

## MEASURING THE IMPACT OF ACADEMIC POLICY INNOVATION

Asylzhan AKYNOVA<sup>1</sup>, Sulushash JUMASHEVA<sup>1</sup>, Krzysztof RYBIŃSKI<sup>2\*</sup>

<sup>1</sup> Narxoz University, Almaty, Kazakhstan

<sup>2</sup> Vistula University, Warsaw, Poland; rybinski@rybinski.eu

\* Corresponding author

**Abstract:** This paper presents application of Data science models to the quality assurance processes at the university. In 2015 Narxoz University in Almaty, Kazakhstan introduced a major change to its academic policy. Final year bachelor students were required to complete team-based diploma projects, focused on solving real business problems, instead of writing standard, often purely descriptive and theoretical diploma theses. This article uses data science models (linear regression, logit and CART) to analyze the effects of this policy change on recent graduates' employability and wage levels using results of telephone survey conducted among 1956 graduates in 2015 and 2016.

Estimated models show that students who have firm plans to find jobs, acquire valuable competences when preparing bachelor diploma and actively participate in student life, have higher probability of employment and earn higher wages. It means that the process of writing bachelor diploma should be carefully designed and monitored and that student learning outcomes also depend on their extra-curricular activity.

Such analysis provides deep and interesting insights into the learning and assessment processes and should be a part of annual quality assurance review in every university. For example, results indicate that grading practices at Narxoz require a major review, as graduates with higher GPA did not exhibit higher employability nor higher wages. Similarly, curricula of some specializations (majors) should be reviewed due to low employment rate of graduates. Appropriate changes have already been implemented at Narxoz in 2017.

Finally, we found that economic shocks have much stronger short-term impact on recent graduates' employability and wages than reforms of academic curricula.

**Keywords:** academic policy, innovation, graduates' employability, graduates' wages, quality assurance, learning outcomes, data science.

### 1. Introduction: university academic policy change and research goals

In the 2015/2016 academic year Narxoz University conducted a large-scale experiment. University changed its academic policy regarding requirements for a bachelor's degree. Earlier each undergraduate student had to write **diploma thesis** or pass a series of state exams during her or his final year in order to graduate. Under new academic policy each bachelor student

graduating in 2016 had to write a **diploma project**. While diploma thesis demonstrated whether student mastered theoretical curriculum, the diploma project was conducted by (on average) three students together and the project goal was to solve a problem sourced from the university business partners. Students' projects were also a part of compulsory company internship.

In November 2016 – February 2017 Narxoz University conducted a phone survey, contacting majority of 2015 and 2016 graduates in order to verify what was the impact of the new academic policy on graduates' professional paths. In particular, survey investigated graduates' employability and their level of income three months after graduation. Additionally, a special review team was assembled and reviewed all diploma theses written in 2015 and diploma projects written in 2016.

Data was collected for 1956 students, out of which 1016 reported their wage levels. This data base was used to perform econometric analysis: linear regression and CART models for wage levels, and logit regression and CART for employability.

There were four goals of this research. Firstly, to understand what factors influence employability and wages of university recent graduates, and whether there have been any significant changes after academic policy reform. Secondly, to create and verify the system of regular monitoring of recent graduates' professional achievement. Thirdly, to understand labor market demand for university graduates in various specializations and verify whether some specializations need major curriculum restructuring. And, finally, to receive valuable feedback about overall university experience and quality of academic programs.

## **2. Factors affecting professional achievement of university graduates: literature review**

There are many literature sources covering the topics of professional achievement of university graduates. For example, Cabrera et al. (2003) have examined alumni surveys between 1980 and 2003 (over 270 sources). They found that about 70 percent of surveys were related to such alumni career outcomes as job satisfaction, income level, and occupational attainment. Surveys also covered engagement in civic and political activities, and tolerance for diversity.

Outcomes assessment approach was used in alumni satisfaction studies by Bristol (2002) in veterinary degree program at North Carolina State University, by Jolly et al. (2009) in Iowa State University, by Borden and Rajcecki (2000) for graduates of psychology baccalaureates in Indiana University, by Braun and others (2011) in Freie Universität Berlin, by Saunders and Stivason (2010) in Marshall University and many more. These studies proved that in general graduates were satisfied with academic programs provided by universities.

