

# Examining Undergraduate University Programs' Appropriateness at Employability Outcomes in Jordan and Egypt Using Ordered Forests Method

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USING ORDERED FORESTS METHOD**

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## Abstract

This study examines university graduates' ratings of the Bachelor of Science (BSc) program's appropriateness regarding employability outcomes in the labor market. The study uses cross-sectional data from two countries in the Middle East and North Africa (MENA) region, Egypt and Jordan. The graduates' rating is modelled using the ordered response method, where we apply the ordered forests machine learning technique, and compare its results with the conventional ordered probit model. The results show that differences in the education system and labor market opportunity structure influence graduates' ratings of the appropriateness of the BSc program. Graduates' skill matching in their jobs is found to be the strongest factor that impacts the ratings and the satisfaction about the university degree. Policies are required to enhance graduates' employability. The marginal effects of the ordered probit model can be implied as significant, even when the size of the effect is trivial and has no real impact on the conditional probabilities, but can easily be linked to the relative importance ranks of the covariates in the model, in contrast to the ordered forests.

**Keywords:** Employability, higher education, machine learning, random forests, and ordered forests.

**JEL Classifications:** C21, C25, C14, I23, J21.

## ملخص

تبحث هذه الدراسة في تصنيفات خريجي الجامعات "لملاءمة برنامج بكالوريوس العلوم (BSc) فيما يتعلق بنتائج قابلية التوظيف في سوق العمل. تستخدم الدراسة بيانات مقطعية من بلدين في منطقة الشرق الأوسط وشمال إفريقيا (MENA)، مصر والأردن. تم تصميم تصنيف الخريجين باستخدام طريقة الاستجابة المرتبة، حيث نطبق تقنية التعلم الآلي للغابات المرتبة، ونقارن نتائجها بنموذج الاحتمال التقليدي المرتب. تظهر النتائج أن الاختلافات في نظام التعليم وهيكل فرص سوق العمل تؤثر على تصنيفات الخريجين لملاءمة برنامج البكالوريوس. وجد أن مطابقة مهارات الخريجين في وظائفهم هي أقوى عامل يؤثر على التصنيفات والرضا عن الشهادة الجامعية. السياسات المطلوبة لتعزيز قابلية الخريجين للتوظيف. يمكن أن تكون الآثار الهامشية لنموذج الاحتمال المرتب مهمة، حتى عندما يكون حجم التأثير تافهًا وليس له تأثير حقيقي على الاحتمالات المشروطة، ولكن يمكن ربطه بسهولة بدرجات الأهمية النسبية للمتغيرات في النموذج، على عكس الغابات المرتبة.

# 1 Introduction

Employability is a key factor in the transition from education to work and progress in the labour market. Higher education institutions attempt to enhance graduates' employability skills to facilitate their transition to work easily and smoothly. University graduates' employability has attracted attention in educational and labour economic research due to its crucial impact on labour market progress and efficiency, and for the lifelong advantages and consequences for graduates (Fallows and Steven, 2000; Pavlin and Svetlik, 2014; Tomlinson and Holmes, 2016). Many attempts have been made to define employability in economic literature. A narrow definition identifies employability as the skills and capabilities that allow individuals to be self-sufficient in mobility in the labour market, able to find matched first jobs, and maintain employment. However, Hillage and Pollard (1998) state that "employability is about work and the ability to be employed", and set three aspects that should be considered in defining employability: the ability to gain initial employment, the ability to obtain new employment if required, and the quality of work. Hillage and Pollard (1998) add that "employability depends on the knowledge, skills and attitudes they possess, the way they use those assets and present them to employers and the context".

Attention to enhancing university graduates' employability skills began early in the economic research. Adding this theme to university study program design and missions has dramatically changed the economic scope of higher education institutions (Dearing, 1997). The study programs should be flexible and updated based on the changing global economic conditions. University career services, which have been established in many universities around the world, aim to enhance graduates' job-search skills (Tomlinson, 2017) and transition to employment. Undoubtedly, university study experience influences graduates' work experience and labour market outcomes. Accordingly, economists are interested in studying the impact of university study program design outcomes on graduates after joining the labour market to improve their work and study experiences.

Employability depends on the labour market structure and the quality of the matching between job-seekers and occupation requirements; the factors that impact this process differ between countries (Nilsson, 2017). An efficient education system supplies the labour market with graduates with high employability skills and minimal job mismatch risks. In skills and education, with a high likelihood of progress and success in their careers. In return, an efficient labour market provides the optimum allocation of human capital and graduates to the available job positions in the economy based on disciplines, fields, skills, academic performance, and economic growth requirements. However, the labour market changes over time, new skills and occupations are developed, and new technologies are introduced, which cause some occupations and skills to become obsolete and not demanded. Education systems and curricula must be designed to minimize these risks. Graduates from the education system with appropriate employability and cognitive skills that are demanded in the labour market have a lower likelihood of facing difficulties in finding jobs, performing job tasks, progressing to higher positions, self-development, continuing education of higher degrees, or moving to different positions in the labour market.

Unsuccessful experience of graduates in the labour market can be revealed strongly as 'regret' for acquiring a university degree (Mora, 2010; Kucel and Vilalta-BufÀ, 2013; García-Aracil, 2009; Fouarge and Somers, 2018). The assessment of the appropriateness of university study from graduates' point of view after joining the labour market is very important for examining the efficiency of both the higher education system and the labour market. Analysing the impact of study experience on the labour market performance of graduates at the microeconomic level will improve the efficiency of the labour market experience of graduates and enhance their productivity, which in turn impacts the economy as a whole by improving the economic growth and level of welfare in the country.

The motivation of this study is to contribute to the short literature in economics that examines the university study program factors that enhance graduates' employability in the labour market. This study

uses cross-sectional data from university graduate surveys in two countries in the Middle East and North Africa (MENA) region: Egypt and Jordan. The survey collected information from a sample of graduates about their rating of the appropriateness of the Bachelor of Science (BSc) programs that they had completed. The questionnaire includes six outcomes that influencing employability of the graduates in the labour market, which are, (1) beginning work in the labour market, (2) continue education after work, (3) performance in current job assignments, (4) prospectives for future jobs, (5) self-development, and (6) creative skills. Our objective is to examine the factors that influence the rating of these factors to better understand the factors that impact graduate employability. We utilise machine learning methods in applied micro-econometrics and use the ordered forests (OF) estimator, which is considered as the random forests estimator that is equivalent to the fully parametric ordered probit and logit estimator in the parametric estimation framework.

This study contributes to labour economics and educational economics research in the MENA region and improves the understanding of the factors that influence and affect graduates' employability at the labour market micro-level. We use a novel estimation method, the machine learning ordered forests technique, to estimate this impact. Our analysis provides a comprehensive analysis of the quality of the estimates of the machine learning ordered forests method compared with the conventional ordered probit method. This enriches research in the field of applied microeconometrics and the applications of machine learning methods. Accordingly, this study highlights the remarkable qualities of machine learning estimates and their attractive qualities for research in applied econometrics.

The remainder of this paper is organised as follows: Section 2 presents the research problem. Section 3 presents a literature review and findings from previous theoretical and applied research in economics examining university graduates' employability. Section 4 presents the structure of the ordered forests machine learning estimator and the method used to estimate marginal effects. Section 5 describes the data and presents the summary statistics. Section 6 presents the results and discusses the interpretation of the results and quality of the estimates. Finally, Section 7 summarises the conclusions and recommendations of this study. In this study, we report a large number of marginal effect coefficients, which may be tedious for some readers. Therefore, in the discussion section we focus on explaining the important coefficients of the model.

## 2 Research problem

Many theoretical frameworks in economics attempt to explain the role of education in the labour market. The economic theory is clear in that education systems provide recognised schemes for sorting graduates based on their performance in study program assessments. These assessments can be considered valid proxies for graduates' knowledge in the field of study and their level of cognitive skills as well as many other favourable individual characteristics that are interesting to employers. The decision to study for a university degree depends on the cost of higher education and discount rate in the economy. In microeconomics, higher education is considered a private individual decision (Card, 1994, 2001; Borjas and Van Ours, 2010; Toutkoushian and Paulsen, 2016). Students' expectations of future wages and job quality are the main drivers of this decision (Psacharopoulos and Patrinos, 2018). Students weigh the expected lifelong benefits of the degree with the potential costs of study before enrolling in a higher education program.

The human capital (HC) theory in economics suggests that individuals invest in education for their associated positive returns after graduation. The higher the schooling years, the higher the expected return in future life (Card, 2001), and the higher the acquired skills, which will be valued by employers by offering higher wages, because this compensates for the costs of on-the-job training of employees. This theory

is considered the widest framework that attempts to explain return to education at the microeconomic level. The alternative theory to HC is the signalling theory, which states that more education is valued by employers because it increases an individual's productivity. Accordingly, education serves as a signal that helps employers distinguish potential productive workers from the pool of job seekers. Education signals potential employees' unobserved characteristics, such as ability, which have been considered in human capital theory as endogenous and a source of heterogeneity. Ability may be positively correlated with both education and productivity, which makes employers believe that education signals ability and enhances productivity (Harmon et al., 2003; Reddick and Ponomariov, 2023).

According to these two theories, graduates with more years of schooling and higher degrees expect employers to offer higher wages than those with lower or basic degrees. However, both human capital and signalling theories value the number of schooling years only among other educational outputs of individuals, without discussing the economic value of other aspects of education output. With growing interest in the knowledge economy, empirical research has focused on understanding the impact of different factors on the return to education, for example, the impact of discipline and field of study (Lemieux, 2014; Altonji et al., 2016; Kirkeboen et al., 2016), university reputation and prestige (Mihut (2022, 2015), study program structure, and teaching methods (Light and Schreiner, 2019; Altonji et al., 2012; Black et al., 2005; Altonji et al., 1998).

Graduate employability is an important issue in labour economics research because of the increasing economic and social costs of high education (Burke et al., 2017). Tomlinson (2017) states that "*Individuals have limited employability until they participate in further education and/ or training. The institutions they attended provided **appropriate** knowledge and skills that make them employable. They then transfer this into the labour market in return for better overall returns and career prospects*". Employability also depends on how much graduates invested in developing their career paths before and after graduation. Tomlinson (2017) refers to this factor as *identity capital*.

For university graduates, a high quality of employability skills indicates a successful investment in the degree program. Employability of graduates can be measured through several outcomes. For example, graduates with high employability make the transition from education to work, progress in their careers smoothly and quickly, and learn job assignments appropriately and quickly. After the transition to employment, it tends to be self-sufficient in the labour market with identity capital, which could be increased through self-development and enhanced through creativity. Our research interest is to examine whether the BSc program at universities in the included MENA countries had good and appropriate employability outcomes, using the six outcomes measured in the Higher Education Graduates Survey 2012. . We refer to the factors examined in this research as employability outcomes, since they measure graduates' ratings of some of the basic employability outcomes in undergraduate program design.

### 3 Literature review

Universities have four basic missions: teaching, research, innovation, and public services (Toutkoushian and Paulsen, 2016). Teaching is considered the primary role and is closely related to labour market activities and human capital building in societies. Graduates from higher education institutions provide the labour market with qualified and skilled workers, which improves productivity and contributes to economic growth. The positive role of higher education institutions in economic development and growth is well understood and has been demonstrated through economic research. Valero and Van Reenen (2019) use data from nearly 15000 universities around the world from 1950 to 2010 and find a strong positive causal effect of new universities and the regional gross domestic product (GDP) growth rate. The creation of new universities is associated with increased employment rates and earnings in local

communities (Frenette, 2009). Goldstein and Drucker (2006) demonstrate the large contribution of universities to human capital development and the innovation of new technologies. However, the design of programs must not ignore the other roles of universities; graduates should be able to continue studying, serve the community, and have creative skills.

Discussions on implementing employability in higher education study program curricula have existed early in the literature on educational economics. Employability simply means that graduates should have the skills and knowledge that allow them to be self-sufficient in the job market and find matched first jobs in the labour market smoothly after graduation. However, Cheng et al. (2022) show that the definition of employability in this context is controversial, and it can be defined from the perspective of personal characteristics and skills that help a graduate find a job, from the perspective of what employers expect from university graduates, or as the ability to perform in the job and progress in it in the future (Byrne, 2022).

Graduates' understanding of employability is important for career building in the labour market (Fallows and Steven, 2000). For university graduates in Germany, Piopiunik et al. (2020) found that signalling the study domain, social and cognitive skills, and maturity increases the propensity to call for a job interview. Employability is affected by several factors. First, by the human capital, which is measured by the number of years of schooling. Second, reputational capital, social capital, and networks. Reputational capital is positively affected by the rank of the university, which gives graduates from elite universities a higher reputational capital. This could also be improved if graduates were innovative in informing themselves of their skills. Souto-Otero and Białowolski (2021) argue that graduates should focus on the three types of capitals, human, reputational and social, to improve their employability in the labour market. Pavlin (2014) believes that universities should put efforts not only to enhance graduates' employability but should also take into consideration the appropriateness and quality of skills and education matching of their graduates, and their satisfaction and trajectory in the labour market in the future.

Labour market outcomes are directly affected by university study programmes, but the level of impact is not yet understood. García-Aracil (2015) finds that well-designed educational programs are linked to work experience and result in better-paid jobs for graduates. and argues that a university study program makes positive effects on employment opportunities, occupational status and earnings. The findings of this study show that the teaching methods followed in the program impact the labour market outcomes of graduates. Some teaching methods, such as participation in research projects, teachers being the main source of information, and group work sessions and assignments, have a positive influence on job satisfaction after graduation, whereas practical knowledge has a negative impact (García-Aracil, 2015). Additionally, the latter study suggests that graduates can achieve better outcomes and satisfaction in the labour market if study programs are designed with more balance between theoretical and practical-oriented learning.

However, McGuinness et al. (2016) stressed the role of study program in the labour market, particularly in reducing the likelihood of job mismatch. Using micro data from 15 European Union countries from samples of graduates from high education who graduated before five years, they show that using practical knowledge teaching methods in the program reduces the likelihood of job mismatch in the first job for graduates by six to nine percentage points. They recommend that educators strengthen the links with employers and invest in career development programs, in addition to helping students with job search methods. Whelan and McGuinness (2021) using data on graduates from higher education institutions in 18 countries in Europe show that enhancing non-cognitive personal skills during university study is a key driver for university experience satisfaction after graduation by more than 15 percentage points. They find that mismatched workers are 11 percentage points less likely to report satisfaction, but that



using practical learning increases satisfaction with the study program experience after graduation.

Salas Velasco (2014) argues that higher education institutions can make a difference in the competence of graduates in the labour market by using innovative methods of teaching that enhance students' skills during the study program period, and that the employability of graduates improves when the study program becomes more vocationally oriented. Blázquez et al. (2018) find that graduates' occupational status is influenced more by non-cognitive skills, particularly in senior positions, and that cognitive skills are more related to earning. They recommend using innovative teaching methods to enhance both the cognitive and non-cognitive skills of graduates to facilitate their transition to work and put them on an effective work track trajectory. Albert and Davia (2023) argue that job mismatch could be reduced dramatically by encouraging graduates to find their first job through internships and job placement services at universities.

Heinesen (2018) finds that undergraduate students in Danish universities are 20 percentage points more likely to continue studying post-graduate degrees if they were admitted to their first-choice programme. Martínez and Toledo (2013) find that services and facilities during the study program at university influence the later experience in the labour market, and some graduates might be influenced by these factors to have the desire to repeat the same experience of study. Solomon (1975) shows that institutional quality in higher education has a highly positive lifetime impact on graduates. Stevenson (2016) finds that the return on the quality of university education on earning in the labour market in the United States is positive.

In MENA countries, Assaad et al. (2018) examine the labour market of university graduates and show that job mismatch is prevalent because of factors affecting both the demand and supply sides. They concluded that the higher education sector required reform. The prevalence of educational mismatch in MENA has been examined by many researchers, who have demonstrated the negative effects of this phenomenon on productivity, earnings, and job satisfaction (Alattas, 2023; Elamin, 2023; Assaad et al., 2016). Using the Higher Education Graduates Survey in Egypt and Jordan, Krafft and Assaad (2016) concluded that university graduates face inequality of opportunity in the labour market.

The economic literature on graduates' satisfaction with university program study is relatively shorter than that focusing on students' satisfaction during study or job satisfaction after joining the labour market. Espinoza and McGinn (2018) stress that work experience after graduation influences degree program re-evaluation. In Spain, Mora (2010), find that job mismatch drives university graduates to regret their chosen fields of study. This result agrees with that of Kucel and Vilalta-BufÀ (2013). However, using data on young European higher education graduates García-Aracil (2009) shows that participating in course projects and poor teaching materials are the main factors that increase the likelihood of dissatisfaction with the study program at the university level.

Unfortunately, economic literature does not directly cover all the outcomes examined in this study. We have not been able to find studies that analyse graduates' ratings of programs on an ordinal scale such as the rating available in our data.

## 4 Econometric method

The main econometric framework for estimating ordered response models is based on several restrictive assumptions. However, the basic assumption is realistic; it assumes that the underlying data-generating process from which the ordered response variable has emerged is continuous. The underlying continuous variable is a latent variable denoted by  $y_i^*$ ,  $i = 1, 2, \dots, N$ . In the model the latent variable follows a linear function on a set of covariates  $X_i$  as follows:

$$y_i^* = X_i' \beta + u_i, \quad (1)$$

where  $\beta$  is the coefficient vector and  $u_i$  is the error term. Both  $X_i$  and  $\beta$  have length  $p$ .

Instead of the continuous latent variable, we observe a discrete categorical variable  $y_i$  which is discretised from  $y_i^*$  and constructed using the following mechanism:

$$y_i = k \quad \text{if} \quad \alpha_{k-1} < y_i^* \leq \alpha_k \quad \text{for} \quad k = 1, 2, \dots, K, \quad (2)$$

with  $\alpha_0 = -\infty$ ,  $\alpha_K = +\infty$ , but other threshold values are unknown but they follow that  $\alpha_1 < \alpha_2 < \dots < \alpha_{K-1}$ .  $K$  is the number of the ordered categories. The unknown thresholds can be estimated with the coefficient vector  $\beta$ , the parallel regression. The observations are assumed to be independent and identically distributed (IID).

The common estimation framework of this model is the maximum likelihood method. The main objects of interest in the estimation process are the coefficient vector  $\beta$  and the threshold parameters  $\alpha_1, \dots, \alpha_{K-1}$ . The estimated conditional probabilities should allow for computing the marginal effects that explain how the conditional probability changes when the values of the covariate change, usually measured subsequently for each covariates while keeping other covariates fixed at certain values or averaged out in the sample. The main disadvantage of the maximum likelihood framework is that it enforces restrictive parametric assumptions regarding the distributions of the error term in the model. The ordered probit model is produced when the errors are assumed to follow a normal distribution, whereas the ordered logit model is produced when the logistic distribution is assumed.

The estimates of the maximum likelihood method will be inconsistent if the functional form and/or the distributional assumptions of the errors are misspecified. Many other estimators in econometrics have been developed to overcome this problem by relaxing some of these restrictive assumptions to develop more flexible estimators for empirical analysis. For example, the generalised ordered logit/probit model relaxes the parallel regression assumption in the maximum likelihood estimator by assuming that the coefficient vector is choice-specific. However, a restrictive parametric assumption about the distribution of the error term is still enforced in the generalised ordered model.

Econometricians have developed estimators with minimal or no distribution assumptions for decades. A nonparametric estimation framework is rich in which types of estimators can be used to estimate the conditional probabilities of ordered response-dependent variables (Horowitz, 2009; Li and Racine, 2007). Racine et al. (2004) developed a conditional density estimator that uses the kernel function smoothing method which is capable of smoothing mixed types of variables, continuous, discrete ordered or discrete unordered. The estimator can be used to estimate the conditional mass probabilities for the ordered response-dependent variable conditional on mixed-type covariates. Ordered response variables can be smoothed with special types of kernel functions constructed following the latent continuous underlying data-generating process. (Aitchison and Aitken, 1976; Titterton and Bowman, 1985). For example, the geometric kernel function, Titterton, Aitken, Aitchison and Aitken, Habbema or modified Aitchison and Aitken kernel (Li and Racine, 2007; Wang and Van Ryzin, 1981).

The validity of the results of the nonparametric kernel estimators depends crucially on the choice of bandwidth parameters of the smoothing function. The optimum bandwidths are estimated using data-driven methods that trade-off between bias and variance in the model. However, the estimation process might become tedious and time-consuming in large samples and objects with many variables. The most reliable methods for kernel conditional density bandwidth estimations are the leave-one-out least squares cross-validation method (LOO-CVLS) and the leave-one-out maximum likelihood (LOO-CVML) method. For the ordered variable kernel functions, the bandwidth value is strictly between zero and one to ensure

that the total probability of all choices equals one. A bandwidth close to 1 means that the variable is over-smoothed, the bias in the estimates is high, and a value close to zero means that the variable is under-smoothed, and the variance is high (Li and Racine, 2007).

Although the kernel method estimator for ordered response conditional density does not enforce distribution assumptions on the variables or the error term and does not specify a functional form for the conditional mass density function, it remains an unattractive estimator for empirical applications for two main disadvantages. First, they are computationally expensive, particularly for large datasets. Second, there is the curse of the dimensionality problem, in which kernel estimators break down quickly with an increase in the number of variables in the model. Finally, for the categorical ordered response model, the kernel framework does not provide a direct method for computing marginal effects.

These drawbacks of the kernel method have overcome by machine-learning estimators. The machine-learning framework in microeconometrics provides estimators for objects of different types and follows different approaches (Mullainathan and Spiess, 2017; Athey, 2018; Athey and Imbens, 2019). The random forests (RF) method (Breiman, 2001; Hastie et al., 2009; Biau and Scornet, 2016) provides many attractive estimators for conditional regression models, quantile regression, classification, treatment effect analysis, and survival analysis. For an ordered response model Lechner and Okasa (2019) developed a random forest estimator that is known as an *ordered forests estimator*, with a method for computing the marginal effects of the variables in the model.

## 4.1 Random forests method

The random forests method was first introduced by Breiman (2001) based on Breiman et al. (1984) and is classified as a nonparametric statistical learning technique. To grow decision trees in random forests, this technique uses a Classification And Regression Tree (CART) method, and the final estimator is an ensemble of the grown trees. The CART method is the core and the working horse of the RF and is classified as a data-driven estimation procedure. Each tree in the RF is grown using the variations in selected variables, *random input of the variables*, and a subsample to perform recursive splitting until the minimum leaf size is reached (Genuer and Poggi, 2020). This procedure is used to avoid having trees that are very similar in the ensemble final estimate.

