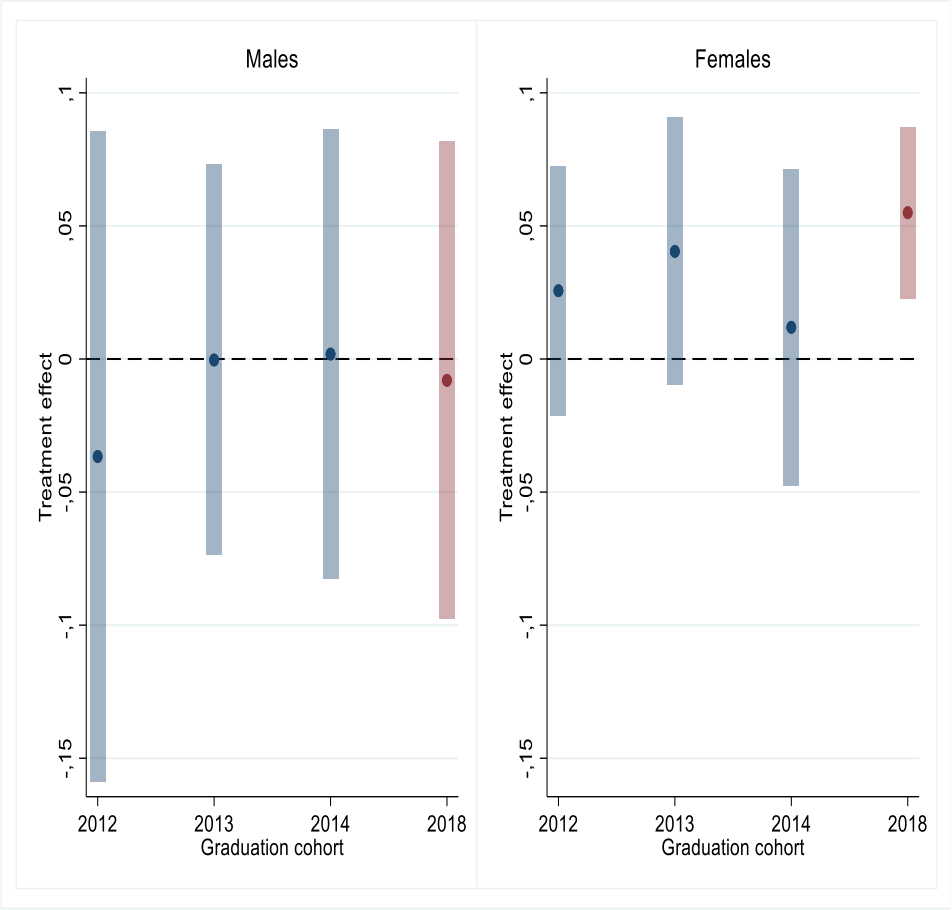
Panel a. Share employed in the year after graduation.



Panel b. Employed at least 6 months in the year after graduation.



Panel c. Full-time college student one year after graduation.



Appendix

Table A1. Unconditional parallel trends test - males.

Dependent variable	Employed one year after graduation	Employed at least 6 months in the year after graduation	Full-time college student one year after graduation
Pre-trend testing			
Treated x cohort 2012	0.031*	0.023**	0.001
	(0.018)	(0.011)	(0.023)
Treated x cohort 2013	0.037**	0.026**	0.023
	(0.017)	(0.011)	(0.023)
Treated x cohort 2014	0.022	0.008	0.024
	(0.018)	(0.011)	(0.024)

Table A2. Unconditional parallel trends test - females.

Dependent variable	Employed one year after graduation	Employed at least 6 months in the year after graduation	Full-time college student one year after graduation
Pre-trend testing			
Treated x cohort 2012	0.024***	0.017**	0.016*
	(0.009)	(0.007)	(0.010)
Treated x cohort 2013	0.025***	0.013**	0.013
	(0.009)	(0.006)	(0.009)
Treated x cohort 2014	0.011	0.010*	0.014
	(0.008)	(0.006)	(0.009)