The consistency of the estimates requires the leaf size to be small relative to the number of observations in the sample. Additionally, Wager (2014) and Athey et al. (2019) suggest that each observation in the subsample must be used to either make splits or compute predictions. In other words, the subsample is divided into two disjoint sets: one to grow the tree, denoted by  $\mathbf{I}$ , and the other to make predictions, denoted as  $\mathbf{J}$ . The resulting tree is known as *double-sample tree*. After growing the tree from the observations in  $\mathbf{I}$ , the leaves are emptied and refilled from the observations in  $\mathbf{J}$  to make predictions. This process is known as *honesty*.

The RF resembles the adaptive kernel method explained in the previous section, in that both methods use local adaptive weights to weigh nearby observations and use a data-driven method to compute the weights. As expressed in Geurts et al. (2006), “tree-based models are kernel-based models”. In its simplified form, random forests estimators can be written as kernel estimators (Biau and Scornet, 2016). The kernel method relies more on using distance measures to weight nearby observations by assigning more weights to closer observations. This weighting approach becomes more difficult when the variables in the model increase because the estimation of the bandwidths for the kernel function becomes a tedious task that requires hard computation.

In contrast, the random forests method requires a few parameters to be tuned to perform the estimation. There is no penalty for adding more variables to the model or incurring additional expensive computational costs. Davies and Ghahramani (2014) show that random forests estimators can outper-

form kernel estimators in terms of prediction accuracy. The RF weights each target set of values based on the proportion of trees in which those values occurred with the target values in the same leaf. The nearby values close to the target value will appear more frequently, and thus, will be assigned a higher weight than far observations. This weighting method has little extra computational cost when the number of variables in the model or sample size increases. The random forests method allows the regression model to be estimated even if the number of covariates exceeds the sample size.

## 4.2 Ordered forests estimator

The ordered forests (OR) method has the same advantages as the RF and kernel methods, where it utilises a data-driven method in the estimation. The approach of Lechner and Okasa (2019) to estimate the conditional probabilities of ordered response variable choices is based on estimating the cumulative probabilities of choices using binary indicator variables, which are called parallel regressions. Let  $Y_{k,i} = \mathbf{1}(y_i \leq k)$  for  $k = 1, 2, \dots, K-1$ , be the binary indicator for each category. The ordered forests algorithm is designed as follows:

1. Generate a multiple overlapping binary indicator variables

$$Y_{k,i} = \mathbf{1}(y_i \leq k) \text{ for } k = 1, 2, \dots, K-1,$$

which will be used as dependent variables in a series of random forests parallel regressions to yield predictions for the distinctive cumulative probabilities of the ordered choices.

2. Estimate a random forests model for each indicator variable. Using  $B$  trees in the random forests, the algorithm makes predictions of the cumulative probability,  $\hat{Y}_{k,i}$ , using ensemble tree estimates as follows:

$$\hat{Y}_{k,i} = P(Y_{k,i} = 1 | X_i = x) \quad (3)$$

$$= \sum_{i=1}^N \frac{1}{B} \sum_{b=1}^B \frac{\mathbf{1}(\{X_i \in L_b(x)\})}{|\{i : X_i \in L_b(x)\}|} Y_{k,i} \quad (4)$$

$$= \sum_{i=1}^N \hat{w}_{k,i} Y_{k,i}. \quad (5)$$

3. From the predictions of the overlapped cumulative probabilities,  $\hat{Y}_{k,i}$ , compute the probability of each distinct choice in the ordered response variable:

$$\hat{P}^k(x) = \widehat{Pr}(y_i = k | X_i = x) = \hat{Y}_{k,i} - \hat{Y}_{k-1,i} \quad (6)$$

for  $k = 2, 3, \dots, M$ . This requires that  $\widehat{Pr}(y_i = 1 | X_i = x) = \hat{Y}_{1,i}$  and that  $\hat{Y}_{K,i} = 1$ . The predicted probabilities are strictly controlled to be non-negative and add up to one over the available ordered choices.

The prediction accuracy is calculated using two measures: the mean square error (MSE) and ranked probability score (RPS).

### 4.2.1 Variable Importance

The random input of covariates in the random forests regression was performed using a hierarchy method. This provides a quantitative measure of the importance of each covariate in the model. Variable

importance measures have attracted attention in traditional parametric estimation methods, and different methods have been suggested for linear regression models (Grömping, 2007, 2015). Variable importance in random forests aims to rank the covariates starting from the most prominent in terms of their effect on the response variable up to the least prominent. In parametric regression, the absolute values of the coefficients' significant test statistics provide a simple way to make this type of sorting (Grömping, 2007). In this case, the covariate with the highest absolute value can be considered the covariate with the most prominent impact on the response variable. However, this sorting depends on the included covariates and can change dramatically with any change in these variables or the sample size.

However, in random forests models, there are no available similar tests for covariate significance, such as those available in traditional parametric regression models. Sorting the covariates based on variable importance provides information about which covariate makes the largest contribution to the response variable compared with other covariates, which benefits decision making based on the model results. In random forests regression variable importance measure is based on "permutation." For each selected subsample the MSE of the predictions is calculated. Then, each covariate is randomly permuted and the MSE measures are re-calculated. This process is repeated several times and the variable importance measure is defined as the difference between the MSE of the subsample and the average MSEs of the permuted samples (Genuer and Poggi, 2020).

The covariates can be ranked based on their importance by sorting them based on the values of the differences between the MES and their average MSEs of the permuted samples. This allows us to compare the relative importance of the covariates. Note that the importance weights and ranks are associated with the covariates included in the model and can change dramatically with any change in the covariates. Since we use the same covariate set in all regressions in this research, we will discuss the relative importance of variables in some detail and compare them with the parametric regression ranks. This will contribute to empirical research on applied microeconometrics. The discussion of the permutation importance weight revealed some good qualities of the ordered forests regression, as presented in Section 4.2.

#### 4.2.2 Computation of the marginal effects

The marginal effects are the changes in the predicted probabilities of the ordered categories when a covariate changes, whereas the other covariates are kept fixed. The sum of the changes in all the categories is zero. For example, if  $x_j$  increases the probability of the first choice, it must reduce the probabilities of the other choices or at least one of them by an equivalent value of the increase. This property is well understood in parametric models (Greene, 2017; Greene and Hensher, 2010; Wooldridge, 2010) and has also been followed in the ordered forests model.

The marginal effects of a dummy covariate are the difference in the probability of each category when the covariate equals 1 and the probability when the covariate equals zero. The marginal effects of continuous covariates are computed by taking the derivatives of the conditional probability of the object, similar to the approach used in the ordered logit and probit models. However, because the OF conditional probability function is estimated nonparametrically, where the derivatives are computed numerically. Thus, for a continuous covariate,  $x_j$  Lechner and Okasa (2019) suggest approximating the derivative using the following formula:

$$\widehat{me}^k(x_j) = \frac{1}{x_j^U - x_j^L} \left[ \widehat{P}^k(x_j^U) - \widehat{P}^k(x_j^L) \right] \quad (7)$$

$$= \frac{1}{x_j^U - x_j^L} \left\{ \sum_{i=1}^N [\widehat{w}_{k,i}(x_j^U) - \widehat{w}_{k,i}(x_j^L)] \widehat{Y}_{k,i} - \sum_{i=1}^N [\widehat{w}_{k,i}(x_j^U) - \widehat{w}_{k,i}(x_j^L)] \widehat{Y}_{k-1,i} \right\} \quad (8)$$

where  $\hat{P}^k(x_j^{(\cdot)})$  is the probability of choice  $k$  with all covariates fixed, except  $x_j$  is set at a value  $x_j^{(\cdot)}$ . The values  $x_j^U$  and  $x_j^L$  are  $x_j$  plus and minus 0.1 standard deviation, respectively. The term  $\frac{1}{x_j^U - x_j^L}$  is known as the scaling factor.  $\hat{w}_{k,i}(x_j^U)$  are the random forests local adaptive weights evaluated at  $x_j^U$  and the fixed values of the other covariates, and similarly for  $\hat{w}_{k,i}(x_j^L)$ . In this research, we apply the mean marginal effects; therefore, we take the average of the weights and scaling factor.

Following the notation in Lechner and Okasa (2019), let  $\tilde{w}_{k,i}(x_j^U, x_j^L) = \hat{w}_{k,i}(x_j^U) - \hat{w}_{k,i}(x_j^L)$  and  $\tilde{w}_{k-1,i}(x_j^U, x_j^L) = \hat{w}_{k-1,i}(x_j^U) - \hat{w}_{k-1,i}(x_j^L)$ . Let also:

$$\tilde{W}_{k,i} = \tilde{w}_{k,i}(x_j^U, x_j^L) \hat{Y}_{k,i} - N^{-1} \sum_{i=1}^N \tilde{w}_{k,i}(x_j^U, x_j^L) \hat{Y}_{k,i},$$

and

$$\tilde{W}_{k-1,i} = \tilde{w}_{k-1,i}(x_j^U, x_j^L) \hat{Y}_{k-1,i} - N^{-1} \sum_{i=1}^N \tilde{w}_{k-1,i}(x_j^U, x_j^L) \hat{Y}_{k-1,i}$$

The standard errors of the marginal effects are estimated by taking the square root of the following variance formula:

$$\widehat{Var}(\widehat{me}^k(x_j)) = \frac{N}{N-1} \cdot \frac{1}{(x_j^U - x_j^L)^2} \left( \sum_{i=1}^N \tilde{W}_{k,i}^2 + \sum_{i=1}^N \tilde{W}_{k-1,i}^2 + 2 \sum_{i=1}^N \tilde{W}_{k,i} \tilde{W}_{k-1,i} \right). \quad (9)$$

In this study, we utilised the R package **orf** of Okasa and Lechner (2022), which includes commands to estimate the average marginal effects and marginal effects at the mean. In our models, we have five categories for each response-dependent variable, which means that three marginal effect coefficients with their standard errors need to be reported for each covariate. Given that we have six employability measures and two countries, the number of marginal effect coefficients that are reported in this study is very large, but they are important and crucial for understanding and discussing the results.

## 5 Data

This study uses data from the Higher Education Graduates Survey 2012 (HEGS 2012) in Egypt and Jordan. The survey was funded and conducted by the Economic Research Forum (ERF) in Cairo, Egypt, jointly with the government statistical agencies in each country. A cross-sectional sample was selected from university graduates from business, accounting, and computer sciences schools in the age group of 25 to 40 years who graduated in a maximum period of 15 years before the survey. Many demographic and socioeconomic characteristics of the graduates and their families were included in the questionnaire. Additionally, many questions that ask about progress in formal education for graduates at the basic, high school, and university levels are included along with questions about current job market input and work history. HEGS 2012 is a distinguished survey data that provides many key measures to examine educational inputs with labour market outputs in these two countries, and questions related to the employability of graduates.

In the survey, respondents were asked the following question: **How appropriate was your bachelor's program for beginning work?**. The same question is also asked for **continuing education after work, performance of current job assignments, future jobs, self-development, and creative skills**. The answers are five ordered categories that are sorted ascendantly, starting from rating the BSc program as *not at all appropriate* ( $y_i = 1$ ), then *not appropriate* ( $y_i = 2$ ), *somewhat appropriate* ( $y_i = 3$ ), *appropriate* ( $y_i = 4$ ) and last *very appropriate* ( $y_i = 5$ ). Based on the respondents' answers to these questions, six ordered categorical response variables were generated.

The covariate set includes some of the demographic characteristics of the respondents, such as age, gender, and marital status; variables about university study, such as whether the language of studying for the bachelor’s degree was English or Arabic; and graduation grade. We include variables about the current job of the respondent, such as the starting real wage, the number of hours of work per day, whether the work is in the private sector, whether the respondent is satisfied with the job security, whether the graduate was hired in the job after a help from family and/or friends, i.e. informally hired in the job position, and whether the graduate is satisfied with the matching between his/her skills and the skills that are required for the job.

Other covariates in the study include a set of dummy variables that measure the frequency of using selected types of teaching methods during university studies. The survey respondents were asked the following question: **To what extent were the teaching methods used in your bachelor’s program during the study period?** The respondents answered the question on each of the following teaching methods: lectures, group projects, participation in research projects, practical general, theories, professor as the only source of information, education based on problem-solving and case studies, analytical assignments, oral presentations by students, multiple choice questions (MCQs), writing topics, and computer-aided education. A dummy variable was generated if the graduate replied that the teaching method was used *often or to a high degree*.

The summary statistics of the covariates are presented in Tables 1 and 2. The distributions of the six BSc appropriateness measures are presented in Table 1. In Jordan, most answers are concentrated in the two middle choices, that is, *somewhat appropriate* and *appropriate* categories. The proportion of graduates who rated the BSc program of their study as *very appropriate* in Egypt is almost four times the corresponding proportion in Jordan. On the other hand, the proportion of those who rated the BSc program as *appropriate* in Egypt is half the corresponding proportion in Jordan.

Table 1: Summary statistics of the BSc program employability outcomes

	Not at all appropriate	Not appropriate	Somewhat appropriate	Appropriate	Very appropriate
<b>Egypt</b>					
Begin work in the labour market	0.34	0.13	0.18	0.20	0.16
Continue education after work	0.35	0.15	0.17	0.22	0.12
Performance in current job assignments	0.32	0.16	0.18	0.22	0.13
Prospectives for future jobs	0.27	0.10	0.18	0.27	0.18
Self-development	0.25	0.14	0.19	0.26	0.16
Creative skills	0.31	0.14	0.20	0.20	0.15
<b>Jordan</b>					
Begin work in the labour market	0.03	0.09	0.41	0.42	0.05
Continue education after work	0.02	0.09	0.36	0.49	0.03
Performance in current job assignments	0.03	0.08	0.34	0.51	0.04
Prospectives for future jobs	0.01	0.08	0.33	0.54	0.04
Self-development	0.02	0.10	0.32	0.53	0.04
Creative skills	0.03	0.10	0.33	0.50	0.03

<sup>a</sup> The sample size equals 1522 in Egypt and 1478 in Jordan.

Almost one-third of the graduates in Egypt rated the BSc program as *not at all appropriate*, compared with less than 5% in Jordan. In the latter country, the proportion of *not at all appropriate* rating is less than 5% in all outcomes. On the other hand, adding the proportion of graduates who answered that the BSc program was *appropriate* and *very appropriate*, i.e.  $y_i \geq 4$ , we find that the employability outcomes with the highest good rating are the appropriateness of the BSc for future jobs prospectives, followed by its appropriateness for self-development, with total proportions that equal 0.45 and 0.42, respectively, in Egypt and 0.58 and 0.57, respectively, in Jordan.

Table 2 lists the means and standard deviations of the covariates. The samples are over-weighted by males, with proportions that reach 78% and 68% in Egypt and Jordan, respectively. Additionally, a

higher proportion of graduates in Egypt are working in the private sector, hired after informal contact, have lectures and theories, and professors as the only source of information during their university study for the BSc degree. For other covariates the sample means are higher in Jordan, where the table shows that 82% of the graduates studied for the BSc degree in English language, 63% are now satisfied with the matching of skills in their current job, and 60% are now satisfied with the job security in their current jobs, compared with 16%, 45%, and 51%, respectively, in Egypt.

Table 2: Summary statistics of the covariates

	Egypt		Jordan	
	Mean	SD	Mean	SD
$\log(s.wage)$	6.78	1.96	5.82	0.50
Age in years	28.97	4.26	30.38	4.38
Tenure in years	4.19	3.78	5.38	4.05
Hours of work	8.86	2.09	8.18	1.25
Male	0.78	0.42	0.68	0.47
Married	0.47	0.50	0.49	0.50
BSc program studied in English	0.16	0.37	0.82	0.39
Graduation grade	71.91	9.78	72.34	7.17
Informal hiring	0.53	0.50	0.25	0.44
Private sector	0.76	0.43	0.58	0.49
Satisfied about job security	0.51	0.50	0.60	0.49
Satisfied about skills matching	0.45	0.50	0.63	0.48
TM - lectures	0.91	0.28	0.84	0.37
TM - group projects	0.18	0.39	0.25	0.43
TM - research project	0.14	0.35	0.19	0.40
TM - practical knowledge	0.19	0.39	0.29	0.46
TM - theories	0.21	0.40	0.16	0.37
TM - depends on professor	0.75	0.43	0.66	0.47
TM - problem solving/case studies	0.14	0.34	0.21	0.41
TM - analytical assignments	0.13	0.33	0.29	0.46
TM - presentations	0.16	0.36	0.21	0.41
TM - MCQs	0.17	0.38	0.41	0.49
TM - Writing topics	0.09	0.29	0.23	0.42
TM: Computer-aided education	0.20	0.40	0.47	0.50
Sample size	1522		1478	

## 6 Results and discussion

Almost one-third of the graduates in Egypt rated the BSc program as *not at all appropriate*, compared with less than 5% in Jordan. In the latter country, the proportion of this rating is less than 5% in all outcomes. By adding the proportion of graduates who answered that the BSc program was *appropriate* and *very appropriate*, i.e.  $y_i \geq 4$ , we find that the employability outcome with the highest good rating proportions are the appropriateness of the BSc for future jobs perspectives, followed by its appropriateness for self-development, with total proportions that equals 0.45 and 0.42, respectively, in Egypt and 0.58 and 0.57, respectively, in Jordan.

Table 2 lists the means and standard deviations of the covariates. The samples are over-weighted by males, with proportions that reach 78% and 68% in Egypt and Jordan, respectively. Additionally, a higher proportion of graduates in Egypt are working in the private sector, hired after informal contact, have lectures and theories, and professors as the only source of information during their university study for the BSc degree. For other covariates the sample means are higher in Jordan, where the table shows that 82% of the graduates studied for the BSc degree in English language, 63% are now satisfied with the matching of skills in their current job, and 60% are now satisfied with the job security in their current jobs, compared with 16%, 45%, and 51%, respectively, in Egypt.



## 6.1 Covariates importance

The importance scores of the covariates in the OF regression are reported in Tables 3 and 4. The covariate 'satisfaction with skills matching' is ranked as the most important covariate in the three regressions in Egypt and five regressions in Jordan. For the prospective for future jobs regression in Egypt, the most important covariate is the number of hours of work, but for the self-development-dependent variable regression, the practical knowledge teaching method ranked the highest. For the creative skills-dependent variable regression in both countries, the most important covariate is computer-aided education. Among the other covariates, the number of working hours is ranked among the five most important variables in most regressions in Egypt and Jordan. The OF relative importance weight in Jordan in Table 4 is slightly different from the weight in the OF regressions in Egypt in Table 3 when we compare the most important covariates. In Egypt, practical knowledge, theories, and group projects are ranked among the most important covariates in most regressions, whereas in Jordan, age, tenure, and wages are ranked more often among the most important covariates. More covariates among the teaching methods are ranked among the top five in Egypt, while more variables among personal and job characteristics are ranked among the top five in Jordan. This implies that graduates' rating of the appropriateness of BSc programs is related more to education practice in Egypt, but related more to graduate and labour market experience in Jordan.

The five bottom-ranked covariates also differ between the two countries. The male dummy has negative weights in the regression of the beginning work in the labour market regression. This indicates that this covariate is completely unimportant in the model to the extent that the permutation led to a slight reduction in the MES. In other words, the permuted variable has higher 'importance' than the real variable. Negative weights appear more often in Jordan's regressions than in Egypt's. Covariates that are regularly ranked among the five least important covariates also differed between the two countries. However, like the top five important variables, more covariates among the teaching methods are ranked among the least important in Egypt, while more variables among personal and job characteristics are ranked among the least important in Jordan.

Tables 5 and 6 report the estimated coefficients and standard errors of the ordered probit regressions, and a naive measure for the relative importance of each covariate based on ranking the absolute value of the  $z$  - statistic from the significance test of each coefficient. The higher the absolute value of  $z$  - statistic the higher the importance of the covariate in the regression relative to the other covariates included in the model. Satisfaction with skills matching is ranked first in all regressions in both Egypt and Jordan, except in the regression of creating skills, where it is ranked second, and computer-aided education ranked the highest. The graduation-grade variable is ranked among the highest 5 covariates more often than other variables. In contrast to the OF regressions, the OP covariate importance ranks are not substantially different between Egypt and Jordan. Generally, the OP regressions imply that personal and job characteristics, in addition to job satisfaction measures, are more important for graduates' assessment of the appropriateness of the BSc program.

## 6.2 Marginal effects estimates

Tables A1 to A24 in Appendix A report the marginal effect coefficients for the covariates in the OF regressions in Egypt followed by the marginal effects of the OF regressions in Jordan and then the OP regressions in Egypt and Jordan, respectively. Because of the large number of marginal effect coefficients that are produced, we generated a list that includes covariates that have a significant effect on the probabilities of BSc program appropriateness, i.e. the probabilities of *appropriate* and *very appropriate* categories. This helps the reader to easily identify the factors in our models that contribute to improving

Table 3: Covariates relative importance weights and ranks in the ordered forests regressions - Egypt<sup>a</sup>.

Covariate	Begin work in the labour market		continue education after work		performance in job assignments		prospectives for future jobs		self development		creative skills	
	RI	rank	RI	rank	RI	rank	RI	rank	RI	rank	RI	rank
log(s.wage)	0.0065	3	0.0039	5	0.0018	13	0.0039	10	0.0022	12	0.0035	10
Age in years	0.0030	7	0.0025	9	0.0004	23	0.0041	9	0.0017	17	0.0029	13
Tenure in years	0.0023	9	0.0038	6	0.0020	11	0.0043	8	0.0025	8	0.0040	9
Hours of work	0.0066	2	0.0032	8	0.0069	2	0.0088	1	0.0040	5	0.0046	8
Male	-0.0002	24	0.0005	22	0.0009	18	0.0005	24	0.0009	20	0.0005	24
Married	0.0013	15	0.0000	24	0.0006	22	0.0024	15	0.0018	16	0.0017	17
BSc program studied in English	0.0003	22	0.0004	23	0.0008	20	0.0008	23	0.0008	22	0.0007	22
Graduation grade	0.0051	5	0.0134	2	0.0042	4	0.0075	3	0.0067	3	0.0094	3
Informal hiring	0.0020	10	0.0008	20	0.0022	8	0.0016	16	0.0004	24	0.0032	12
Private sector	0.0039	6	0.0020	13	0.0023	7	0.0010	22	0.0009	20	0.0013	19
Satisfied about job security	0.0019	12	0.0009	18	0.0013	15	0.0011	21	0.0018	16	0.0009	21
Satisfied for skills matching	0.0176	1	0.0200	1	0.0248	1	0.0051	7	0.0081	2	0.0103	2
TM - lectures	0.0003	22	0.0011	15	0.0034	5	0.0032	12	0.0007	23	0.0021	15
TM - group projects	0.0017	14	0.0060	4	0.0042	4	0.0033	11	0.0020	14	0.0049	7
TM - research project	0.0010	16	0.0024	10	0.0029	6	0.0028	14	0.0016	18	0.0014	18
TM - practical knowledge	0.0055	4	0.0071	3	0.0020	11	0.0062	5	0.0087	1	0.0083	4
TM - theories	0.0017	14	0.0032	8	0.0012	16	0.0078	2	0.0060	4	0.0081	5
TM - depends on professor	0.0008	20	0.0009	18	0.0012	16	0.0013	18	0.0034	6	0.0020	16
TM - problem solving/case studies	0.0019	12	0.0022	12	0.0015	14	0.0054	6	0.0025	8	0.0053	6
TM - analytical assignments	0.0009	18	0.0018	14	0.0008	20	0.0012	20	0.0023	11	0.0028	14
TM - presentations	0.0004	21	0.0010	16	0.0002	24	0.0031	13	0.0022	12	0.0010	20
TM - MCQs	0.0027	8	0.0008	20	0.0021	9	0.0013	18	0.0024	10	0.0007	22
TM - Writing topics	0.0008	20	0.0023	11	0.0006	22	0.0014	17	0.0008	22	0.0035	10
TM: Computer-aided education	0.0009	18	0.0010	16	0.0020	11	0.0067	4	0.0034	6	0.0119	1
MSE	0.6190		0.5990		0.6130		0.6100		0.6380		0.6270	
RPS	0.1530		0.1420		0.1440		0.1490		0.1520		0.1540	

<sup>a</sup> The sample size equals 1522.

<sup>b</sup> Covariate importance weights are generated using the variable permutation method and the MSE measure.

<sup>c</sup> Important covariates in the model have higher weights (the permutation results on higher MSE measure, i.e. reduction on the model accuracy). Unimportant covariates in the model have lower or zero weights, and for some variables negative weights (the permutation has resulted in small or no change in the MSE measure and for some variables lower MSE).

Table 4: Covariates relative importance weights and ranks in the ordered forests regressions - Jordan<sup>a</sup>.

Covariate	Begin work in the labour market		continue education after work		performance in job assignments		prospectives for future jobs		self development		creative skills	
	RI	rank	RI	rank	RI	rank	RI	rank	RI	rank	RI	rank
log(s.wage)	-0.0053	24	0.0930	3	0.0174	14	0.0591	5	0.0450	9	0.0035	10
Age in years	0.0637	4	0.0543	5	0.0976	3	0.0787	4	0.1375	2	0.0029	13
Tenure in years	0.0637	4	0.0504	6	0.0941	4	0.0906	3	0.1300	3	0.0040	9
Hours of work	0.0106	19	0.0039	20	0.0348	8	0.0197	15	0.0075	19	0.0046	8
Male	-0.0027	22	0.0155	15	0.0244	10	0.0039	20	0.0000	24	0.0005	24
Married	0.0133	18	0.0155	15	0.0174	14	-0.0039	22	0.0750	6	0.0017	17
BSc program studied in English	0.0159	15	0.0271	12	0.0000	24	0.0118	18	0.0025	22	0.0007	22
Graduation grade	0.0345	8	0.0736	4	0.0697	5	0.0433	7	0.0225	12	0.0094	3
Informal hiring	0.0027	21	0.0465	8	0.0453	6	0.0236	11	0.0050	20	0.0032	12
Private sector	-0.0027	22	0.0116	17	0.0035	23	-0.0039	22	0.0025	22	0.0013	19
Satisfied about job security	0.1061	2	0.1357	2	0.1045	2	0.1535	2	0.0025	22	0.0009	21
Satisfied for skills matching	0.3660	1	0.2636	1	0.2718	1	0.2953	1	0.1400	1	0.0103	2
TM - lectures	0.0212	12	0.0000	23	0.0209	12	0.0039	20	0.0175	14	0.0021	15
TM - group projects	0.0398	6	0.0310	11	0.0174	14	0.0079	19	0.0100	18	0.0049	7
TM - research project	0.0133	18	0.0039	20	0.0139	18	0.0472	6	0.0150	16	0.0014	18
TM - practical knowledge	0.0212	12	0.0426	10	0.0105	20	-0.0079	24	0.0250	11	0.0083	4
TM - theories	0.0080	20	0.0194	13	0.0070	22	0.0197	15	0.0750	6	0.0081	5
TM - depends on professor	0.0212	12	0.0155	15	0.0279	9	0.0236	11	0.0175	14	0.0020	16
TM - problem solving/case studies	0.0212	12	0.0039	20	0.0139	18	0.0236	11	0.0200	13	0.0053	6
TM - analytical assignments	0.0875	3	0.0426	10	0.0139	18	0.0197	15	0.0875	4	0.0028	14
TM - presentations	0.0371	7	0.0039	20	0.0418	7	0.0236	11	0.0575	8	0.0010	20
TM - MCQs	0.0318	9	0.0465	8	0.0244	10	0.0236	11	0.0325	10	0.0007	22
TM - Writing topics	0.0159	15	0.0000	23	0.0105	20	0.0157	17	0.0125	17	0.0035	10
TM: Computer-aided education	0.0159	15	0.0000	23	0.0174	14	0.0276	8	0.0600	7	0.0119	1
MSE	0.5380		0.5270		0.5170		0.5150		0.5160		0.6270	
RPS	0.0880		0.0850		0.0830		0.0810		0.0840		0.1540	

<sup>a</sup> The sample size equals 1478.

<sup>b</sup> Covariate importance weights are generated using the variable permutation method and the MSE measure.

<sup>c</sup> Important covariates in the model have higher weights (the permutation results on higher MSE measure, i.e. reduction on the model accuracy). Unimportant covariates in the model have lower or zero weights, and for some variables negative weights (the permutation has resulted in small or no change in the MSE measure and for some variables lower MSE).

Table 5: Ordered model estimated coefficients, standard errors and relative importance rank based on the absolute value of coefficient's significance test statistic - Egypt<sup>a</sup>.

	Begin work in the labour market			continue education after work			performance in job assignments			prospectives for future jobs			self development			creative skills		
	$\hat{\beta}$	$s.e(\hat{\beta})$	rank	$\hat{\beta}$	$s.e(\hat{\beta})$	rank	$\hat{\beta}$	$s.e(\hat{\beta})$	rank	$\hat{\beta}$	$s.e(\hat{\beta})$	rank	$\hat{\beta}$	$s.e(\hat{\beta})$	rank	$\hat{\beta}$	$s.e(\hat{\beta})$	rank
log(s.wage)	0.053***	(0.016)	4	0.053***	(0.015)	5	0.031**	(0.014)	7	0.037***	(0.013)	8	0.027**	(0.013)	12	0.043***	(0.015)	6
Age in years	0.016	(0.011)	15	0.014	(0.011)	14	0.002	(0.011)	22	0.016	(0.011)	13	0.031***	(0.011)	7	0.026**	(0.011)	11
Tenure in years	-0.022*	(0.011)	12	-0.024**	(0.011)	11	-0.013	(0.011)	14	-0.026**	(0.011)	10	-0.036***	(0.011)	4	-0.027**	(0.011)	10
Hours of work	-0.035**	(0.015)	10	-0.064***	(0.015)	3	-0.053***	(0.014)	3	-0.077***	(0.015)	4	-0.035**	(0.014)	9	-0.054***	(0.015)	5
Male	-0.079	(0.072)	19	0.022	(0.070)	21	0.003	(0.070)	24	0.052	(0.070)	21	0.006	(0.069)	23	0.020	(0.070)	24
Married	-0.045	(0.067)	22	-0.058	(0.067)	18	-0.060	(0.066)	15	-0.171***	(0.066)	9	-0.211***	(0.065)	5	-0.190***	(0.066)	7
BSc program studied in English	0.095	(0.080)	17	0.001	(0.082)	24	0.044	(0.079)	19	-0.088	(0.076)	16	-0.046	(0.075)	21	-0.091	(0.076)	17
Graduation grade	0.009***	(0.003)	6	0.015***	(0.003)	2	0.012***	(0.003)	2	0.016***	(0.003)	3	0.011***	(0.003)	3	0.011***	(0.003)	4
Informal hiring	0.227***	(0.058)	2	0.208***	(0.058)	6	0.100*	(0.058)	9	0.199***	(0.057)	6	0.179***	(0.057)	6	0.236***	(0.057)	3
Private sector	-0.238***	(0.078)	5	-0.180**	(0.077)	10	-0.227***	(0.075)	5	-0.083	(0.075)	17	-0.137*	(0.075)	13	-0.057	(0.074)	22
Satisfied about job security	0.046	(0.062)	21	0.020	(0.062)	20	-0.005	(0.061)	23	-0.034	(0.061)	23	-0.002	(0.060)	24	-0.092	(0.061)	15
Satisfied for skills matching	0.682***	(0.063)	1	0.620***	(0.064)	1	0.820***	(0.063)	1	0.377***	(0.063)	1	0.403***	(0.061)	1	0.351***	(0.063)	2
TM - lectures	0.172*	(0.102)	14	-0.172*	(0.096)	13	-0.245***	(0.090)	6	-0.341***	(0.089)	5	-0.210**	(0.088)	10	-0.256***	(0.091)	8
TM - group projects	0.316***	(0.084)	3	0.148**	(0.075)	12	0.066	(0.082)	16	-0.111	(0.082)	14	-0.124	(0.083)	17	-0.036	(0.080)	23
TM - research project	0.073	(0.094)	20	0.023	(0.087)	23	0.046	(0.091)	20	-0.023	(0.100)	24	0.069	(0.095)	19	0.085	(0.092)	20
TM - practical knowledge	0.252***	(0.089)	8	0.300***	(0.082)	4	0.109	(0.081)	13	0.109	(0.082)	15	0.105	(0.081)	18	0.073	(0.081)	21
TM - theories	0.148**	(0.075)	11	0.196***	(0.075)	8	0.119	(0.077)	12	0.235***	(0.076)	7	0.212***	(0.075)	8	0.159**	(0.075)	12
TM - depends on professor	-0.196***	(0.067)	7	-0.062	(0.065)	16	-0.100	(0.064)	11	-0.068	(0.062)	18	-0.138**	(0.061)	11	-0.109*	(0.063)	13
TM - problem solving/case studies	0.139	(0.095)	16	0.103	(0.088)	15	0.160*	(0.091)	8	0.072	(0.082)	19	0.064	(0.089)	20	0.142	(0.089)	14
TM - analytical assignments	-0.026	(0.102)	24	0.076	(0.093)	19	0.070	(0.092)	17	0.206**	(0.090)	11	0.141	(0.094)	16	0.235***	(0.092)	9
TM - presentations	0.048	(0.092)	23	0.217**	(0.088)	9	0.063	(0.087)	18	0.143	(0.090)	12	0.158*	(0.089)	14	0.112	(0.088)	16
TM - MCQs	0.210***	(0.078)	9	0.068	(0.077)	17	0.121*	(0.073)	10	0.065	(0.079)	20	0.120	(0.075)	15	-0.080	(0.077)	19
TM - Writing topics	-0.209*	(0.110)	13	-0.030	(0.100)	22	0.024	(0.099)	21	0.062	(0.096)	22	0.032	(0.099)	22	0.104	(0.099)	18
TM: Computer-aided education	0.092	(0.083)	18	0.208***	(0.077)	7	0.262***	(0.080)	4	0.451***	(0.077)	2	0.377***	(0.077)	2	0.450***	(0.076)	1
Constant cut1	1.013**	(0.409)		0.962**	(0.407)		0.188	(0.408)		0.370	(0.412)		0.601	(0.402)		0.690*	(0.412)	
Constant cut2	1.401***	(0.409)		1.410***	(0.408)		0.661	(0.408)		0.707*	(0.411)		1.049***	(0.402)		1.119***	(0.412)	
Constant cut3	1.944***	(0.410)		1.935***	(0.409)		1.195***	(0.409)		1.230***	(0.411)		1.593***	(0.404)		1.700***	(0.413)	
Constant cut4	2.680***	(0.412)		2.817***	(0.413)		2.064***	(0.410)		2.085***	(0.413)		2.455***	(0.407)		2.399***	(0.416)	
r2p	0.0798			0.0847			0.0843			0.0660			0.0530			0.0574		
chi2	376.6			427.6			411.9			328.3			279.0			310.7		
dfm	24			24			24			24			24			24		
ll	-2171			-2138			-2165			-2216			-2280			-2249		
k	47			47			47			47			47			47		

<sup>a</sup> The sample size equals 1522.

<sup>b</sup> Covariate importance ranks are generated using the absolute values of the coefficients' significance test statistics.

<sup>c</sup> A high absolute value of the coefficient significance test statistics indicates high significance of the covariate which implies higher relative importance.

Table 6: Ordered model estimated coefficients, standard errors and relative importance rank based on the absolute value of coefficient's significance test statistic - Jordan<sup>a</sup>.

	Begin work in the labour market			continue education after work			performance in job assignments			prospectives for future jobs			self development			creative skills		
	$\hat{\beta}$	$s.e(\hat{\beta})$	RI	$\hat{\beta}$	$s.e(\hat{\beta})$	RI	$\hat{\beta}$	$s.e(\hat{\beta})$	RI	$\hat{\beta}$	$s.e(\hat{\beta})$	RI	$\hat{\beta}$	$s.e(\hat{\beta})$	RI	$\hat{\beta}$	$s.e(\hat{\beta})$	RI
log(s.wage)	-0.006	(0.077)	21	0.110	(0.072)	8	0.108	(0.073)	10	0.092	(0.082)	11	-0.063	(0.068)	15	0.028	(0.073)	20
Age in years	-0.022**	(0.009)	6	-0.008	(0.010)	16	0.000	(0.010)	23	-0.000	(0.010)	24	0.007	(0.010)	17	0.019*	(0.010)	9
Tenure in years	0.021**	(0.010)	7	0.003	(0.010)	20	0.000	(0.010)	24	-0.009	(0.010)	14	-0.007	(0.010)	16	-0.020**	(0.010)	7
Hours of work	-0.053**	(0.025)	8	-0.031	(0.027)	11	-0.099***	(0.029)	3	-0.062**	(0.028)	5	0.037	(0.028)	11	-0.011	(0.029)	21
Male	0.002	(0.064)	22	-0.094	(0.065)	9	0.082	(0.063)	12	0.026	(0.065)	15	0.083	(0.065)	12	0.041	(0.063)	17
Married	-0.066	(0.066)	15	-0.032	(0.066)	19	-0.020	(0.066)	21	-0.153**	(0.066)	4	0.039	(0.072)	20	-0.022	(0.068)	22
BSc program studied in English	0.217***	(0.075)	5	0.171***	(0.078)	7	0.138*	(0.080)	8	0.144*	(0.079)	7	0.103	(0.073)	10	0.030	(0.072)	19
Graduation grade	0.018***	(0.004)	3	0.015***	(0.004)	4	0.012***	(0.004)	4	0.005	(0.004)	10	0.009**	(0.004)	6	0.004	(0.004)	12
Informal hiring	-0.011	(0.066)	19	-0.054	(0.067)	15	-0.057	(0.069)	16	0.007	(0.070)	23	-0.109	(0.069)	7	-0.066	(0.067)	11
Private sector	0.074	(0.065)	12	-0.052	(0.067)	17	0.159***	(0.066)	5	0.017	(0.065)	19	0.063	(0.066)	14	0.009	(0.066)	23
Satisfied about job security	0.334***	(0.068)	2	0.290***	(0.067)	2	0.247***	(0.067)	2	0.163**	(0.066)	3	0.196***	(0.068)	5	0.190***	(0.066)	4
Satisfied for skills matching	0.540***	(0.070)	1	0.456***	(0.070)	1	0.553***	(0.070)	1	0.417***	(0.066)	1	0.415***	(0.068)	1	0.491***	(0.067)	1
TM - lectures	-0.075	(0.080)	16	-0.089	(0.084)	12	0.120	(0.082)	11	-0.022	(0.080)	18	-0.046	(0.085)	19	-0.061	(0.079)	14
TM - group projects	-0.035	(0.088)	18	-0.020	(0.087)	22	0.077	(0.088)	15	0.111	(0.085)	9	-0.041	(0.086)	21	0.072	(0.086)	13
TM - research project	0.084	(0.098)	17	0.025	(0.094)	21	-0.088	(0.099)	14	-0.016	(0.098)	21	-0.064	(0.099)	18	-0.066	(0.099)	15
TM - practical knowledge	-0.010	(0.073)	20	0.047	(0.076)	18	-0.029	(0.076)	19	-0.029	(0.078)	16	0.079	(0.077)	13	0.147**	(0.077)	8
TM - theories	0.105	(0.095)	14	0.267***	(0.096)	5	0.205**	(0.100)	6	0.343***	(0.096)	2	0.436***	(0.097)	2	0.449***	(0.095)	2
TM - depends on professor	-0.127*	(0.067)	9	-0.150**	(0.066)	6	0.033	(0.067)	17	-0.069	(0.066)	13	-0.095	(0.066)	9	-0.251**	(0.067)	3
TM - problem solving/case studies	-0.002	(0.086)	23	-0.113	(0.085)	10	0.040	(0.086)	18	0.025	(0.087)	17	0.132	(0.088)	8	0.057	(0.087)	16
TM - analytical assignments	0.287***	(0.074)	4	0.300***	(0.076)	3	0.127*	(0.077)	9	0.166**	(0.076)	6	0.313***	(0.073)	3	0.149**	(0.070)	6
TM - presentations	0.104	(0.088)	11	-0.083	(0.085)	13	0.185**	(0.091)	7	0.100	(0.089)	12	-0.032	(0.088)	23	-0.056	(0.090)	18
TM - MCQs	-0.086	(0.066)	10	0.009	(0.069)	23	-0.022	(0.066)	20	-0.016	(0.067)	20	0.024	(0.068)	24	0.081	(0.068)	10
TM - Writing topics	0.000	(0.077)	24	-0.001	(0.080)	24	0.014	(0.081)	22	0.011	(0.083)	22	-0.029	(0.079)	22	0.005	(0.077)	24
TM: Computer-aided education	0.074	(0.067)	13	0.061	(0.066)	14	0.082	(0.068)	13	0.097	(0.066)	8	0.209***	(0.066)	4	0.158**	(0.066)	5
Constant cut1	-1.063**	(0.511)		-0.496	(0.526)		-0.408	(0.524)		-1.544***	(0.518)		-1.388**	(0.551)		-0.725	(0.552)	
Constant cut2	-0.316	(0.510)		0.385	(0.522)		0.323	(0.522)		-0.511	(0.517)		-0.428	(0.555)		0.134	(0.554)	
Constant cut3	1.080**	(0.510)		1.613***	(0.524)		1.576***	(0.521)		0.695	(0.519)		0.698	(0.557)		1.242**	(0.556)	
Constant cut4	2.824***	(0.516)		3.674***	(0.531)		3.601***	(0.529)		2.752***	(0.526)		2.847***	(0.566)		3.337***	(0.564)	
r2p	0.0710			0.0601			0.0673			0.0517			0.0628			0.0635		
ch2	255.7			199.8			219.2			161.9			205.3			196.6		
ll	-1642			-1579			-1564			-1521			-1548			-1615		

<sup>a</sup> The number of observations is 1478.

<sup>b</sup> Covariate importance ranks are generated using the absolute values of the coefficients significance test statistics.

<sup>c</sup> A high absolute value of the coefficient significance test statistics indicates a high significance of the covariate which implies higher relative importance.

the appropriateness of the BSc program.

The OF results show that teaching methods are more likely to influence graduates' ratings of BSc program appropriateness than personal or job characteristics, or even the graduation grade. Teaching methods have a lower impact on graduates' ratings in Jordan, which is influenced more by job satisfaction and wages. However, wage has an effect only on graduates' ratings of performance in current job assignments in Jordan. The teaching method that has the most positive contribution in our model is practical knowledge, while the skills matching variable has the largest positive impact on rating the BSc program as appropriate.

Referring to Tables A1 - A24 in Appendix A, we compare the quality of the estimates produced by the OF method with those produced by the OP method. The obvious difference is in the size of the effects that are estimated by each technique, and the coefficients of the OP model are larger than those of the OF model. For example, in the regression of the beginning work in the labour market ordered response in Table A13, the OP model estimates the total change in the conditional probabilities with respect to change in the matching of skills dummy as 24.36 percentage points (pp), 22.19 pp and 2.45 pp decrease in rating the BSc program as *not at all appropriate* or *not appropriate*, versus an equivalent increase in the conditional probabilities of other choices. The OF model in Table A1 estimates the total changes of this covariate as 20.94 pp. Additionally, in the regression of performance in current job assignments ordered response in Egypt the OP estimates that the matching of skills dummy makes changes in the choices probabilities that in total size equals 29.86 pp, while the OF estimates the total change as 24.89 pp.

The marginal effects that are estimated for BSc program appropriateness for the beginning work in the labour market ordered response model in Egypt using the OF method are reported in Table A1. They show that satisfaction with skills matching increases the rating of the program as being *appropriate* by 9.4 pp and being *very appropriate* by 11.5 pp. Satisfaction with skills matching increases the rating of BSc being *appropriate* for continuing education after work by 9.13 pp, Table A2. For performing the current job assignments model, the satisfaction with skills matching variable increases the probability of rating the BSc program as *appropriate* by 12.14 pp and *very appropriate* by 12.75 pp, as shown in Table A3. For the prospective for future jobs model the matching of skills increases the probability of rating the BSc program as being *very appropriate*, in Table A4, by 7.89 pp. However, the satisfaction with skills matching shows no significant effect on the conditional probabilities of self-development and creative skills in Tables A5 and A6.

In Jordan the matching of skills dummy has a positive significant effect on the conditional probabilities of rating the BSc program as *appropriate*, but no effect on rating the program as *very appropriate*. Table A7 shows that satisfaction with skills matching increases the rating of the BSc program as being *appropriate* by 14.64 pp, for continuing education after work by 15.12 pp, Table A8, for performing current job assignments by 18.15 pp, Table A9. For the prospective for future jobs ordered response the matching of skills increases the probability of rating the BSc program as *appropriate* by 10.03 pp, Table A4, for self-development by 10.11 pp and creative skills by 11.43 pp in Tables A5 and A6, respectively. The other covariates in the model show different effects in Egypt and Jordan. Satisfaction with job security has a significant effect on rating the BSc program as *appropriate* in Jordan only. In the beginning work in the labour market ordered response model, satisfaction with job security increases the conditional probability by 7.77 pp. In the performance in current job assignments and creative skills ordered response models, the effects are 6.21 pp and 3.4 pp, respectively.

Most of the significant effects are negative changes on the conditional probabilities of rating the BSc program as *not at all appropriate* or *not appropriate*, with a few significant opposite positive effects on the rating of the BSc program as *appropriate* or *very appropriate*. In other words, some covariates reduce the conditional probabilities of negative ratings more strongly than their effect on increasing the probability

of positive ratings.

The problem-solving/case studies teaching method has significant marginal effect coefficients on increasing the rating of the BSc program as *appropriate* for beginning work in the labour market, continuing education after work and self-development models in Egypt. On the other hand, in Jordan the same teaching methods only affect the rating of the program in the self-development model. For creative skills using analytical assignments increases the rating of the BSc program as being *appropriate* by approximately 5.83 pp in Egypt but the effect is insignificant in Jordan. Using computer-aided education increases the conditional probability of rating the BSc program as being *appropriate* for self-development and creative skills by approximately 8.57 pp and 11.54 pp in Egypt, respectively, but the effect is insignificant in Jordan.

The OP method's marginal effects of the covariates are substantially different from those estimated by the OF method, not only in terms of size and significance but also in terms of which covariate impacts the conditional probabilities. For example, the OP model implies that the number of hours of work has significant marginal effects in rating the BSc program appropriateness, but in all models its effect hardly exceeded 2 pp. The covariates, starting wage, employment sector, and informal hiring, on the other hand, do not show a significant impact on the conditional probabilities based on the OF models estimates, but implied that they do affect the conditional probabilities based on the OP model estimates although the estimated marginal effects are very small in values and rarely exceed 3 pp. The covariates BSc program studied in English and graduation grade, both have significant marginal effects in the OP models but the OF model reports that their effect is insignificant.

The quality of the estimates that are produced by the ordered forests method differs from that produced by the ordered probit model. The ordered forests estimator does not enforce parametric distributional assumptions or functional form for the conditional probability mass density function. Accordingly, continuous covariates are not assumed to have effects that could be represented by linear or quadratic lines. As a result of this difference in approaches, we find that the marginal effects that are produced by each technique for the continuous variables are substantially large. On the other hand, the random forests method has a traditional problem with dummy variables, because of the very limited support of making splits in the growing of the random forests decision trees. The OF method seems to capture significant marginal effects for dummy variables less often than the OP method does. For many results, the marginal effects of the OP model can be implied as significant, even if the size of the effect is trivial and has no real impact on the conditional probabilities of the ordered choices. However, the marginal effects of the OP models can easily be linked to the relative importance ranks, in contrast to the OF estimates.

Although some covariates have shown high relative importance rank in the model, they have very small, or even zero, marginal effects. The importance weight of the covariate is calculated based on the drop in the MSE when the covariate is replaced by a permuted randomly generated similar variable, and the process is repeated several times. The marginal effects are computed as described in Section 4.2. The marginal effect aims to examine the impact of the covariate on changing the probabilities of the choices. Apart from the variables that ranked too high or too low in the importance weight, it is not easy to link the rank of importance with the size and significance of the marginal effect coefficient. This is easily understandable because in both techniques all the covariates in the model contribute to the marginal effects calculation.

## 7 Conclusion and recommendations

This study examines university graduates' ratings of the appropriateness of a BSc study program for employability. Six employability outcomes were examined. We used cross-sectional survey data from

Table 7: Significant covariates BSc program appropriateness bases on the OF machine learning regressions<sup>a</sup>.

BSc program appropriateness	Country	
	Egypt	Jordan
<b>Begin work in the labour market</b>	Satisfied about skills matching (+) TM - problem solving/case studies (+)	Satisfied about job security (+) Satisfied about skills matching (+) TM - analytical assignments (-)
<b>Continue education after work</b>	Graduation grade (+) Satisfied about skills matching (+) TM - practical knowledge (+) TM - theories (+) TM - problem solving/case studies (+) TM: Computer-aided education (+)	Satisfied about skills matching (+) TM - analytical assignments (+)
<b>Performance in current job assignments</b>	Satisfied about skills matching (+) TM - practical knowledge (+) TM - theories (+) TM - analytical assignments (+) TM: Computer-aided education (+)	Wage (+) Satisfied about job security (+) Satisfied about skills matching (+) TM - research project (+) TM - presentations (+)
<b>Prospectives for future jobs</b>	Graduation grade (+) Satisfied about job security (-) TM - lectures (-) TM - practical knowledge (+) TM - theories (+) TM - Writing topics (+)	Satisfied about skills matching (+)
<b>Self-development</b>	TM - practical knowledge (+) TM - theories (+) TM - problem solving/case studies (+) TM - Writing topics (+) TM: Computer-aided education (+)	Satisfied about job security (+) Satisfied about skills matching (+) TM - problem solving/case studies (+)
<b>Creative skills</b>	TM - analytical assignments (+) TM: Computer-aided education (+)	Satisfied about skills matching (+)

<sup>a</sup> Only the covariates that show significance at 5% and 1% level of significance are listed in this table.



the 2012 Higher Education Graduates Survey (HEGS 2012) in Egypt and Jordan. The estimation was performed using a novel machine-learning technique known as the ordered forests method. The estimates were compared to the results of the ordered probit model. The ordered forests machine learning marginal effects estimates are produced without enforcing parametric distributional assumptions to the variables or the error term, and without assuming a specific functional form to the conditional probability mass function of the ordered response.

Graduates' ratings of the appropriateness of the BSc program differ substantially between Egypt and Jordan. Country differences in the higher education system and labour market opportunity structure influence graduates' employability. Employability outcomes rating are influenced by personal experience and current job characteristics in Jordan, whereas they are influenced by the BSc program study experience in Egypt. However, when calculating the marginal effects, the results show that the dominant factor affecting graduates' ratings in most outcomes is satisfaction with skill matching in their current job. This result is consistent with the findings of previous studies in this field. Teaching methods such as problem-solving/case studies, writing reports, and computer-aided education have a prominent impact on enhancing graduates' employability skills, particularly in self-development and creative skills. Other teaching methods have shown a significant effect on rating the BSc study program appropriateness negatively, particularly on lectures, and depend on professor as the main source of information.

This study recommends that it is important to develop policies to enhance university graduates' employability. Understanding the opportunity structure of higher education graduates in local labour markets can improve employment opportunities. However, the types of jobs and occupation requirements are dynamic and change frequently in the labour market due to many factors, including the invention of new technologies, globalisation, and artificial intelligence, etc. Generally, the change in the required skills in the labour market is defined as a technologically biased change toward certain sets of skills. Since new jobs mostly require basic knowledge about the Internet, communication technologies, and computer applications, and use of smart devices and equipment. Artificial intelligence has also raised the challenge of developing soft skills. These factors enforce additional challenges in the economic and social roles of higher education institutions.

Graduates' weak employability is an economic problem at both microeconomics and macroeconomics levels. It signifies inefficiencies in investment in higher education and is considered lost productivity. At the micro level, university graduates with low employability are not self-sufficient in the labour market and might be unemployed or work in mismatched positions. It also increases job insecurity and lack of job satisfaction. Governments can invest in active labour market programs to improve the employability of university graduates.

We also suggest establishing career service offices at universities. This can substantially increase the chances of allocating graduates to suitable jobs and help them establish robust career. Graduates who enter the job market with correctly matched jobs have better chances to continue working in good jobs and be self-sufficient in mobility in the labour market. For the labour market of university graduates to be more market-oriented in the trade between both sides, employers and graduates, they need to have full knowledge of the skills required for their jobs. This can be achieved by developing institutional linkages between the higher education and business sectors to participate in developing educational curricula and improving the delivery of study materials and teaching facilities. The business sector can also participate by offering more internships and vocational training opportunities to students.

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- Authors' contributions This work is produced by a single author.

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## A Marginal effects tables

Table A1: Ordered forests marginal effects for BSc program appropriateness for begin work in the labour market ordered response regression - Egypt <sup>a</sup>.

	Not at all appropriate	Not appropriate	Somewhat appropriate	Appropriate	Very appropriate
log(s.wage)	-0.0335** (0.0122)	0.0016 (0.0076)	0.0096 (0.0074)	0.0068 (0.0073)	0.0156 (0.0121)
Age in years	0.0000 (0.0002)	-0.0002 (0.0001)	-0.0002 (0.0001)	0.0001 (0.0002)	0.0003 (0.0003)
Tenure in years	0.0006* (0.0003)	-0.0003* (0.0002)	-0.0005*** (0.0001)	0.0000 (0.0001)	0.0002 (0.0002)
Hours of work	0.0004 (0.0004)	-0.0002 (0.0003)	-0.0001 (0.0003)	-0.0001 (0.0003)	-0.0001 (0.0004)
Male	0.0085 (0.0091)	0.0070 (0.0058)	-0.0059 (0.0063)	-0.0056 (0.0068)	-0.0040 (0.0117)
Married	0.0074 (0.0083)	-0.0036 (0.0061)	0.0027 (0.0060)	-0.0093 (0.0066)	0.0028 (0.0132)
BSc program studied in English	-0.0060 (0.0125)	-0.0002 (0.0084)	-0.0007 (0.0074)	0.0037 (0.0074)	0.0032 (0.0128)
Graduation grade	-0.0012 (0.0010)	-0.0008 (0.0009)	0.0002 (0.0012)	0.0007 (0.0011)	0.0011 (0.0013)
Informal hiring	-0.0324** (0.0121)	0.0143* (0.0064)	0.0065 (0.0054)	0.0011 (0.0056)	0.0105 (0.0113)
Private sector	0.0124 (0.0123)	0.0325*** (0.0092)	-0.0045 (0.0145)	-0.0015 (0.0226)	-0.0389 (0.0383)
Satisfied about job security	-0.0103 (0.0118)	0.0058 (0.0072)	0.0011 (0.0074)	-0.0176 (0.0116)	0.0210 (0.0207)
Satisfied about skills matching	-0.1210*** (0.0262)	-0.0685*** (0.0183)	-0.0199 (0.0195)	0.0940*** (0.0231)	0.1154** (0.0433)
TM - lectures	-0.0052 (0.0126)	-0.0060 (0.0104)	0.0147 (0.0076)	0.0044 (0.0082)	-0.0079 (0.0146)
TM - group projects	-0.0776*** (0.0086)	0.0294* (0.0123)	0.0078 (0.0101)	0.0100 (0.0103)	0.0304* (0.0147)
TM - research project	-0.0710*** (0.0144)	0.0068 (0.0104)	0.0235** (0.0086)	0.0105 (0.0127)	0.0303 (0.0177)
TM - practical knowledge	-0.0775** (0.0252)	-0.0272 (0.0178)	0.0398* (0.0183)	0.0516* (0.0214)	0.0133 (0.0163)
TM - theories	-0.0350* (0.0153)	0.0064 (0.0101)	0.0057 (0.0116)	0.0181 (0.0128)	0.0048 (0.0115)
TM - depends on professor	0.0117 (0.0115)	0.0073 (0.0073)	-0.0108 (0.0077)	-0.0006 (0.0099)	-0.0075 (0.0180)
TM - problem solving/case studies	-0.0413** (0.0134)	-0.0271* (0.0126)	0.0242* (0.0117)	0.0383** (0.0127)	0.0058 (0.0102)
TM - analytical assignments	-0.0071 (0.0111)	-0.0118 (0.0089)	-0.0073 (0.0123)	0.0206 (0.0141)	0.0056 (0.0173)
TM - presentations	-0.0058 (0.0159)	-0.0025 (0.0082)	-0.0154 (0.0088)	0.0069 (0.0111)	0.0169 (0.0127)
TM - MCQs	-0.0493** (0.0158)	0.0101 (0.0185)	0.0189 (0.0163)	0.0222* (0.0098)	-0.0018 (0.0141)
TM - Writing topics	-0.0017 (0.0107)	-0.0014 (0.0088)	0.0082 (0.0100)	-0.0051 (0.0092)	0.0000 (0.0192)
TM: Computer-aided education	-0.0195 (0.0111)	-0.0207* (0.0104)	0.0165 (0.0099)	0.0141 (0.0089)	0.0096 (0.0134)

<sup>a</sup> The sample size equals 1522.

Table A2: Ordered forests marginal effects for BSc program appropriateness for continue education after work ordered response regression - Egypt<sup>a</sup> .

	<b>Not at all appropriate</b>	<b>Not appropriate</b>	<b>Somewhat appropriate</b>	<b>Appropriate</b>	<b>Very appropriate</b>
log(s.wage)	-0.0269** (0.0095)	-0.0048 (0.0062)	0.0230*** (0.0056)	0.0016 (0.0063)	0.0070 (0.0109)
Age in years	-0.0001 (0.0002)	-0.0001 (0.0001)	0.0001 (0.0001)	0.0000 (0.0001)	0.0001 (0.0002)
Tenure in years	0.0003 (0.0002)	-0.0001 (0.0001)	-0.0004** (0.0001)	0.0002 (0.0002)	0.0001 (0.0002)
Hours of work	0.0010** (0.0003)	-0.0002 (0.0002)	-0.0003 (0.0002)	-0.0003 (0.0003)	-0.0002 (0.0003)
Male	0.0038 (0.0114)	0.0036 (0.0067)	-0.0005 (0.0076)	-0.0075 (0.0069)	0.0006 (0.0103)
Married	0.0046 (0.0081)	0.0060 (0.0057)	-0.0104* (0.0052)	0.0003 (0.0057)	-0.0004 (0.0102)
BSc program studied in English	-0.0022 (0.0108)	0.0036 (0.0070)	0.0052 (0.0066)	-0.0097 (0.0081)	0.0032 (0.0122)
Graduation grade	-0.0022 (0.0013)	-0.0047* (0.0021)	0.0000 (0.0019)	0.0052** (0.0020)	0.0017 (0.0014)
Informal hiring	-0.0252* (0.0119)	0.0075 (0.0065)	0.0112* (0.0053)	0.0032 (0.0063)	0.0032 (0.0126)
Private sector	0.0112 (0.0095)	0.0154 (0.0129)	-0.0033 (0.0148)	-0.0043 (0.0149)	-0.0190 (0.0290)
Satisfied about job security	0.0008 (0.0091)	-0.0145* (0.0059)	0.0072 (0.0069)	0.0019 (0.0155)	0.0046 (0.0259)
Satisfied about skills matching	-0.0785*** (0.0219)	-0.0786*** (0.0184)	-0.0162 (0.0214)	0.0913*** (0.0221)	0.0820 (0.0430)
TM - lectures	0.0414* (0.0185)	-0.0213 (0.0126)	-0.0090 (0.0103)	-0.0063 (0.0084)	-0.0049 (0.0100)
TM - group projects	-0.1340*** (0.0271)	0.0852*** (0.0202)	0.0233 (0.0119)	0.0259 (0.0147)	-0.0004 (0.0087)
TM - research project	-0.0835*** (0.0180)	0.0139 (0.0164)	0.0262 (0.0142)	0.0414* (0.0173)	0.0020 (0.0098)
TM - practical knowledge	-0.1034*** (0.0207)	-0.0622** (0.0238)	0.0094 (0.0194)	0.1534*** (0.0279)	0.0028 (0.0134)
TM - theories	-0.0488*** (0.0134)	-0.0340* (0.0154)	0.0229 (0.0147)	0.0629*** (0.0186)	-0.0030 (0.0112)
TM - depends on professor	0.0103 (0.0110)	0.0029 (0.0075)	-0.0068 (0.0074)	-0.0067 (0.0081)	0.0004 (0.0111)
TM - problem solving/case studies	-0.0724*** (0.0145)	0.0115 (0.0137)	0.0150 (0.0160)	0.0458** (0.0166)	0.0002 (0.0148)
TM - analytical assignments	-0.0393* (0.0196)	-0.0038 (0.0108)	0.0164 (0.0186)	0.0211 (0.0212)	0.0056 (0.0154)
TM - presentations	-0.0303** (0.0101)	-0.0039 (0.0084)	-0.0059 (0.0141)	0.0071 (0.0163)	0.0330 (0.0280)
TM - MCQs	-0.0247* (0.0115)	0.0017 (0.0075)	0.0019 (0.0097)	0.0236* (0.0116)	-0.0025 (0.0091)
TM - Writing topics	-0.0480* (0.0188)	0.0371* (0.0186)	-0.0012 (0.0149)	0.0151 (0.0187)	-0.0030 (0.0290)
TM: Computer-aided education	-0.0417*** (0.0112)	-0.0200 (0.0112)	0.0106 (0.0117)	0.0381** (0.0128)	0.0131 (0.0185)

<sup>a</sup> The sample size equals 1522.



Table A3: Ordered forests marginal effects for BSc program appropriateness for performance in current job assignments ordered response regression - Egypt<sup>a</sup> .

	Not at all appropriate	Not appropriate	Somewhat appropriate	Appropriate	Very appropriate
log(s.wage)	-0.0240** (0.0092)	0.0017 (0.0060)	0.0105 (0.0056)	0.0053 (0.0056)	0.0065 (0.0115)
Age in years	0.0000 (0.0002)	-0.0001 (0.0001)	0.0000 (0.0002)	0.0001 (0.0002)	0.0001 (0.0001)
Tenure in years	0.0003 (0.0002)	-0.0005*** (0.0001)	-0.0003 (0.0002)	0.0003 (0.0002)	0.0002 (0.0001)
Hours of work	0.0002 (0.0003)	-0.0001 (0.0002)	-0.0001 (0.0002)	0.0001 (0.0002)	-0.0002 (0.0003)
Male	0.0110 (0.0096)	-0.0019 (0.0072)	-0.0115 (0.0073)	-0.0011 (0.0067)	0.0035 (0.0108)
Married	0.0049 (0.0116)	0.0014 (0.0093)	-0.0087 (0.0087)	-0.0009 (0.0073)	0.0033 (0.0108)
BSc program studied in English	-0.0128 (0.0108)	-0.0131* (0.0067)	0.0182* (0.0091)	0.0075 (0.0076)	0.0002 (0.0136)
Graduation grade	-0.0028*** (0.0009)	0.0000 (0.0007)	-0.0011 (0.0010)	0.0011 (0.0020)	0.0029 (0.0026)
Informal hiring	-0.0013 (0.0154)	0.0022 (0.0084)	0.0067 (0.0071)	-0.0021 (0.0073)	-0.0055 (0.0145)
Private sector	0.0324** (0.0116)	0.0312* (0.0131)	-0.0306* (0.0123)	-0.0150 (0.0101)	-0.0180 (0.0177)
Satisfied about job security	-0.0005 (0.0122)	0.0052 (0.0089)	-0.0090 (0.0092)	-0.0078 (0.0091)	0.0121 (0.0166)
Satisfied about skills matching	-0.1502*** (0.0259)	-0.0838*** (0.0215)	-0.0149 (0.0236)	0.1214*** (0.0238)	0.1275** (0.0465)
TM - lectures	0.0389 (0.0263)	-0.0191 (0.0171)	-0.0011 (0.0131)	-0.0205 (0.0146)	0.0018 (0.0208)
TM - group projects	-0.0947*** (0.0247)	0.0566** (0.0204)	0.0210 (0.0164)	0.0181* (0.0082)	-0.0010 (0.0089)
TM - research project	-0.0907*** (0.0144)	0.0222 (0.0254)	0.0465* (0.0181)	0.0210 (0.0139)	0.0009 (0.0128)
TM - practical knowledge	-0.0703*** (0.0123)	-0.0186 (0.0156)	0.0476*** (0.0135)	0.0385** (0.0138)	0.0027 (0.0092)
TM - theories	-0.0331** (0.0101)	-0.0132 (0.0099)	0.0208 (0.0107)	0.0270** (0.0103)	-0.0014 (0.0121)
TM - depends on professor	0.0320** (0.0119)	-0.0061 (0.0105)	-0.0158 (0.0089)	-0.0182* (0.0093)	0.0081 (0.0118)
TM - problem solving/case studies	-0.0503*** (0.0105)	-0.0323* (0.0131)	0.0398** (0.0145)	0.0349* (0.0150)	0.0078 (0.0099)
TM - analytical assignments	-0.0267* (0.0123)	0.0007 (0.0098)	-0.0098 (0.0084)	0.0325** (0.0113)	0.0032 (0.0096)
TM - presentations	-0.0144 (0.0094)	-0.0015 (0.0061)	-0.0192 (0.0102)	0.0080 (0.0133)	0.0271 (0.0198)
TM - MCQs	-0.0409** (0.0142)	0.0120 (0.0111)	0.0059 (0.0096)	0.0244* (0.0109)	-0.0014 (0.0140)
TM - Writing topics	-0.0242** (0.0079)	-0.0037 (0.0067)	-0.0112 (0.0142)	0.0356* (0.0180)	0.0036 (0.0076)
TM: Computer-aided education	-0.0391*** (0.0118)	-0.0176 (0.0115)	-0.0134 (0.0197)	0.0584** (0.0178)	0.0117 (0.0196)

<sup>a</sup> The sample size equals 1522.

Table A4: Ordered forests marginal effects for BSc program appropriateness for prospectives for future jobs ordered response regression - Egypt<sup>a</sup>.

	Not at all appropriate	Not appropriate	Somewhat appropriate	Appropriate	Very appropriate
log(s.wage)	-0.0280*** (0.0074)	0.0109* (0.0051)	0.0134* (0.0067)	-0.0056 (0.0073)	0.0094 (0.0132)
Age in years	-0.0002 (0.0002)	-0.0001 (0.0001)	-0.0002 (0.0002)	0.0002 (0.0002)	0.0003 (0.0002)
Tenure in years	0.0003 (0.0002)	-0.0002 (0.0001)	-0.0002 (0.0002)	-0.0001 (0.0002)	0.0001 (0.0002)
Hours of work	0.0008* (0.0003)	-0.0003 (0.0002)	-0.0001 (0.0002)	-0.0001 (0.0003)	-0.0003 (0.0004)
Male	-0.0054 (0.0083)	0.0073 (0.0044)	-0.0053 (0.0063)	0.0009 (0.0094)	0.0025 (0.0164)
Married	0.0118 (0.0128)	0.0046 (0.0111)	-0.0118 (0.0114)	-0.0054 (0.0077)	0.0009 (0.0124)
BSc program studied in English	-0.0008 (0.0101)	0.0033 (0.0071)	0.0030 (0.0072)	-0.0017 (0.0084)	-0.0037 (0.0135)
Graduation grade	-0.0022** (0.0007)	-0.0030** (0.0010)	-0.0024 (0.0015)	0.0045** (0.0014)	0.0031 (0.0021)
Informal hiring	-0.0207 (0.0116)	0.0139* (0.0055)	-0.0023 (0.0065)	0.0078 (0.0133)	0.0013 (0.0208)
Private sector	0.0075 (0.0080)	0.0124*** (0.0034)	-0.0070 (0.0081)	-0.0030 (0.0082)	-0.0098 (0.0143)
Satisfied about job security	0.0055 (0.0081)	-0.0055 (0.0055)	0.0119 (0.0065)	-0.0220*** (0.0065)	0.0100 (0.0107)
Satisfied about skills matching	-0.0192 (0.0100)	-0.0102 (0.0062)	-0.0531** (0.0192)	0.0036 (0.0177)	0.0789** (0.0296)
TM - lectures	0.0605*** (0.0143)	-0.0001 (0.0099)	0.0347 (0.0255)	-0.0980*** (0.0289)	0.0030 (0.0128)
TM - group projects	-0.0913*** (0.0136)	0.0608*** (0.0140)	0.0359** (0.0139)	-0.0043 (0.0109)	-0.0012 (0.0149)
TM - research project	-0.0592*** (0.0136)	0.0187 (0.0112)	0.0277* (0.0123)	-0.0127 (0.0151)	0.0255 (0.0250)
TM - practical knowledge	-0.1118*** (0.0169)	-0.0265 (0.0180)	0.0577** (0.0211)	0.0653** (0.0205)	0.0153 (0.0179)
TM - theories	-0.0772*** (0.0217)	-0.0236 (0.0184)	0.0018 (0.0248)	0.0989** (0.0334)	0.0002 (0.0140)
TM - depends on professor	0.0282* (0.0115)	-0.0096 (0.0064)	-0.0142* (0.0071)	-0.0116 (0.0079)	0.0073 (0.0121)
TM - problem solving/case studies	-0.1044*** (0.0132)	-0.0110 (0.0215)	0.0675** (0.0230)	0.0510* (0.0260)	-0.0032 (0.0140)
TM - analytical assignments	-0.0322*** (0.0067)	-0.0198** (0.0071)	0.0071 (0.0140)	0.0273* (0.0136)	0.0177 (0.0123)
TM - presentations	-0.0179 (0.0108)	-0.0057 (0.0087)	-0.0301* (0.0147)	0.0286 (0.0241)	0.0251 (0.0347)
TM - MCQs	-0.0212 (0.0116)	-0.0017 (0.0074)	0.0018 (0.0125)	0.0183 (0.0136)	0.0029 (0.0220)
TM - Writing topics	-0.0229*** (0.0066)	-0.0430*** (0.0047)	-0.0265 (0.0202)	0.0843*** (0.0209)	0.0080 (0.0167)
TM: Computer-aided education	-0.1071*** (0.0165)	0.0087 (0.0091)	-0.0332 (0.0255)	0.0720* (0.0289)	0.0595 (0.0413)

<sup>a</sup> The sample size equals 1522.

Table A5: Ordered forests marginal effects for BSc program appropriateness for self-development ordered response regression - Egypt<sup>a</sup> .

	Not at all appropriate	Not appropriate	Somewhat appropriate	Appropriate	Very appropriate
log(s.wage)	-0.0073 (0.0090)	0.0054 (0.0058)	0.0048 (0.0062)	-0.0039 (0.0078)	0.0010 (0.0138)
Age in years	0.0001 (0.0002)	-0.0003* (0.0001)	-0.0001 (0.0002)	0.0003 (0.0002)	0.0000 (0.0002)
Tenure in years	0.0005* (0.0002)	-0.0003* (0.0001)	-0.0003* (0.0002)	0.0001 (0.0002)	0.0000 (0.0002)
Hours of work	0.0004 (0.0002)	-0.0003 (0.0002)	0.0001 (0.0002)	-0.0002 (0.0002)	0.0000 (0.0002)
Male	0.0016 (0.0083)	0.0046 (0.0060)	-0.0019 (0.0075)	-0.0093 (0.0087)	0.0050 (0.0155)
Married	0.0161 (0.0100)	0.0010 (0.0082)	-0.0090 (0.0083)	-0.0066 (0.0085)	-0.0015 (0.0131)
BSc program studied in English	-0.0146 (0.0095)	0.0070 (0.0088)	0.0151 (0.0093)	-0.0097 (0.0077)	0.0023 (0.0135)
Graduation grade	-0.0016* (0.0006)	-0.0013 (0.0013)	-0.0009 (0.0014)	0.0026 (0.0015)	0.0012 (0.0015)
Informal hiring	-0.0174* (0.0083)	0.0059 (0.0057)	0.0064 (0.0059)	-0.0029 (0.0092)	0.0080 (0.0156)
Private sector	0.0098 (0.0077)	0.0140* (0.0061)	-0.0106 (0.0097)	-0.0037 (0.0170)	-0.0095 (0.0266)
Satisfied about job security	0.0051 (0.0086)	-0.0030 (0.0065)	-0.0002 (0.0078)	-0.0080 (0.0090)	0.0060 (0.0160)
Satisfied about skills matching	-0.0363* (0.0178)	-0.0292 (0.0162)	-0.0274 (0.0179)	0.0367 (0.0199)	0.0561 (0.0336)
TM - lectures	0.0339*** (0.0099)	0.0143 (0.0105)	-0.0277* (0.0119)	-0.0113 (0.0113)	-0.0091 (0.0164)
TM - group projects	-0.0669*** (0.0105)	0.0558*** (0.0132)	0.0101 (0.0094)	0.0034 (0.0085)	-0.0023 (0.0114)
TM - research project	-0.0472*** (0.0069)	0.0098 (0.0135)	0.0067 (0.0092)	0.0208 (0.0142)	0.0099 (0.0198)
TM - practical knowledge	-0.1069*** (0.0180)	-0.0510** (0.0185)	0.0608* (0.0297)	0.0948** (0.0328)	0.0023 (0.0149)
TM - theories	-0.0583** (0.0198)	-0.0225 (0.0205)	0.0034 (0.0198)	0.0823** (0.0268)	-0.0049 (0.0133)
TM - depends on professor	0.0365 (0.0246)	-0.0014 (0.0143)	-0.0246* (0.0120)	-0.0161 (0.0109)	0.0056 (0.0133)
TM - problem solving/case studies	-0.0654*** (0.0060)	-0.0152 (0.0134)	0.0059 (0.0111)	0.0742*** (0.0131)	0.0004 (0.0126)
TM - analytical assignments	-0.0458*** (0.0077)	-0.0205 (0.0135)	0.0003 (0.0261)	0.0502* (0.0248)	0.0158 (0.0181)
TM - presentations	-0.0268*** (0.0058)	-0.0107 (0.0104)	-0.0272 (0.0201)	0.0394* (0.0181)	0.0252 (0.0161)
TM - MCQs	-0.0589*** (0.0141)	-0.0038 (0.0141)	0.0478*** (0.0139)	0.0128 (0.0095)	0.0022 (0.0119)
TM - Writing topics	-0.0232* (0.0098)	-0.0227* (0.0102)	-0.0342*** (0.0089)	0.0688*** (0.0153)	0.0113 (0.0132)
TM: Computer-aided education	-0.0539*** (0.0088)	-0.0349* (0.0142)	-0.0406** (0.0140)	0.0857*** (0.0177)	0.0437* (0.0198)

<sup>a</sup> The sample size equals 1522.

Table A6: Ordered forests marginal effects for BSc program appropriateness for creative skills ordered response regression - Egypt<sup>a</sup> .

	<b>Not at all appropriate</b>	<b>Not appropriate</b>	<b>Somewhat appropriate</b>	<b>Appropriate</b>	<b>Very appropriate</b>
log(s.wage)	-0.0100 (0.0079)	0.0032 (0.0055)	-0.0006 (0.0065)	0.0010 (0.0064)	0.0064 (0.0134)
Age in years	-0.0002 (0.0002)	-0.0001 (0.0001)	0.0001 (0.0002)	0.0001 (0.0001)	0.0001 (0.0002)
Tenure in years	0.0002 (0.0002)	-0.0003* (0.0001)	0.0001 (0.0002)	0.0000 (0.0001)	0.0001 (0.0002)
Hours of work	0.0007* (0.0003)	0.0000 (0.0002)	-0.0004 (0.0002)	0.0000 (0.0003)	-0.0003 (0.0003)
Male	-0.0082 (0.0088)	0.0068 (0.0052)	0.0024 (0.0064)	-0.0017 (0.0073)	0.0007 (0.0150)
Married	0.0094 (0.0108)	0.0125 (0.0088)	-0.0121 (0.0088)	-0.0093 (0.0084)	-0.0005 (0.0124)
BSc program studied in English	-0.0065 (0.0093)	0.0031 (0.0074)	0.0005 (0.0083)	0.0074 (0.0094)	-0.0045 (0.0173)
Graduation grade	-0.0057* (0.0024)	-0.0018 (0.0025)	0.0032 (0.0024)	0.0012 (0.0016)	0.0031 (0.0024)
Informal hiring	-0.0368* (0.0182)	0.0202* (0.0100)	0.0104 (0.0082)	-0.0028 (0.0113)	0.0091 (0.0221)
Private sector	-0.0009 (0.0093)	0.0121 (0.0072)	-0.0119 (0.0093)	0.0034 (0.0084)	-0.0028 (0.0175)
Satisfied about job security	0.0071 (0.0090)	-0.0011 (0.0070)	-0.0053 (0.0076)	-0.0105 (0.0063)	0.0097 (0.0135)
Satisfied about skills matching	-0.0220 (0.0130)	-0.0134 (0.0136)	-0.0199 (0.0229)	0.0132 (0.0195)	0.0420 (0.0390)
TM - lectures	0.0602*** (0.0153)	0.0025 (0.0157)	-0.0556** (0.0185)	-0.0040 (0.0123)	-0.0031 (0.0130)
TM - group projects	-0.1375*** (0.0215)	0.1106*** (0.0170)	0.0136 (0.0104)	-0.0027 (0.0101)	0.0160 (0.0176)
TM - research project	-0.0609*** (0.0070)	0.0190** (0.0070)	0.0113 (0.0081)	0.0157 (0.0121)	0.0148 (0.0166)
TM - practical knowledge	-0.1200*** (0.0185)	0.0237 (0.0303)	0.0376 (0.0262)	0.0491 (0.0292)	0.0096 (0.0117)
TM - theories	-0.0460 (0.0260)	-0.0071 (0.0164)	0.0343 (0.0225)	0.0242 (0.0249)	-0.0055 (0.0187)
TM - depends on professor	0.0258 (0.0161)	-0.0075 (0.0119)	-0.0090 (0.0111)	-0.0166 (0.0104)	0.0073 (0.0115)
TM - problem solving/case studies	-0.0789*** (0.0118)	-0.0187 (0.0266)	0.0319 (0.0222)	0.0632* (0.0252)	0.0025 (0.0139)
TM - analytical assignments	-0.0735*** (0.0126)	0.0085 (0.0091)	-0.0055 (0.0165)	0.0583*** (0.0166)	0.0122 (0.0218)
TM - presentations	-0.0247** (0.0085)	-0.0142 (0.0096)	0.0108 (0.0105)	0.0144 (0.0093)	0.0136 (0.0145)
TM - MCQs	-0.0141 (0.0086)	-0.0042 (0.0063)	0.0092 (0.0075)	0.0088 (0.0085)	0.0002 (0.0147)
TM - Writing topics	-0.0280* (0.0113)	-0.0349 (0.0188)	-0.0035 (0.0338)	0.0516 (0.0383)	0.0148 (0.0172)
TM: Computer-aided education	-0.0992*** (0.0270)	-0.0301 (0.0230)	-0.0233 (0.0241)	0.1154*** (0.0272)	0.0372 (0.0267)

<sup>a</sup> The sample size equals 1522.

Table A7: Ordered forests marginal effects for BSc program appropriateness for begin work in the labour market ordered response regression - Jordan<sup>a</sup> .

	Not at all appropriate	Not appropriate	Somewhat appropriate	Appropriate	Very appropriate
log(s.wage)	-0.0048 (0.0026)	-0.0125 (0.0103)	0.0125 (0.0193)	0.0050 (0.0155)	-0.0002 (0.0177)
Age in years	0.0000 (0.0000)	0.0001 (0.0001)	0.0001 (0.0002)	-0.0002 (0.0002)	0.0000 (0.0001)
Tenure in years	0.0000 (0.0000)	-0.0001 (0.0001)	-0.0001 (0.0002)	0.0002 (0.0002)	0.0000 (0.0001)
Hours of work	-0.0001 (0.0002)	0.0003 (0.0002)	-0.0003 (0.0004)	0.0001 (0.0004)	0.0000 (0.0002)
Male	0.0003 (0.0013)	0.0029 (0.0046)	-0.0013 (0.0083)	-0.0039 (0.0072)	0.0020 (0.0081)
Married	0.0012 (0.0012)	0.0119** (0.0042)	-0.0059 (0.0073)	-0.0081 (0.0060)	0.0009 (0.0075)
BSc program studied in English	-0.0026 (0.0021)	-0.0055 (0.0073)	0.0016 (0.0105)	0.0013 (0.0130)	0.0052 (0.0184)
Graduation grade	-0.0002 (0.0002)	-0.0024** (0.0008)	-0.0001 (0.0012)	0.0023* (0.0011)	0.0004 (0.0011)
Informal hiring	0.0006 (0.0012)	0.0017 (0.0027)	0.0056 (0.0124)	-0.0039 (0.0096)	-0.0040 (0.0093)
Private sector	-0.0003 (0.0010)	-0.0073 (0.0044)	0.0070 (0.0094)	0.0038 (0.0116)	-0.0032 (0.0160)
Satisfied about job security	-0.0029 (0.0030)	-0.0143* (0.0072)	-0.0741** (0.0266)	0.0777*** (0.0195)	0.0136 (0.0220)
Satisfied about skills matching	-0.0096 (0.0059)	-0.0402** (0.0139)	-0.1099** (0.0356)	0.1464*** (0.0267)	0.0133 (0.0226)
TM - lectures	0.0014 (0.0008)	0.0007 (0.0039)	0.0114 (0.0138)	-0.0163 (0.0120)	0.0028 (0.0123)
TM - group projects	-0.0006 (0.0013)	0.0000 (0.0045)	0.0006 (0.0147)	-0.0032 (0.0119)	0.0031 (0.0130)
TM - research project	0.0006 (0.0020)	-0.0087* (0.0038)	-0.0067 (0.0092)	0.0058 (0.0110)	0.0090 (0.0136)
TM - practical knowledge	-0.0014 (0.0013)	-0.0014 (0.0036)	0.0036 (0.0106)	-0.0036 (0.0085)	0.0028 (0.0066)
TM - theories	-0.0005 (0.0016)	-0.0070 (0.0046)	-0.0149 (0.0085)	0.0195* (0.0089)	0.0030 (0.0105)
TM - depends on professor	0.0012 (0.0013)	0.0032 (0.0032)	0.0087 (0.0117)	-0.0149 (0.0097)	0.0018 (0.0068)
TM - problem solving/case studies	-0.0005 (0.0020)	-0.0008 (0.0050)	-0.0185 (0.0136)	0.0204 (0.0127)	-0.0006 (0.0063)
TM - analytical assignments	0.0012 (0.0017)	-0.0138 (0.0071)	-0.0488* (0.0204)	0.0573** (0.0192)	0.0041 (0.0067)
TM - presentations	0.0002 (0.0022)	-0.0048 (0.0033)	-0.0111 (0.0147)	0.0061 (0.0132)	0.0095 (0.0160)
TM - MCQs	-0.0001 (0.0021)	0.0000 (0.0034)	0.0008 (0.0096)	-0.0072 (0.0083)	0.0065 (0.0111)
TM - Writing topics	-0.0005 (0.0015)	-0.0024 (0.0035)	-0.0140 (0.0147)	0.0179 (0.0123)	-0.0010 (0.0074)
TM: Computer-aided education	-0.0007 (0.0013)	-0.0033 (0.0028)	-0.0125 (0.0085)	0.0079 (0.0097)	0.0086 (0.0136)

<sup>a</sup> The sample size equals 1478.

Table A8: Ordered forests marginal effects for BSc program appropriateness for continue education after work ordered response regression - Jordan<sup>a</sup>.

	Not at all appropriate	Not appropriate	Somewhat appropriate	Appropriate	Very appropriate
log(s.wage)	-0.0070 (0.0040)	-0.0298 (0.0153)	0.0275 (0.0218)	0.0123 (0.0197)	-0.0030 (0.0155)
Age in years	0.0000 (0.0000)	0.0001 (0.0001)	-0.0002 (0.0002)	0.0001 (0.0002)	0.0000 (0.0001)
Tenure in years	0.0000 (0.0000)	-0.0001 (0.0001)	0.0001 (0.0002)	0.0000 (0.0002)	0.0001 (0.0001)
Hours of work	0.0000 (0.0001)	0.0001 (0.0001)	-0.0001 (0.0003)	0.0000 (0.0003)	0.0000 (0.0001)
Male	0.0011 (0.0008)	0.0014 (0.0063)	0.0047 (0.0089)	-0.0068 (0.0082)	-0.0004 (0.0068)
Married	0.0000 (0.0010)	0.0008 (0.0037)	-0.0031 (0.0077)	0.0035 (0.0071)	-0.0013 (0.0047)
BSc program studied in English	-0.0002 (0.0006)	-0.0052 (0.0042)	-0.0177 (0.0150)	0.0232 (0.0125)	-0.0001 (0.0086)
Graduation grade	-0.0001 (0.0002)	-0.0005 (0.0008)	-0.0004 (0.0011)	0.0005 (0.0011)	0.0005 (0.0012)
Informal hiring	-0.0001 (0.0009)	0.0018 (0.0037)	-0.0097 (0.0117)	0.0090 (0.0101)	-0.0009 (0.0089)
Private sector	-0.0009 (0.0010)	0.0017 (0.0030)	0.0089 (0.0098)	-0.0091 (0.0090)	-0.0007 (0.0061)
Satisfied about job security	-0.0037 (0.0020)	-0.0147* (0.0058)	-0.0263 (0.0247)	0.0367 (0.0200)	0.0080 (0.0159)
Satisfied about skills matching	-0.0079 (0.0046)	-0.0359** (0.0112)	-0.1092*** (0.0316)	0.1512*** (0.0288)	0.0017 (0.0110)
TM - lectures	0.0001 (0.0008)	0.0024 (0.0037)	0.0157 (0.0082)	-0.0165* (0.0078)	-0.0016 (0.0064)
TM - group projects	-0.0003 (0.0008)	0.0048 (0.0050)	-0.0111 (0.0077)	0.0039 (0.0075)	0.0027 (0.0095)
TM - research project	0.0007 (0.0015)	-0.0087*** (0.0026)	0.0019 (0.0082)	0.0065 (0.0098)	-0.0004 (0.0128)
TM - practical knowledge	-0.0014* (0.0007)	-0.0080 (0.0044)	0.0110 (0.0120)	-0.0009 (0.0105)	-0.0007 (0.0120)
TM - theories	0.0002 (0.0010)	-0.0031 (0.0055)	-0.0148 (0.0105)	0.0101 (0.0154)	0.0076 (0.0203)
TM - depends on professor	0.0012 (0.0009)	0.0049 (0.0056)	0.0019 (0.0092)	-0.0080 (0.0083)	0.0000 (0.0048)
TM - problem solving/case studies	-0.0012 (0.0007)	-0.0038 (0.0032)	0.0083 (0.0088)	-0.0025 (0.0075)	-0.0008 (0.0059)
TM - analytical assignments	-0.0009 (0.0009)	-0.0079* (0.0032)	-0.0393* (0.0182)	0.0447** (0.0149)	0.0034 (0.0127)
TM - presentations	0.0006 (0.0010)	-0.0023 (0.0030)	0.0167 (0.0137)	-0.0133 (0.0113)	-0.0017 (0.0146)
TM - MCQs	-0.0007 (0.0012)	0.0021 (0.0042)	-0.0012 (0.0081)	-0.0138 (0.0227)	0.0136 (0.0280)
TM - Writing topics	-0.0008 (0.0009)	0.0018 (0.0038)	-0.0084 (0.0112)	0.0083 (0.0098)	-0.0010 (0.0094)
TM: Computer-aided education	-0.0005 (0.0011)	-0.0018 (0.0035)	-0.0125 (0.0096)	0.0126 (0.0080)	0.0022 (0.0078)

<sup>a</sup> The sample size equals 1478.

Table A9: Ordered forests marginal effects for BSc program appropriateness for performance in current job assignments ordered response regression - Jordan<sup>a</sup> .

	Not at all appropriate	Not appropriate	Somewhat appropriate	Appropriate	Very appropriate
log(s.wage)	-0.0215** (0.0074)	-0.0275* (0.0108)	0.0086 (0.0171)	0.0463** (0.0170)	-0.0059 (0.0224)
Age in years	0.0000 (0.0000)	0.0000 (0.0001)	-0.0001 (0.0002)	0.0000 (0.0002)	0.0000 (0.0001)
Tenure in years	0.0000 (0.0000)	0.0000 (0.0000)	0.0001 (0.0002)	-0.0001 (0.0002)	0.0000 (0.0001)
Hours of work	0.0000 (0.0002)	0.0003* (0.0001)	-0.0003 (0.0003)	0.0000 (0.0003)	0.0000 (0.0001)
Male	0.0011 (0.0009)	0.0069 (0.0037)	-0.0162 (0.0132)	0.0054 (0.0115)	0.0029 (0.0099)
Married	-0.0017 (0.0009)	0.0015 (0.0032)	-0.0004 (0.0074)	0.0017 (0.0078)	-0.0012 (0.0099)
BSc program studied in English	-0.0016 (0.0015)	-0.0113 (0.0070)	0.0059 (0.0099)	0.0076 (0.0092)	-0.0006 (0.0119)
Graduation grade	-0.0002 (0.0002)	-0.0008 (0.0004)	-0.0001 (0.0013)	0.0010 (0.0012)	0.0001 (0.0009)
Informal hiring	-0.0001 (0.0007)	0.0009 (0.0026)	-0.0065 (0.0161)	0.0059 (0.0134)	-0.0002 (0.0083)
Private sector	-0.0012 (0.0014)	-0.0034 (0.0034)	0.0004 (0.0075)	0.0051 (0.0074)	-0.0010 (0.0089)
Satisfied about job security	-0.0020 (0.0011)	-0.0141* (0.0058)	-0.0534* (0.0230)	0.0621*** (0.0188)	0.0074 (0.0130)
Satisfied about skills matching	-0.0117** (0.0038)	-0.0576*** (0.0132)	-0.1172*** (0.0317)	0.1815*** (0.0255)	0.0049 (0.0178)
TM - lectures	0.0025 (0.0014)	-0.0075 (0.0040)	0.0101 (0.0105)	-0.0056 (0.0096)	0.0005 (0.0101)
TM - group projects	0.0010 (0.0012)	0.0020 (0.0034)	-0.0234** (0.0084)	0.0110 (0.0092)	0.0095 (0.0105)
TM - research project	-0.0002 (0.0015)	-0.0027 (0.0029)	-0.0251*** (0.0075)	0.0261*** (0.0072)	0.0018 (0.0055)
TM - practical knowledge	-0.0003 (0.0035)	-0.0046 (0.0030)	-0.0043 (0.0085)	0.0081 (0.0083)	0.0011 (0.0095)
TM - theories	-0.0005 (0.0017)	-0.0043 (0.0027)	-0.0194 (0.0107)	0.0124 (0.0215)	0.0119 (0.0264)
TM - depends on professor	0.0002 (0.0009)	-0.0014 (0.0032)	-0.0155 (0.0097)	0.0113 (0.0102)	0.0054 (0.0140)
TM - problem solving/case studies	-0.0035* (0.0016)	-0.0008 (0.0033)	-0.0151 (0.0108)	0.0180 (0.0097)	0.0014 (0.0058)
TM - analytical assignments	-0.0012 (0.0018)	0.0014 (0.0032)	-0.0262* (0.0109)	0.0246* (0.0098)	0.0015 (0.0075)
TM - presentations	0.0001 (0.0009)	0.0013 (0.0034)	-0.0475** (0.0168)	0.0378** (0.0146)	0.0084 (0.0124)
TM - MCQs	-0.0005 (0.0011)	-0.0031 (0.0024)	0.0058 (0.0087)	-0.0056 (0.0072)	0.0034 (0.0074)
TM - Writing topics	-0.0028* (0.0013)	0.0072 (0.0065)	-0.0130 (0.0085)	0.0059 (0.0075)	0.0028 (0.0072)
TM: Computer-aided education	0.0004 (0.0010)	0.0044 (0.0067)	-0.0194 (0.0101)	0.0116 (0.0085)	0.0031 (0.0079)

<sup>a</sup> The sample size equals 1478.

Table A10: Ordered forests marginal effects for BSc program appropriateness for prospectives for future jobs ordered response regression - Jordan<sup>a</sup> .

	Not at all appropriate	Not appropriate	Somewhat appropriate	Appropriate	Very appropriate
log(s.wage)	-0.0019 (0.0018)	-0.0122 (0.0078)	-0.0148 (0.0200)	0.0229 (0.0180)	0.0060 (0.0182)
Age in years	0.0000 (0.0000)	0.0001 (0.0000)	-0.0003 (0.0002)	0.0002 (0.0002)	0.0000 (0.0001)
Tenure in years	0.0000 (0.0000)	0.0001 (0.0001)	0.0000 (0.0002)	-0.0002 (0.0002)	0.0000 (0.0001)
Hours of work	0.0000 (0.0000)	0.0002 (0.0002)	-0.0003 (0.0003)	0.0001 (0.0003)	0.0000 (0.0001)
Male	0.0010* (0.0004)	0.0101 (0.0053)	-0.0087 (0.0089)	-0.0032 (0.0077)	0.0008 (0.0078)
Married	0.0000 (0.0004)	0.0058* (0.0029)	0.0039 (0.0089)	-0.0078 (0.0080)	-0.0019 (0.0091)
BSc program studied in English	0.0001 (0.0006)	-0.0042 (0.0037)	-0.0059 (0.0098)	0.0099 (0.0083)	0.0000 (0.0058)
Graduation grade	0.0000 (0.0001)	-0.0009 (0.0005)	0.0017 (0.0012)	-0.0008 (0.0011)	0.0000 (0.0011)
Informal hiring	-0.0006 (0.0009)	-0.0016 (0.0030)	-0.0024 (0.0097)	0.0059 (0.0084)	-0.0013 (0.0066)
Private sector	-0.0002 (0.0004)	0.0008 (0.0035)	-0.0027 (0.0081)	0.0037 (0.0069)	-0.0016 (0.0063)
Satisfied about job security	-0.0006 (0.0005)	-0.0029 (0.0044)	-0.0223 (0.0247)	0.0233 (0.0216)	0.0025 (0.0090)
Satisfied about skills matching	-0.0006 (0.0004)	-0.0275* (0.0113)	-0.0793* (0.0310)	0.1003*** (0.0270)	0.0071 (0.0128)
TM - lectures	-0.0002 (0.0004)	-0.0011 (0.0039)	0.0172 (0.0088)	-0.0144 (0.0081)	-0.0015 (0.0065)
TM - group projects	-0.0001 (0.0002)	-0.0012 (0.0033)	-0.0135 (0.0097)	-0.0060 (0.0318)	0.0208 (0.0379)
TM - research project	0.0007 (0.0005)	-0.0027 (0.0032)	-0.0202* (0.0097)	0.0133 (0.0149)	0.0088 (0.0185)
TM - practical knowledge	-0.0005 (0.0008)	-0.0030 (0.0032)	0.0012 (0.0088)	0.0000 (0.0161)	0.0022 (0.0207)
TM - theories	-0.0003* (0.0001)	-0.0079*** (0.0016)	-0.0297** (0.0095)	0.0251 (0.0309)	0.0127 (0.0352)
TM - depends on professor	-0.0001 (0.0009)	0.0025 (0.0027)	-0.0008 (0.0101)	0.0006 (0.0087)	-0.0022 (0.0063)
TM - problem solving/case studies	0.0000 (0.0003)	-0.0037 (0.0034)	-0.0173 (0.0118)	0.0198* (0.0101)	0.0013 (0.0078)
TM - analytical assignments	-0.0002 (0.0003)	-0.0030 (0.0026)	-0.0283* (0.0141)	0.0258 (0.0135)	0.0057 (0.0165)
TM - presentations	0.0003 (0.0005)	-0.0050 (0.0028)	-0.0262* (0.0119)	0.0276* (0.0119)	0.0033 (0.0145)
TM - MCQs	0.0000 (0.0005)	-0.0016 (0.0030)	0.0004 (0.0091)	-0.0048 (0.0080)	0.0060 (0.0080)
TM - Writing topics	-0.0004* (0.0002)	-0.0019 (0.0040)	-0.0129 (0.0095)	0.0112 (0.0083)	0.0039 (0.0074)
TM: Computer-aided education	-0.0001 (0.0007)	-0.0097* (0.0040)	-0.0058 (0.0110)	0.0125 (0.0101)	0.0031 (0.0124)

<sup>a</sup> The sample size equals 1478.



Table A11: Ordered forests marginal effects for BSc program appropriateness for self-development ordered response regression - Jordan<sup>a</sup> .

	Not at all appropriate	Not appropriate	Somewhat appropriate	Appropriate	Very appropriate
log(s.wage)	0.0012 (0.0033)	-0.0068 (0.0105)	-0.0056 (0.0175)	0.0102 (0.0160)	0.0009 (0.0163)
Age in years	0.0000 (0.0000)	0.0000 (0.0001)	-0.0002 (0.0002)	0.0002 (0.0002)	0.0000 (0.0001)
Tenure in years	0.0000 (0.0000)	0.0001 (0.0001)	-0.0001 (0.0002)	0.0000 (0.0002)	0.0000 (0.0001)
Hours of work	0.0000 (0.0000)	0.0000 (0.0002)	0.0001 (0.0003)	0.0000 (0.0003)	0.0000 (0.0001)
Male	-0.0002 (0.0010)	0.0002 (0.0030)	-0.0082 (0.0075)	0.0070 (0.0067)	0.0012 (0.0069)
Married	-0.0018 (0.0014)	0.0024 (0.0036)	0.0008 (0.0075)	-0.0005 (0.0141)	-0.0010 (0.0172)
BSc program studied in English	0.0003 (0.0006)	-0.0075 (0.0053)	-0.0099 (0.0090)	0.0165* (0.0075)	0.0007 (0.0070)
Graduation grade	-0.0001 (0.0001)	-0.0009 (0.0006)	0.0012 (0.0010)	-0.0005 (0.0012)	0.0002 (0.0014)
Informal hiring	0.0019* (0.0009)	0.0033 (0.0033)	0.0124 (0.0084)	-0.0179* (0.0070)	0.0003 (0.0065)
Private sector	0.0008 (0.0007)	0.0061 (0.0041)	0.0054 (0.0073)	-0.0120 (0.0066)	-0.0004 (0.0068)
Satisfied about job security	-0.0009 (0.0007)	-0.0095 (0.0051)	-0.0266* (0.0109)	0.0344*** (0.0094)	0.0026 (0.0088)
Satisfied about skills matching	-0.0013 (0.0018)	-0.0450** (0.0169)	-0.0596* (0.0269)	0.1011*** (0.0252)	0.0047 (0.0125)
TM - lectures	-0.0006 (0.0004)	0.0025 (0.0032)	0.0038 (0.0133)	-0.0051 (0.0121)	-0.0006 (0.0059)
TM - group projects	-0.0006 (0.0017)	-0.0012 (0.0034)	-0.0085 (0.0086)	0.0068 (0.0090)	0.0035 (0.0105)
TM - research project	0.0007 (0.0012)	-0.0042 (0.0026)	-0.0090 (0.0159)	0.0108 (0.0135)	0.0017 (0.0131)
TM - practical knowledge	-0.0018 (0.0016)	-0.0024 (0.0047)	-0.0071 (0.0117)	0.0022 (0.0131)	0.0091 (0.0165)
TM - theories	-0.0006*** (0.0002)	-0.0173*** (0.0036)	-0.0388 (0.0231)	0.0391 (0.0276)	0.0175 (0.0339)
TM - depends on professor	0.0007 (0.0013)	0.0117* (0.0052)	-0.0185* (0.0086)	0.0077 (0.0077)	-0.0017 (0.0087)
TM - problem solving/case studies	-0.0004 (0.0005)	-0.0023 (0.0031)	-0.0484** (0.0147)	0.0505*** (0.0137)	0.0007 (0.0078)
TM - analytical assignments	-0.0015* (0.0008)	-0.0066 (0.0067)	-0.0489 (0.0257)	0.0527* (0.0223)	0.0043 (0.0210)
TM - presentations	-0.0004 (0.0004)	0.0000 (0.0030)	0.0089 (0.0221)	-0.0145 (0.0206)	0.0060 (0.0276)
TM - MCQs	0.0000 (0.0008)	-0.0088 (0.0057)	0.0029 (0.0073)	0.0066 (0.0135)	-0.0008 (0.0174)
TM - Writing topics	-0.0011*** (0.0003)	-0.0038 (0.0032)	-0.0081 (0.0089)	0.0118 (0.0083)	0.0012 (0.0052)
TM: Computer-aided education	0.0002 (0.0011)	-0.0127 (0.0100)	-0.0279 (0.0194)	0.0381* (0.0183)	0.0022 (0.0079)

<sup>a</sup> The sample size equals 1478.

Table A12: Ordered forests marginal effects for BSc program appropriateness for creative skills ordered response regression - Jordan<sup>a</sup> .

	Not at all appropriate	Not appropriate	Somewhat appropriate	Appropriate	Very appropriate
log(s.wage)	-0.0114* (0.0058)	-0.0131 (0.0113)	0.0056 (0.0174)	0.0231 (0.0159)	-0.0042 (0.0122)
Age in years	0.0000 (0.0000)	-0.0001 (0.0001)	-0.0001 (0.0002)	0.0002 (0.0002)	0.0000 (0.0001)
Tenure in years	0.0000 (0.0000)	0.0001 (0.0001)	0.0000 (0.0002)	-0.0001 (0.0002)	0.0001 (0.0001)
Hours of work	0.0001 (0.0001)	0.0000 (0.0002)	-0.0007* (0.0003)	0.0005 (0.0004)	0.0001 (0.0002)
Male	0.0012 (0.0013)	0.0006 (0.0041)	-0.0092 (0.0073)	0.0083 (0.0100)	-0.0009 (0.0131)
Married	-0.0019 (0.0017)	0.0002 (0.0035)	0.0092 (0.0073)	-0.0095 (0.0066)	0.0019 (0.0062)
BSc program studied in English	0.0007 (0.0007)	0.0025 (0.0043)	-0.0097 (0.0101)	0.0050 (0.0099)	0.0014 (0.0038)
Graduation grade	-0.0004 (0.0002)	-0.0002 (0.0006)	0.0004 (0.0009)	-0.0001 (0.0014)	0.0003 (0.0016)
Informal hiring	-0.0028 (0.0024)	0.0025 (0.0034)	0.0158 (0.0093)	-0.0143 (0.0081)	-0.0012 (0.0083)
Private sector	0.0007 (0.0012)	-0.0006 (0.0043)	0.0032 (0.0099)	-0.0028 (0.0092)	-0.0005 (0.0064)
Satisfied about job security	0.0001 (0.0018)	-0.0123 (0.0135)	-0.0217 (0.0202)	0.0334 (0.0184)	0.0004 (0.0112)
Satisfied about skills matching	-0.0176** (0.0060)	-0.0573*** (0.0163)	-0.0429 (0.0286)	0.1143*** (0.0304)	0.0035 (0.0075)
TM - lectures	0.0012* (0.0006)	0.0106* (0.0044)	0.0019 (0.0098)	-0.0137 (0.0095)	0.0000 (0.0032)
TM - group projects	-0.0012 (0.0008)	-0.0046 (0.0042)	-0.0228 (0.0136)	0.0247* (0.0122)	0.0038 (0.0135)
TM - research project	-0.0019 (0.0010)	-0.0082 (0.0045)	-0.0087 (0.0138)	0.0161 (0.0132)	0.0026 (0.0061)
TM - practical knowledge	-0.0017 (0.0021)	-0.0033 (0.0059)	-0.0219 (0.0191)	0.0212 (0.0173)	0.0055 (0.0096)
TM - theories	-0.0019*** (0.0004)	-0.0226*** (0.0029)	-0.0370 (0.0197)	0.0444* (0.0211)	0.0170 (0.0250)
TM - depends on professor	0.0050*** (0.0011)	0.0143*** (0.0039)	-0.0076 (0.0093)	-0.0109 (0.0082)	-0.0008 (0.0046)
TM - problem solving/case studies	-0.0001 (0.0011)	-0.0138*** (0.0028)	-0.0042 (0.0122)	0.0165 (0.0117)	0.0015 (0.0037)
TM - analytical assignments	-0.0005 (0.0012)	-0.0126 (0.0071)	-0.0084 (0.0165)	0.0201 (0.0146)	0.0014 (0.0111)
TM - presentations	-0.0001 (0.0010)	-0.0047 (0.0041)	0.0060 (0.0094)	-0.0176 (0.0223)	0.0164 (0.0287)
TM - MCQs	0.0015 (0.0015)	-0.0039 (0.0045)	-0.0044 (0.0077)	-0.0011 (0.0127)	0.0080 (0.0170)
TM - Writing topics	-0.0009 (0.0009)	-0.0114** (0.0042)	-0.0044 (0.0073)	0.0149* (0.0068)	0.0018 (0.0058)
TM: Computer-aided education	0.0002 (0.0031)	-0.0173** (0.0067)	-0.0036 (0.0096)	0.0182* (0.0090)	0.0026 (0.0110)

<sup>a</sup> The sample size equals 1478.

Table A13: Ordered probit marginal effects for BSc program appropriateness for begin work in the labour market ordered response regression - Egypt<sup>a</sup>.

	<b>Not at all appropriate</b>	<b>Not appropriate</b>	<b>Somewhat appropriate</b>	<b>Appropriate</b>	<b>Very appropriate</b>
log(s.wage)	-0.0169*** (0.0049)	-0.0014*** (0.0005)	0.0013*** (0.0005)	0.0061*** (0.0018)	0.0109*** (0.0032)
Age in years	-0.0052 (0.0035)	-0.0004 (0.0003)	0.0004 (0.0003)	0.0019 (0.0013)	0.0033 (0.0023)
Tenure in years	0.0070* (0.0036)	0.0006* (0.0003)	-0.0005* (0.0003)	-0.0025* (0.0013)	-0.0045* (0.0023)
Hours of work	0.0111** (0.0046)	0.0009** (0.0004)	-0.0009** (0.0004)	-0.0040** (0.0017)	-0.0071** (0.0030)
Male	0.0248 (0.0225)	0.0023 (0.0022)	-0.0017 (0.0014)	-0.0089 (0.0081)	-0.0164 (0.0153)
Married	0.0144 (0.0213)	0.0012 (0.0018)	-0.0011 (0.0017)	-0.0052 (0.0077)	-0.0093 (0.0137)
BSc program studied in English	-0.0297 (0.0247)	-0.0028 (0.0026)	0.0019 (0.0013)	0.0107 (0.0088)	0.0200 (0.0173)
Graduation grade	-0.0029*** (0.0010)	-0.0003*** (0.0001)	0.0002*** (0.0001)	0.0011*** (0.0004)	0.0019*** (0.0006)
Informal hiring	-0.0720*** (0.0185)	-0.0059*** (0.0016)	0.0057*** (0.0018)	0.0261*** (0.0068)	0.0462*** (0.0118)
Private sector	0.0745*** (0.0237)	0.0079** (0.0032)	-0.0042*** (0.0013)	-0.0269*** (0.0086)	-0.0513*** (0.0177)
Satisfied about job security	-0.0146 (0.0196)	-0.0012 (0.0017)	0.0011 (0.0016)	0.0053 (0.0072)	0.0094 (0.0126)
Satisfied about skills matching	-0.2219*** (0.0197)	-0.0245*** (0.0040)	0.0154*** (0.0035)	0.0872*** (0.0094)	0.1438*** (0.0146)
TM - lectures	-0.0557* (0.0339)	-0.0035** (0.0015)	0.0057 (0.0044)	0.0205 (0.0126)	0.0330* (0.0184)
TM - group projects	-0.0969*** (0.0246)	-0.0121*** (0.0042)	0.0032** (0.0015)	0.0348*** (0.0088)	0.0711*** (0.0206)
TM - research project	-0.0228 (0.0292)	-0.0022 (0.0031)	0.0015 (0.0017)	0.0083 (0.0106)	0.0152 (0.0201)
TM - practical knowledge	-0.0780*** (0.0266)	-0.0091** (0.0040)	0.0033*** (0.0011)	0.0282*** (0.0097)	0.0556*** (0.0208)
TM - theories	-0.0463** (0.0232)	-0.0047* (0.0028)	0.0027** (0.0012)	0.0167** (0.0084)	0.0315* (0.0166)
TM - depends on professor	0.0612*** (0.0203)	0.0062** (0.0025)	-0.0035*** (0.0011)	-0.0219*** (0.0073)	-0.0420*** (0.0149)
TM - problem solving/case studies	-0.0433 (0.0292)	-0.0045 (0.0036)	0.0024** (0.0012)	0.0156 (0.0105)	0.0298 (0.0214)
TM - analytical assignments	0.0082 (0.0324)	0.0007 (0.0025)	-0.0007 (0.0028)	-0.0030 (0.0118)	-0.0052 (0.0205)
TM - presentations	-0.0151 (0.0290)	-0.0014 (0.0028)	0.0011 (0.0019)	0.0055 (0.0105)	0.0100 (0.0195)
TM - MCQs	-0.0649*** (0.0237)	-0.0071** (0.0032)	0.0032*** (0.0011)	0.0232*** (0.0084)	0.0456** (0.0180)
TM - Writing topics	0.0677* (0.0362)	0.0038*** (0.0012)	-0.0074 (0.0050)	-0.0247* (0.0133)	-0.0395** (0.0191)
TM: Computer-aided education	-0.0289 (0.0258)	-0.0027 (0.0027)	0.0019 (0.0015)	0.0104 (0.0093)	0.0193 (0.0178)

<sup>a</sup> The sample size equals 1522.

Table A14: Ordered probit marginal effects for BSc program appropriateness for continue education after work ordered response regression - Egypt<sup>a</sup> .

	Not at all appropriate	Not appropriate	Somewhat appropriate	Appropriate	Very appropriate
log(s.wage)	-0.0170*** (0.0046)	-0.0013*** (0.0004)	0.0017*** (0.0005)	0.0076*** (0.0021)	0.0089*** (0.0025)
Age in years	-0.0044 (0.0034)	-0.0003 (0.0003)	0.0004 (0.0004)	0.0020 (0.0015)	0.0023 (0.0018)
Tenure in years	0.0078** (0.0035)	0.0006** (0.0003)	-0.0008** (0.0004)	-0.0035** (0.0016)	-0.0041** (0.0018)
Hours of work	0.0204*** (0.0047)	0.0016*** (0.0004)	-0.0021*** (0.0005)	-0.0092*** (0.0021)	-0.0107*** (0.0026)
Male	-0.0070 (0.0225)	-0.0005 (0.0017)	0.0007 (0.0024)	0.0031 (0.0101)	0.0037 (0.0117)
Married	0.0184 (0.0212)	0.0014 (0.0016)	-0.0019 (0.0022)	-0.0082 (0.0095)	-0.0096 (0.0111)
BSc program studied in English	-0.0002 (0.0260)	-0.0000 (0.0020)	0.0000 (0.0027)	0.0001 (0.0117)	0.0001 (0.0137)
Graduation grade	-0.0047*** (0.0010)	-0.0004*** (0.0001)	0.0005*** (0.0001)	0.0021*** (0.0004)	0.0025*** (0.0005)
Informal hiring	-0.0663*** (0.0184)	-0.0050*** (0.0016)	0.0069*** (0.0022)	0.0298*** (0.0084)	0.0346*** (0.0097)
Private sector	0.0566** (0.0240)	0.0053* (0.0028)	-0.0051*** (0.0019)	-0.0255** (0.0109)	-0.0313** (0.0142)
Satisfied about job security	-0.0062 (0.0198)	-0.0005 (0.0015)	0.0006 (0.0020)	0.0028 (0.0089)	0.0033 (0.0104)
Satisfied about skills matching	-0.2017*** (0.0205)	-0.0198*** (0.0037)	0.0203*** (0.0034)	0.0962*** (0.0112)	0.1050*** (0.0122)
TM - lectures	0.0535* (0.0288)	0.0055 (0.0038)	-0.0042** (0.0017)	-0.0239* (0.0128)	-0.0310* (0.0183)
TM - group projects	-0.0464** (0.0232)	-0.0046 (0.0028)	0.0040** (0.0017)	0.0211** (0.0107)	0.0259* (0.0137)
TM - research project	-0.0074 (0.0276)	-0.0006 (0.0024)	0.0007 (0.0027)	0.0033 (0.0125)	0.0039 (0.0148)
TM - practical knowledge	-0.0931*** (0.0248)	-0.0114*** (0.0043)	0.0061*** (0.0015)	0.0431*** (0.0121)	0.0553*** (0.0165)
TM - theories	-0.0615*** (0.0232)	-0.0064** (0.0031)	0.0050*** (0.0016)	0.0280** (0.0109)	0.0349** (0.0141)
TM - depends on professor	0.0195 (0.0206)	0.0016 (0.0019)	-0.0019 (0.0019)	-0.0088 (0.0093)	-0.0105 (0.0113)
TM - problem solving/case studies	-0.0324 (0.0273)	-0.0030 (0.0030)	0.0029 (0.0021)	0.0146 (0.0124)	0.0179 (0.0158)
TM - analytical assignments	-0.0239 (0.0291)	-0.0021 (0.0030)	0.0022 (0.0024)	0.0108 (0.0132)	0.0130 (0.0165)
TM - presentations	-0.0676** (0.0264)	-0.0074* (0.0039)	0.0051*** (0.0015)	0.0307** (0.0121)	0.0392** (0.0171)
TM - MCQs	-0.0216 (0.0243)	-0.0019 (0.0023)	0.0021 (0.0021)	0.0097 (0.0110)	0.0117 (0.0135)
TM - Writing topics	0.0097 (0.0321)	0.0007 (0.0022)	-0.0010 (0.0036)	-0.0043 (0.0144)	-0.0050 (0.0163)
TM: Computer-aided education	-0.0651*** (0.0235)	-0.0069** (0.0033)	0.0052*** (0.0015)	0.0297*** (0.0109)	0.0371** (0.0147)

<sup>a</sup> The sample size equals 1522.

Table A15: Ordered probit marginal effects for BSc program appropriateness for performance in current job assignments ordered response regression - Egypt<sup>a</sup> .

	Not at all appropriate	Not appropriate	Somewhat appropriate	Appropriate	Very appropriate
log(s.wage)	-0.0096** (0.0043)	-0.0010** (0.0005)	0.0008** (0.0004)	0.0042** (0.0019)	0.0055** (0.0025)
Age in years	-0.0007 (0.0033)	-0.0001 (0.0003)	0.0001 (0.0003)	0.0003 (0.0015)	0.0004 (0.0019)
Tenure in years	0.0040 (0.0034)	0.0004 (0.0003)	-0.0004 (0.0003)	-0.0018 (0.0015)	-0.0023 (0.0019)
Hours of work	0.0163*** (0.0044)	0.0017*** (0.0005)	-0.0014*** (0.0004)	-0.0072*** (0.0020)	-0.0093*** (0.0026)
Male	-0.0010 (0.0217)	-0.0001 (0.0022)	0.0001 (0.0019)	0.0004 (0.0096)	0.0005 (0.0124)
Married	0.0186 (0.0203)	0.0019 (0.0021)	-0.0017 (0.0018)	-0.0082 (0.0090)	-0.0106 (0.0116)
BSc program studied in English	-0.0135 (0.0241)	-0.0015 (0.0028)	0.0011 (0.0019)	0.0060 (0.0106)	0.0079 (0.0143)
Graduation grade	-0.0037*** (0.0009)	-0.0004*** (0.0001)	0.0003*** (0.0001)	0.0017*** (0.0004)	0.0021*** (0.0005)
Informal hiring	-0.0309* (0.0179)	-0.0031* (0.0018)	0.0028* (0.0017)	0.0137* (0.0079)	0.0176* (0.0102)
Private sector	0.0692*** (0.0222)	0.0088** (0.0036)	-0.0048*** (0.0015)	-0.0310*** (0.0102)	-0.0422*** (0.0146)
Satisfied about job security	0.0016 (0.0188)	0.0002 (0.0019)	-0.0001 (0.0017)	-0.0007 (0.0083)	-0.0009 (0.0107)
Satisfied about skills matching	-0.2614*** (0.0190)	-0.0371*** (0.0054)	0.0219*** (0.0042)	0.1294*** (0.0116)	0.1473*** (0.0137)
TM - lectures	0.0729*** (0.0256)	0.0103** (0.0047)	-0.0037*** (0.0010)	-0.0318*** (0.0110)	-0.0477** (0.0191)
TM - group projects	-0.0202 (0.0251)	-0.0023 (0.0030)	0.0016 (0.0019)	0.0090 (0.0112)	0.0118 (0.0151)
TM - research project	-0.0141 (0.0279)	-0.0015 (0.0033)	0.0012 (0.0021)	0.0062 (0.0124)	0.0082 (0.0166)
TM - practical knowledge	-0.0334 (0.0247)	-0.0039 (0.0033)	0.0025 (0.0016)	0.0149 (0.0112)	0.0199 (0.0153)
TM - theories	-0.0365 (0.0232)	-0.0043 (0.0031)	0.0028* (0.0015)	0.0162 (0.0104)	0.0218 (0.0145)
TM - depends on professor	0.0308 (0.0194)	0.0035 (0.0024)	-0.0024* (0.0014)	-0.0136 (0.0087)	-0.0182 (0.0118)
TM - problem solving/case studies	-0.0484* (0.0269)	-0.0062 (0.0042)	0.0032** (0.0013)	0.0215* (0.0120)	0.0298* (0.0180)
TM - analytical assignments	-0.0215 (0.0280)	-0.0024 (0.0035)	0.0017 (0.0020)	0.0095 (0.0125)	0.0127 (0.0171)
TM - presentations	-0.0194 (0.0266)	-0.0022 (0.0032)	0.0016 (0.0019)	0.0086 (0.0118)	0.0114 (0.0161)
TM - MCQs	-0.0371* (0.0221)	-0.0044 (0.0030)	0.0027* (0.0014)	0.0164* (0.0099)	0.0223 (0.0139)
TM - Writing topics	-0.0074 (0.0303)	-0.0008 (0.0034)	0.0006 (0.0025)	0.0033 (0.0135)	0.0043 (0.0178)
TM: Computer-aided education	-0.0789*** (0.0231)	-0.0108*** (0.0042)	0.0046*** (0.0012)	0.0352*** (0.0105)	0.0500*** (0.0164)

<sup>a</sup> The sample size equals 1522.

Table A16: Ordered probit marginal effects for BSc program appropriateness for prospectives for future jobs ordered response regression - Egypt<sup>a</sup> .

	Not at all appropriate	Not appropriate	Somewhat appropriate	Appropriate	Very appropriate
log(s.wage)	-0.0109*** (0.0039)	-0.0016*** (0.0006)	-0.0004* (0.0002)	0.0043*** (0.0015)	0.0086*** (0.0031)
Age in years	-0.0048 (0.0032)	-0.0007 (0.0005)	-0.0002 (0.0001)	0.0019 (0.0013)	0.0038 (0.0025)
Tenure in years	0.0077** (0.0032)	0.0011** (0.0005)	0.0003* (0.0002)	-0.0031** (0.0013)	-0.0061** (0.0025)
Hours of work	0.0228*** (0.0045)	0.0034*** (0.0007)	0.0009** (0.0004)	-0.0091*** (0.0018)	-0.0180*** (0.0036)
Male	-0.0156 (0.0210)	-0.0022 (0.0029)	-0.0005 (0.0006)	0.0063 (0.0085)	0.0121 (0.0160)
Married	0.0506*** (0.0195)	0.0074** (0.0029)	0.0018* (0.0010)	-0.0203** (0.0079)	-0.0396*** (0.0152)
BSc program studied in English	0.0265 (0.0233)	0.0036 (0.0030)	0.0006 (0.0004)	-0.0107 (0.0096)	-0.0200 (0.0169)
Graduation grade	-0.0047*** (0.0009)	-0.0007*** (0.0001)	-0.0002** (0.0001)	0.0019*** (0.0004)	0.0037*** (0.0007)
Informal hiring	-0.0591*** (0.0171)	-0.0086*** (0.0026)	-0.0021* (0.0011)	0.0237*** (0.0070)	0.0461*** (0.0132)
Private sector	0.0242 (0.0217)	0.0037 (0.0035)	0.0012 (0.0013)	-0.0095 (0.0085)	-0.0196 (0.0181)
Satisfied about job security	0.0100 (0.0179)	0.0015 (0.0026)	0.0004 (0.0007)	-0.0040 (0.0071)	-0.0079 (0.0142)
Satisfied about skills matching	-0.1114*** (0.0182)	-0.0175*** (0.0034)	-0.0054** (0.0022)	0.0450*** (0.0078)	0.0893*** (0.0154)
TM - lectures	0.0925*** (0.0219)	0.0178*** (0.0054)	0.0107** (0.0046)	-0.0327*** (0.0070)	-0.0883*** (0.0249)
TM - group projects	0.0334 (0.0250)	0.0045 (0.0031)	0.0006 (0.0005)	-0.0134 (0.0102)	-0.0250 (0.0179)
TM - research project	0.0068 (0.0298)	0.0010 (0.0042)	0.0002 (0.0009)	-0.0027 (0.0120)	-0.0053 (0.0230)
TM - practical knowledge	-0.0317 (0.0234)	-0.0051 (0.0041)	-0.0019 (0.0020)	0.0125 (0.0091)	0.0263 (0.0203)
TM - theories	-0.0668*** (0.0207)	-0.0116*** (0.0043)	-0.0054* (0.0027)	0.0257*** (0.0080)	0.0580*** (0.0196)
TM - depends on professor	0.0198 (0.0180)	0.0030 (0.0028)	0.0009 (0.0010)	-0.0078 (0.0070)	-0.0160 (0.0148)
TM - problem solving/case studies	-0.0209 (0.0236)	-0.0033 (0.0039)	-0.0011 (0.0016)	0.0082 (0.0092)	0.0171 (0.0200)
TM - analytical assignments	-0.0581** (0.0244)	-0.0102** (0.0051)	-0.0049 (0.0034)	0.0221** (0.0088)	0.0512** (0.0240)
TM - presentations	-0.0412* (0.0250)	-0.0068 (0.0047)	-0.0028 (0.0026)	0.0160* (0.0095)	0.0348 (0.0227)
TM - MCQs	-0.0190 (0.0227)	-0.0030 (0.0037)	-0.0010 (0.0015)	0.0075 (0.0088)	0.0155 (0.0190)
TM - Writing topics	-0.0181 (0.0277)	-0.0028 (0.0046)	-0.0010 (0.0019)	0.0071 (0.0107)	0.0148 (0.0234)
TM: Computer-aided education	-0.1231*** (0.0190)	-0.0249*** (0.0052)	-0.0155*** (0.0048)	0.0451*** (0.0067)	0.1183*** (0.0224)

<sup>a</sup> The sample size equals 1522.

Table A17: Ordered probit marginal effects for BSc program appropriateness for self-development ordered response regression - Egypt<sup>a</sup> .

	Not at all appropriate	Not appropriate	Somewhat appropriate	Appropriate	Very appropriate
log(s.wage)	-0.0077** (0.0037)	-0.0017** (0.0008)	-0.0001 (0.0001)	0.0036** (0.0017)	0.0059** (0.0028)
Age in years	-0.0090*** (0.0031)	-0.0019*** (0.0007)	-0.0001 (0.0002)	0.0042*** (0.0014)	0.0069*** (0.0024)
Tenure in years	0.0102*** (0.0031)	0.0022*** (0.0007)	0.0002 (0.0002)	-0.0048*** (0.0015)	-0.0078*** (0.0024)
Hours of work	0.0101** (0.0041)	0.0022** (0.0009)	0.0002 (0.0002)	-0.0047** (0.0019)	-0.0077** (0.0032)
Male	-0.0017 (0.0200)	-0.0004 (0.0043)	-0.0000 (0.0003)	0.0008 (0.0094)	0.0013 (0.0152)
Married	0.0610*** (0.0189)	0.0131*** (0.0041)	0.0007 (0.0011)	-0.0287*** (0.0090)	-0.0461*** (0.0142)
BSc program studied in English	0.0133 (0.0220)	0.0028 (0.0044)	0.0001 (0.0002)	-0.0063 (0.0104)	-0.0099 (0.0160)
Graduation grade	-0.0030*** (0.0009)	-0.0007*** (0.0002)	-0.0000 (0.0001)	0.0014*** (0.0004)	0.0023*** (0.0007)
Informal hiring	-0.0518*** (0.0165)	-0.0111*** (0.0036)	-0.0006 (0.0009)	0.0244*** (0.0078)	0.0391*** (0.0124)
Private sector	0.0386* (0.0207)	0.0090* (0.0053)	0.0013 (0.0014)	-0.0179* (0.0096)	-0.0310* (0.0176)
Satisfied about job security	0.0005 (0.0172)	0.0001 (0.0037)	0.0000 (0.0003)	-0.0002 (0.0080)	-0.0004 (0.0131)
Satisfied about skills matching	-0.1156*** (0.0173)	-0.0271*** (0.0048)	-0.0031 (0.0023)	0.0556*** (0.0088)	0.0901*** (0.0143)
TM - lectures	0.0570** (0.0227)	0.0147** (0.0068)	0.0038 (0.0029)	-0.0258*** (0.0099)	-0.0497** (0.0224)
TM - group projects	0.0364 (0.0249)	0.0071 (0.0044)	-0.0003 (0.0010)	-0.0170 (0.0117)	-0.0261 (0.0170)
TM - research project	-0.0197 (0.0265)	-0.0045 (0.0065)	-0.0006 (0.0013)	0.0092 (0.0123)	0.0156 (0.0219)
TM - practical knowledge	-0.0296 (0.0224)	-0.0070 (0.0058)	-0.0011 (0.0014)	0.0139 (0.0106)	0.0238 (0.0189)
TM - theories	-0.0586*** (0.0200)	-0.0148** (0.0059)	-0.0033 (0.0022)	0.0273*** (0.0094)	0.0494*** (0.0184)
TM - depends on professor	0.0389** (0.0170)	0.0091** (0.0043)	0.0014 (0.0011)	-0.0181** (0.0079)	-0.0313** (0.0143)
TM - problem solving/case studies	-0.0181 (0.0249)	-0.0042 (0.0060)	-0.0005 (0.0012)	0.0085 (0.0116)	0.0144 (0.0204)
TM - analytical assignments	-0.0393 (0.0254)	-0.0096 (0.0070)	-0.0019 (0.0023)	0.0182 (0.0116)	0.0326 (0.0229)
TM - presentations	-0.0439* (0.0237)	-0.0108 (0.0067)	-0.0022 (0.0023)	0.0204* (0.0109)	0.0365* (0.0216)
TM - MCQs	-0.0337 (0.0205)	-0.0080 (0.0053)	-0.0013 (0.0014)	0.0157* (0.0095)	0.0274 (0.0177)
TM - Writing topics	-0.0093 (0.0280)	-0.0021 (0.0064)	-0.0002 (0.0009)	0.0043 (0.0130)	0.0072 (0.0223)
TM: Computer-aided education	-0.1006*** (0.0188)	-0.0284*** (0.0069)	-0.0094** (0.0041)	0.0462*** (0.0085)	0.0922*** (0.0210)

<sup>a</sup> The sample size equals 1522.

Table A18: Ordered probit marginal effects for BSc program appropriateness for creative skills ordered response regression - Egypt<sup>a</sup>.

	Not at all appropriate	Not appropriate	Somewhat appropriate	Appropriate	Very appropriate
log(s.wage)	-0.0139*** (0.0046)	-0.0017*** (0.0006)	0.0013*** (0.0005)	0.0053*** (0.0018)	0.0090*** (0.0030)
Age in years	-0.0084** (0.0034)	-0.0010** (0.0004)	0.0008** (0.0003)	0.0032** (0.0013)	0.0054** (0.0022)
Tenure in years	0.0087** (0.0035)	0.0010** (0.0004)	-0.0008** (0.0004)	-0.0033** (0.0013)	-0.0056** (0.0023)
Hours of work	0.0172*** (0.0049)	0.0021*** (0.0006)	-0.0016*** (0.0005)	-0.0066*** (0.0019)	-0.0111*** (0.0032)
Male	-0.0065 (0.0225)	-0.0008 (0.0026)	0.0006 (0.0022)	0.0025 (0.0086)	0.0041 (0.0143)
Married	0.0612*** (0.0213)	0.0072*** (0.0026)	-0.0060** (0.0024)	-0.0234*** (0.0083)	-0.0390*** (0.0135)
BSc program studied in English	0.0294 (0.0249)	0.0031 (0.0024)	-0.0032 (0.0031)	-0.0112 (0.0095)	-0.0181 (0.0147)
Graduation grade	-0.0035*** (0.0010)	-0.0004*** (0.0001)	0.0003*** (0.0001)	0.0013*** (0.0004)	0.0023*** (0.0006)
Informal hiring	-0.0761*** (0.0186)	-0.0089*** (0.0023)	0.0076*** (0.0023)	0.0292*** (0.0073)	0.0483*** (0.0118)
Private sector	0.0183 (0.0236)	0.0023 (0.0031)	-0.0016 (0.0020)	-0.0070 (0.0090)	-0.0120 (0.0158)
Satisfied about job security	0.0295 (0.0196)	0.0035 (0.0024)	-0.0028 (0.0019)	-0.0112 (0.0075)	-0.0191 (0.0127)
Satisfied about skills matching	-0.1127*** (0.0198)	-0.0145*** (0.0032)	0.0100*** (0.0024)	0.0435*** (0.0081)	0.0737*** (0.0137)
TM - lectures	0.0780*** (0.0262)	0.0127** (0.0055)	-0.0034** (0.0014)	-0.0292*** (0.0097)	-0.0581*** (0.0225)
TM - group projects	0.0117 (0.0259)	0.0013 (0.0028)	-0.0012 (0.0027)	-0.0045 (0.0098)	-0.0074 (0.0162)
TM - research project	-0.0271 (0.0288)	-0.0036 (0.0043)	0.0022 (0.0019)	0.0104 (0.0111)	0.0182 (0.0202)
TM - practical knowledge	-0.0233 (0.0256)	-0.0031 (0.0037)	0.0019 (0.0019)	0.0089 (0.0099)	0.0155 (0.0175)
TM - theories	-0.0501** (0.0233)	-0.0071* (0.0039)	0.0036** (0.0014)	0.0192** (0.0091)	0.0344** (0.0171)
TM - depends on professor	0.0345* (0.0196)	0.0045 (0.0028)	-0.0028* (0.0015)	-0.0132* (0.0076)	-0.0231* (0.0135)
TM - problem solving/case studies	-0.0445 (0.0274)	-0.0064 (0.0047)	0.0030** (0.0014)	0.0170 (0.0106)	0.0308 (0.0204)
TM - analytical assignments	-0.0723*** (0.0272)	-0.0116** (0.0056)	0.0035*** (0.0013)	0.0276*** (0.0104)	0.0528** (0.0225)
TM - presentations	-0.0354 (0.0272)	-0.0049 (0.0043)	0.0027* (0.0016)	0.0135 (0.0105)	0.0240 (0.0195)
TM - MCQs	0.0258 (0.0251)	0.0028 (0.0024)	-0.0028 (0.0030)	-0.0098 (0.0095)	-0.0160 (0.0151)
TM - Writing topics	-0.0326 (0.0306)	-0.0045 (0.0049)	0.0024 (0.0017)	0.0124 (0.0117)	0.0223 (0.0222)
TM: Computer-aided education	-0.1356*** (0.0210)	-0.0254*** (0.0059)	0.0028 (0.0029)	0.0522*** (0.0085)	0.1061*** (0.0204)

<sup>a</sup> The sample size equals 1522.



Table A19: Ordered probit marginal effects for BSc program appropriateness for begin work in the labour market ordered response regression - Jordan<sup>a</sup> .

	<b>Not at all</b>	<b>Not</b>	<b>Somewhat</b>	<b>Appropriate</b>	<b>Very</b>
log(s.wage)	0.0004 (0.0048)	0.0007 (0.0087)	0.0011 (0.0140)	-0.0015 (0.0204)	-0.0005 (0.0072)
Age in years	0.0014** (0.0006)	0.0025** (0.0011)	0.0040** (0.0017)	-0.0058** (0.0025)	-0.0021** (0.0009)
Tenure in years	-0.0013** (0.0006)	-0.0023** (0.0011)	-0.0038** (0.0018)	0.0055** (0.0026)	0.0019** (0.0009)
Hours of work	0.0033** (0.0017)	0.0060** (0.0029)	0.0096** (0.0046)	-0.0140** (0.0067)	-0.0049** (0.0024)
Male	-0.0002 (0.0040)	-0.0003 (0.0072)	-0.0004 (0.0116)	0.0007 (0.0169)	0.0002 (0.0060)
Married	0.0042 (0.0042)	0.0075 (0.0075)	0.0121 (0.0120)	-0.0176 (0.0175)	-0.0062 (0.0061)
BSc program studied in English	-0.0153** (0.0061)	-0.0258*** (0.0095)	-0.0366*** (0.0116)	0.0595*** (0.0210)	0.0182*** (0.0059)
Graduation grade	-0.0011*** (0.0003)	-0.0021*** (0.0005)	-0.0033*** (0.0008)	0.0048*** (0.0011)	0.0017*** (0.0004)
Informal hiring	0.0007 (0.0042)	0.0013 (0.0076)	0.0021 (0.0121)	-0.0031 (0.0177)	-0.0011 (0.0062)
Private sector	-0.0047 (0.0042)	-0.0084 (0.0074)	-0.0134 (0.0116)	0.0197 (0.0172)	0.0069 (0.0060)
Satisfied about job security	-0.0211*** (0.0048)	-0.0396*** (0.0088)	-0.0619*** (0.0130)	0.0942*** (0.0199)	0.0285*** (0.0058)
Satisfied about skills matching	-0.0349*** (0.0063)	-0.0670*** (0.0100)	-0.0987*** (0.0134)	0.1589*** (0.0219)	0.0417*** (0.0058)
TM - lectures	0.0045 (0.0047)	0.0084 (0.0088)	0.0142 (0.0156)	-0.0198 (0.0209)	-0.0073 (0.0081)
TM - group projects	0.0023 (0.0058)	0.0040 (0.0101)	0.0063 (0.0156)	-0.0094 (0.0235)	-0.0033 (0.0081)
TM - research project	-0.0051 (0.0056)	-0.0094 (0.0107)	-0.0160 (0.0192)	0.0223 (0.0256)	0.0082 (0.0099)
TM - practical knowledge	0.0006 (0.0047)	0.0011 (0.0083)	0.0018 (0.0133)	-0.0026 (0.0195)	-0.0009 (0.0068)
TM - theories	-0.0062 (0.0053)	-0.0116 (0.0103)	-0.0200 (0.0190)	0.0275 (0.0247)	0.0103 (0.0098)
TM - depends on professor	0.0078* (0.0040)	0.0142* (0.0074)	0.0237* (0.0128)	-0.0334* (0.0174)	-0.0123* (0.0067)
TM - problem solving/case studies	0.0001 (0.0054)	0.0002 (0.0097)	0.0004 (0.0157)	-0.0006 (0.0228)	-0.0002 (0.0080)
TM - analytical assignments	-0.0159*** (0.0040)	-0.0312*** (0.0081)	-0.0575*** (0.0161)	0.0759*** (0.0195)	0.0288*** (0.0081)
TM - presentations	-0.0062 (0.0050)	-0.0115 (0.0096)	-0.0197 (0.0174)	0.0273 (0.0230)	0.0101 (0.0089)
TM - MCQs	0.0056 (0.0044)	0.0099 (0.0076)	0.0156 (0.0118)	-0.0230 (0.0177)	-0.0080 (0.0061)
TM - Writing topics	-0.0000 (0.0049)	-0.0000 (0.0087)	-0.0001 (0.0141)	0.0001 (0.0205)	0.0000 (0.0072)
TM: Computer-aided education	-0.0046 (0.0042)	-0.0084 (0.0077)	-0.0137 (0.0126)	0.0198 (0.0181)	0.0069 (0.0063)

<sup>a</sup> The sample size equals 1478.

Table A20: Ordered probit marginal effects for BSc program appropriateness for continue education after work ordered response regression - Jordan<sup>a</sup>.

	<b>Not at all appropriate</b>	<b>Not appropriate</b>	<b>Somewhat appropriate</b>	<b>Appropriate</b>	<b>Very appropriate</b>
log(s.wage)	-0.0055 (0.0037)	-0.0144 (0.0094)	-0.0205 (0.0133)	0.0328 (0.0213)	0.0075 (0.0049)
Age in years	0.0004 (0.0005)	0.0010 (0.0013)	0.0014 (0.0018)	-0.0023 (0.0029)	-0.0005 (0.0007)
Tenure in years	-0.0002 (0.0005)	-0.0004 (0.0013)	-0.0006 (0.0018)	0.0010 (0.0030)	0.0002 (0.0007)
Hours of work	0.0015 (0.0013)	0.0040 (0.0035)	0.0057 (0.0050)	-0.0091 (0.0079)	-0.0021 (0.0018)
Male	0.0045 (0.0031)	0.0121 (0.0083)	0.0178 (0.0125)	-0.0278 (0.0191)	-0.0066 (0.0047)
Married	0.0016 (0.0033)	0.0042 (0.0086)	0.0059 (0.0122)	-0.0095 (0.0195)	-0.0022 (0.0045)
BSc program studied in English	-0.0093* (0.0048)	-0.0233** (0.0112)	-0.0301** (0.0131)	0.0521** (0.0245)	0.0106** (0.0045)
Graduation grade	-0.0007*** (0.0002)	-0.0019*** (0.0006)	-0.0027*** (0.0008)	0.0044*** (0.0012)	0.0010*** (0.0003)
Informal hiring	0.0027 (0.0035)	0.0071 (0.0089)	0.0099 (0.0121)	-0.0162 (0.0201)	-0.0036 (0.0044)
Private sector	0.0026 (0.0032)	0.0068 (0.0087)	0.0098 (0.0126)	-0.0156 (0.0199)	-0.0036 (0.0046)
Satisfied about job security	-0.0143*** (0.0039)	-0.0392*** (0.0097)	-0.0545*** (0.0130)	0.0901*** (0.0215)	0.0180*** (0.0045)
Satisfied about skills matching	-0.0229*** (0.0050)	-0.0641*** (0.0109)	-0.0859*** (0.0137)	0.1471*** (0.0241)	0.0259*** (0.0043)
TM - lectures	0.0042 (0.0037)	0.0114 (0.0104)	0.0170 (0.0164)	-0.0261 (0.0241)	-0.0064 (0.0063)
TM - group projects	0.0010 (0.0044)	0.0027 (0.0115)	0.0037 (0.0159)	-0.0060 (0.0259)	-0.0014 (0.0059)
TM - research project	-0.0012 (0.0045)	-0.0033 (0.0122)	-0.0047 (0.0178)	0.0075 (0.0279)	0.0017 (0.0066)
TM - practical knowledge	-0.0023 (0.0036)	-0.0062 (0.0097)	-0.0089 (0.0144)	0.0141 (0.0224)	0.0033 (0.0053)
TM - theories	-0.0110*** (0.0036)	-0.0322*** (0.0108)	-0.0539*** (0.0208)	0.0762*** (0.0260)	0.0209** (0.0089)
TM - depends on professor	0.0071** (0.0032)	0.0192** (0.0084)	0.0285** (0.0128)	-0.0442** (0.0193)	-0.0107** (0.0050)
TM - problem solving/case studies	0.0060 (0.0049)	0.0151 (0.0116)	0.0201 (0.0145)	-0.0338 (0.0255)	-0.0074 (0.0054)
TM - analytical assignments	-0.0128*** (0.0033)	-0.0372*** (0.0091)	-0.0602*** (0.0163)	0.0881*** (0.0218)	0.0222*** (0.0064)
TM - presentations	0.0043 (0.0047)	0.0111 (0.0114)	0.0150 (0.0148)	-0.0249 (0.0254)	-0.0055 (0.0055)
TM - MCQs	-0.0005 (0.0034)	-0.0012 (0.0090)	-0.0017 (0.0129)	0.0027 (0.0206)	0.0006 (0.0048)
TM - Writing topics	0.0000 (0.0040)	0.0001 (0.0104)	0.0001 (0.0148)	-0.0002 (0.0238)	-0.0000 (0.0055)
TM: Computer-aided education	-0.0030 (0.0032)	-0.0080 (0.0087)	-0.0114 (0.0125)	0.0182 (0.0198)	0.0042 (0.0045)

<sup>a</sup> The sample size equals 1478.

Table A21: Ordered probit marginal effects for BSc program appropriateness for performance in current job assignments ordered response regression - Jordan<sup>a</sup> .

	Not at all appropriate	Not appropriate	Somewhat appropriate	Appropriate	Very appropriate
log(s.wage)	-0.0060 (0.0042)	-0.0113 (0.0077)	-0.0214 (0.0143)	0.0296 (0.0200)	0.0091 (0.0061)
Age in years	-0.0000 (0.0005)	-0.0000 (0.0010)	-0.0001 (0.0019)	0.0001 (0.0027)	0.0000 (0.0008)
Tenure in years	-0.0000 (0.0005)	-0.0000 (0.0010)	-0.0001 (0.0019)	0.0001 (0.0027)	0.0000 (0.0008)
Hours of work	0.0055*** (0.0018)	0.0104*** (0.0031)	0.0197*** (0.0057)	-0.0273*** (0.0078)	-0.0084*** (0.0026)
Male	-0.0046 (0.0037)	-0.0087 (0.0068)	-0.0161 (0.0124)	0.0226 (0.0177)	0.0067 (0.0052)
Married	0.0011 (0.0037)	0.0021 (0.0070)	0.0039 (0.0131)	-0.0054 (0.0182)	-0.0017 (0.0056)
BSc program studied in English	-0.0082 (0.0052)	-0.0150 (0.0092)	-0.0266* (0.0148)	0.0390* (0.0232)	0.0108* (0.0059)
Graduation grade	-0.0007*** (0.0002)	-0.0013*** (0.0005)	-0.0025*** (0.0008)	0.0034*** (0.0011)	0.0010*** (0.0004)
Informal hiring	0.0032 (0.0040)	0.0060 (0.0074)	0.0112 (0.0134)	-0.0157 (0.0193)	-0.0047 (0.0056)
Private sector	-0.0091** (0.0041)	-0.0168** (0.0071)	-0.0311** (0.0127)	0.0437** (0.0181)	0.0133** (0.0056)
Satisfied about job security	-0.0136*** (0.0040)	-0.0268*** (0.0078)	-0.0502*** (0.0139)	0.0713*** (0.0201)	0.0194*** (0.0052)
Satisfied about skills matching	-0.0310*** (0.0057)	-0.0637*** (0.0099)	-0.1140*** (0.0151)	0.1709*** (0.0236)	0.0379*** (0.0053)
TM - lectures	-0.0071 (0.0053)	-0.0130 (0.0093)	-0.0231 (0.0152)	0.0337 (0.0236)	0.0095 (0.0062)
TM - group projects	-0.0041 (0.0045)	-0.0080 (0.0090)	-0.0157 (0.0183)	0.0211 (0.0238)	0.0067 (0.0079)
TM - research project	0.0052 (0.0062)	0.0094 (0.0109)	0.0170 (0.0185)	-0.0244 (0.0276)	-0.0072 (0.0078)
TM - practical knowledge	0.0016 (0.0043)	0.0030 (0.0080)	0.0057 (0.0149)	-0.0079 (0.0209)	-0.0024 (0.0063)
TM - theories	-0.0099** (0.0043)	-0.0202** (0.0094)	-0.0429** (0.0218)	0.0540** (0.0250)	0.0191* (0.0103)
TM - depends on professor	-0.0018 (0.0038)	-0.0035 (0.0071)	-0.0066 (0.0133)	0.0091 (0.0186)	0.0028 (0.0056)
TM - problem solving/case studies	-0.0022 (0.0045)	-0.0042 (0.0089)	-0.0081 (0.0175)	0.0111 (0.0234)	0.0035 (0.0075)
TM - analytical assignments	-0.0066* (0.0038)	-0.0131* (0.0078)	-0.0260 (0.0162)	0.0346* (0.0208)	0.0111 (0.0070)
TM - presentations	-0.0092** (0.0041)	-0.0186** (0.0087)	-0.0387* (0.0198)	0.0497** (0.0235)	0.0168* (0.0089)
TM - MCQs	0.0012 (0.0037)	0.0023 (0.0070)	0.0044 (0.0131)	-0.0061 (0.0182)	-0.0019 (0.0056)
TM - Writing topics	-0.0008 (0.0044)	-0.0015 (0.0085)	-0.0028 (0.0163)	0.0038 (0.0223)	0.0012 (0.0069)
TM: Computer-aided education	-0.0045 (0.0037)	-0.0086 (0.0071)	-0.0164 (0.0137)	0.0226 (0.0188)	0.0069 (0.0057)

<sup>a</sup> The sample size equals 1478.

Table A22: Ordered probit marginal effects for BSc program appropriateness for prospectives for future jobs ordered response regression - Jordan<sup>a</sup> .

	Not at all appropriate	Not appropriate	Somewhat appropriate	Appropriate	Very appropriate
log(s.wage)	-0.0024 (0.0022)	-0.0116 (0.0103)	-0.0196 (0.0174)	0.0256 (0.0226)	0.0081 (0.0072)
Age in years	0.0000 (0.0003)	0.0001 (0.0013)	0.0001 (0.0021)	-0.0001 (0.0028)	-0.0000 (0.0009)
Tenure in years	0.0002 (0.0003)	0.0011 (0.0012)	0.0018 (0.0021)	-0.0024 (0.0027)	-0.0008 (0.0009)
Hours of work	0.0016* (0.0008)	0.0078** (0.0035)	0.0131** (0.0058)	-0.0171** (0.0076)	-0.0054** (0.0025)
Male	-0.0007 (0.0017)	-0.0032 (0.0083)	-0.0054 (0.0137)	0.0071 (0.0181)	0.0022 (0.0056)
Married	0.0040** (0.0019)	0.0193** (0.0085)	0.0324** (0.0141)	-0.0423** (0.0185)	-0.0133** (0.0059)
BSc program studied in English	-0.0041 (0.0026)	-0.0191* (0.0110)	-0.0299* (0.0160)	0.0414* (0.0235)	0.0117* (0.0060)
Graduation grade	-0.0001 (0.0001)	-0.0007 (0.0006)	-0.0011 (0.0009)	0.0015 (0.0012)	0.0005 (0.0004)
Informal hiring	-0.0002 (0.0018)	-0.0008 (0.0087)	-0.0014 (0.0148)	0.0018 (0.0192)	0.0006 (0.0061)
Private sector	-0.0004 (0.0017)	-0.0021 (0.0082)	-0.0036 (0.0138)	0.0047 (0.0181)	0.0015 (0.0057)
Satisfied about job security	-0.0042** (0.0020)	-0.0209** (0.0086)	-0.0349** (0.0142)	0.0464** (0.0192)	0.0136** (0.0054)
Satisfied about skills matching	-0.0110*** (0.0029)	-0.0557*** (0.0101)	-0.0900*** (0.0147)	0.1251*** (0.0210)	0.0316*** (0.0053)
TM - lectures	0.0006 (0.0020)	0.0027 (0.0099)	0.0046 (0.0171)	-0.0060 (0.0218)	-0.0019 (0.0071)
TM - group projects	-0.0027 (0.0020)	-0.0136 (0.0100)	-0.0242 (0.0188)	0.0304 (0.0226)	0.0101 (0.0081)
TM - research project	0.0004 (0.0026)	0.0021 (0.0125)	0.0034 (0.0206)	-0.0045 (0.0272)	-0.0014 (0.0085)
TM - practical knowledge	0.0008 (0.0021)	0.0037 (0.0100)	0.0061 (0.0164)	-0.0080 (0.0217)	-0.0025 (0.0067)
TM - theories	-0.0067*** (0.0020)	-0.0376*** (0.0095)	-0.0779*** (0.0227)	0.0869*** (0.0219)	0.0353*** (0.0118)
TM - depends on professor	0.0018 (0.0017)	0.0086 (0.0082)	0.0147 (0.0141)	-0.0190 (0.0180)	-0.0062 (0.0060)
TM - problem solving/case studies	-0.0006 (0.0022)	-0.0031 (0.0107)	-0.0053 (0.0186)	0.0069 (0.0238)	0.0022 (0.0077)
TM - analytical assignments	-0.0039** (0.0018)	-0.0201** (0.0089)	-0.0364** (0.0172)	0.0453** (0.0203)	0.0151** (0.0073)
TM - presentations	-0.0024 (0.0020)	-0.0122 (0.0105)	-0.0217 (0.0197)	0.0272 (0.0238)	0.0091 (0.0083)
TM - MCQs	0.0004 (0.0018)	0.0020 (0.0084)	0.0034 (0.0141)	-0.0045 (0.0184)	-0.0014 (0.0058)
TM - Writing topics	-0.0003 (0.0021)	-0.0014 (0.0103)	-0.0024 (0.0176)	0.0031 (0.0228)	0.0010 (0.0073)
TM: Computer-aided education	-0.0025 (0.0017)	-0.0122 (0.0083)	-0.0209 (0.0143)	0.0271 (0.0186)	0.0085 (0.0057)

<sup>a</sup> The sample size equals 1478.

Table A23: Ordered probit marginal effects for BSc program appropriateness for self-development ordered response regression - Jordan<sup>a</sup> .

	<b>Not at all appropriate</b>	<b>Not appropriate</b>	<b>Somewhat appropriate</b>	<b>Appropriate</b>	<b>Very appropriate</b>
log(s.wage)	0.0026 (0.0028)	0.0085 (0.0092)	0.0115 (0.0124)	-0.0179 (0.0193)	-0.0046 (0.0050)
Age in years	-0.0003 (0.0004)	-0.0009 (0.0014)	-0.0012 (0.0019)	0.0019 (0.0029)	0.0005 (0.0008)
Tenure in years	0.0003 (0.0004)	0.0010 (0.0014)	0.0014 (0.0018)	-0.0021 (0.0029)	-0.0006 (0.0007)
Hours of work	0.0015 (0.0012)	0.0051 (0.0038)	0.0069 (0.0052)	-0.0107 (0.0081)	-0.0028 (0.0021)
Male	-0.0035 (0.0028)	-0.0114 (0.0091)	-0.0149 (0.0116)	0.0238 (0.0188)	0.0060 (0.0046)
Married	-0.0016 (0.0030)	-0.0052 (0.0098)	-0.0071 (0.0133)	0.0110 (0.0207)	0.0029 (0.0054)
BSc program studied in English	-0.0044 (0.0033)	-0.0143 (0.0105)	-0.0183 (0.0128)	0.0299 (0.0216)	0.0072 (0.0049)
Graduation grade	-0.0004** (0.0002)	-0.0013** (0.0006)	-0.0017** (0.0008)	0.0026** (0.0013)	0.0007** (0.0003)
Informal hiring	0.0046 (0.0032)	0.0151 (0.0098)	0.0196 (0.0121)	-0.0317 (0.0204)	-0.0077* (0.0047)
Private sector	-0.0026 (0.0028)	-0.0086 (0.0090)	-0.0115 (0.0119)	0.0180 (0.0188)	0.0047 (0.0049)
Satisfied about job security	-0.0080*** (0.0030)	-0.0273*** (0.0099)	-0.0363*** (0.0128)	0.0578*** (0.0207)	0.0138*** (0.0047)
Satisfied about skills matching	-0.0172*** (0.0040)	-0.0599*** (0.0110)	-0.0770*** (0.0130)	0.1277*** (0.0220)	0.0264*** (0.0047)
TM - lectures	0.0018 (0.0032)	0.0062 (0.0113)	0.0085 (0.0161)	-0.0130 (0.0240)	-0.0035 (0.0067)
TM - group projects	0.0017 (0.0037)	0.0056 (0.0119)	0.0073 (0.0154)	-0.0116 (0.0248)	-0.0030 (0.0063)
TM - research project	0.0028 (0.0045)	0.0089 (0.0138)	0.0115 (0.0172)	-0.0185 (0.0285)	-0.0047 (0.0070)
TM - practical knowledge	-0.0031 (0.0030)	-0.0106 (0.0101)	-0.0149 (0.0147)	0.0226 (0.0218)	0.0060 (0.0060)
TM - theories	-0.0126*** (0.0030)	-0.0510*** (0.0101)	-0.0898*** (0.0212)	0.1139*** (0.0224)	0.0395*** (0.0112)
TM - depends on professor	0.0038 (0.0027)	0.0128 (0.0089)	0.0176 (0.0122)	-0.0268 (0.0184)	-0.0073 (0.0052)
TM - problem solving/case studies	-0.0049 (0.0030)	-0.0174 (0.0111)	-0.0254 (0.0176)	0.0374 (0.0245)	0.0103 (0.0071)
TM - analytical assignments	-0.0106*** (0.0028)	-0.0399*** (0.0090)	-0.0623*** (0.0157)	0.0881*** (0.0203)	0.0248*** (0.0067)
TM - presentations	0.0013 (0.0038)	0.0043 (0.0122)	0.0057 (0.0158)	-0.0090 (0.0254)	-0.0023 (0.0064)
TM - MCQs	-0.0010 (0.0027)	-0.0033 (0.0093)	-0.0045 (0.0126)	0.0069 (0.0195)	0.0018 (0.0051)
TM - Writing topics	0.0012 (0.0033)	0.0040 (0.0109)	0.0053 (0.0142)	-0.0083 (0.0227)	-0.0021 (0.0058)
TM: Computer-aided education	-0.0081*** (0.0027)	-0.0283*** (0.0091)	-0.0396*** (0.0129)	0.0608*** (0.0195)	0.0152*** (0.0049)

<sup>a</sup> The sample size equals 1478.

Table A24: Ordered probit marginal effects for BSc program appropriateness for creative skills ordered response regression - Jordan<sup>a</sup>.

	Not at all appropriate	Not appropriate	Somewhat appropriate	Appropriate	Very appropriate
log(s.wage)	-0.0017 (0.0045)	-0.0039 (0.0100)	-0.0046 (0.0120)	0.0083 (0.0214)	0.0020 (0.0051)
Age in years	-0.0012* (0.0006)	-0.0027* (0.0014)	-0.0032* (0.0017)	0.0057* (0.0030)	0.0013* (0.0007)
Tenure in years	0.0012* (0.0006)	0.0027* (0.0014)	0.0032* (0.0017)	-0.0058** (0.0029)	-0.0014* (0.0007)
Hours of work	0.0007 (0.0018)	0.0015 (0.0040)	0.0018 (0.0048)	-0.0033 (0.0085)	-0.0008 (0.0020)
Male	-0.0025 (0.0040)	-0.0056 (0.0088)	-0.0066 (0.0102)	0.0120 (0.0187)	0.0028 (0.0043)
Married	0.0014 (0.0042)	0.0031 (0.0094)	0.0036 (0.0112)	-0.0065 (0.0200)	-0.0015 (0.0047)
BSc program studied in English	-0.0019 (0.0045)	-0.0042 (0.0100)	-0.0049 (0.0115)	0.0089 (0.0212)	0.0021 (0.0049)
Graduation grade	-0.0002 (0.0003)	-0.0005 (0.0006)	-0.0006 (0.0007)	0.0011 (0.0013)	0.0003 (0.0003)
Informal hiring	0.0041 (0.0043)	0.0092 (0.0094)	0.0107 (0.0106)	-0.0195 (0.0199)	-0.0045 (0.0044)
Private sector	-0.0005 (0.0040)	-0.0012 (0.0090)	-0.0014 (0.0108)	0.0025 (0.0193)	0.0006 (0.0046)
Satisfied about job security	-0.0117*** (0.0042)	-0.0267*** (0.0097)	-0.0312*** (0.0111)	0.0571*** (0.0205)	0.0125*** (0.0043)
Satisfied about skills matching	-0.0310*** (0.0059)	-0.0730*** (0.0112)	-0.0807*** (0.0112)	0.1565*** (0.0221)	0.0282*** (0.0046)
TM - lectures	0.0036 (0.0045)	0.0083 (0.0105)	0.0102 (0.0135)	-0.0177 (0.0226)	-0.0044 (0.0058)
TM - group projects	-0.0042 (0.0049)	-0.0099 (0.0115)	-0.0122 (0.0149)	0.0212 (0.0250)	0.0051 (0.0062)
TM - research project	0.0042 (0.0067)	0.0091 (0.0140)	0.0104 (0.0153)	-0.0193 (0.0293)	-0.0045 (0.0066)
TM - practical knowledge	-0.0084** (0.0042)	-0.0199* (0.0102)	-0.0254* (0.0140)	0.0431* (0.0225)	0.0106* (0.0059)
TM - theories	-0.0200*** (0.0041)	-0.0548*** (0.0105)	-0.0866*** (0.0201)	0.1229*** (0.0234)	0.0386*** (0.0107)
TM - depends on professor	0.0144*** (0.0041)	0.0336*** (0.0089)	0.0426*** (0.0116)	-0.0718*** (0.0186)	-0.0187*** (0.0056)
TM - problem solving/case studies	-0.0033 (0.0050)	-0.0077 (0.0118)	-0.0095 (0.0150)	0.0166 (0.0255)	0.0040 (0.0063)
TM - analytical assignments	-0.0084** (0.0038)	-0.0200** (0.0093)	-0.0256** (0.0126)	0.0434** (0.0203)	0.0107** (0.0052)
TM - presentations	0.0036 (0.0059)	0.0078 (0.0126)	0.0090 (0.0140)	-0.0166 (0.0265)	-0.0038 (0.0059)
TM - MCQs	-0.0048 (0.0040)	-0.0110 (0.0093)	-0.0134 (0.0115)	0.0237 (0.0199)	0.0056 (0.0049)
TM - Writing topics	-0.0003 (0.0047)	-0.0007 (0.0106)	-0.0009 (0.0127)	0.0016 (0.0227)	0.0004 (0.0054)
TM: Computer-aided education	-0.0094** (0.0040)	-0.0218** (0.0092)	-0.0266** (0.0113)	0.0469** (0.0197)	0.0109** (0.0046)

<sup>a</sup> The sample size equals 1478.