The diploma theses/projects analyzed in this paper are example of a work-integrated-learning (WIL). Many research papers ((Rayner et al. (2015); Richardson et al. (2013), Sahama et al. (2008), Jackson (2015), El-Temtamy et al. (2016), Cranmer (2007), Artess et al. (2017)) show the importance of work-integrated learning approach in enhancing graduates' employability and workplace readiness. A number of recent studies revealed that being part of WIL internships played a vital role in enhancing the career preparation and employability of graduates in the job market. In addition, studies show that employers are more willing to hire graduates with internship experience ((Knose et al., (1999), Shoenfelt et al., (2012), Varghese et al., (2012), Rothman (2010), Rigsby (2013), Hurst et al., (2010), Gault et al., (2000, 2010), Mason et al., (2009), Nunley et al., 2016, Park (2015), Jackson (2013), Lalanie and Withanawasam (2012), Reddan and Rauchle (2016), Blicblau et al. (2014)). Therefore, internships bridge the gap between career expectations developed in the classroom and the reality of employment. Regarding students of business education, a study by Hergert (2009) revealed that students' most valued study experience was the internship that led to finding a job.

Development of practical competencies is also emphasized by industrial leaders' calls for college graduates who are expected work in teams and solve real-world problems. Most of the examples in which the competency approach has been followed are in professional fields such as engineering and business (Cabrera et al., 2005).

Another important factor for employability of graduates is their GPA. Research shows that strong academic performance is highly valued for the entry-level jobs, as concluded by Li et al. (2010), Ramalheira (2015), El-Temtamy et al. (2016), Park et al., (2015, 2016), Qenani et al. (2014). Humburg and his colleagues (2013) find that grades matter for getting invited to a job interview. Gokuladas (2011) in his research on predicting the job placement for Indian undergraduate students establishes that GPA has significant influence on enhancing the employability of engineering graduates in software services companies. Pinto and Ramalheira (2017) highlight that academic performance combined with extracurricular activities can be a valuable differentiating factor on the labor market of business graduates.

Literature also points to several other factors influencing the starting wages of graduates, such as:

- university quality, Roshchin et al., (2015), Iftikhar Hussain et al. (2009), Brunello et al. (2008), Rumberger et al., (1993), Thomas et al., (2005);
- college major, Thomas et al., (2005);
- and overall academic performance, Roshchin et al., (2015)).

As mentioned by Roshchin et al. (2015), a high quality of university is generally understood as one belonging to an elite group of educational institutions that includes the leaders in education on the national level. High quality institution is also a recognizable brand that is highly appreciated by employers. Brunello et al. (2008) and Thomas et al. (2005) show that university quality matters for earnings only in the short run. On the contrary Frank (2015)

presents evidence that long-run achievements are not related to the university brand, and that most successful people in United States are not those who graduate from Ivy League, but those who contributed greatest efforts to their in-class and extra-curricular development.

Several studies point out to the importance of extra-curricular activity in enhancing employability (Kumarasinghe and Udeshika, 2015; Bourner and Millican, 2011; Javier, 2015). Lau and others (2014) show that students who become core members in extra-curricular activities later enjoy more successful professional careers.

### 3. Economic environment and recent graduates' employment prospects

Employability of Narxoz University graduates should be analyzed in the context of a large economic shock that took place in Kazakhstan in late 2015, that led to a severe economic slowdown in 2016. Kazakhstan is a commodities exporter, with oil accounting for a bulk of country exports. In 2015 there was a strong decline of oil prices, which combined with economic crisis in Russia, Kazakhstan main trade partner, contributed to a major deterioration of the country labor market. It also led to a massive currency devaluation that further reduced purchasing power of citizens, and was not offset by export-led expansion due to a very low manufacturing base. Employment in many sectors sharply declined, as showed in table 1 below. Shaded areas are industries related to several key specializations offered by Narxoz University. In many of these industries the decline was particularly severe, for example 18.5% decline of employment in financial services, while Finance and Accounting are specializations at Narxoz with the highest number of students. It means that job placement of university graduates became much more difficult in 2016.

Both measures of employability declined: (1) number of employed graduates as percent of total graduates, and (2) number of employed as a percentage of graduates reporting intension to find a job. This decline was from 70.4%/82.3% in 2015 to respectively 67%/81.6% in 2016 (figure 1).

**Table 1.**  
*Employed population by sector of Kazakhstani economy*

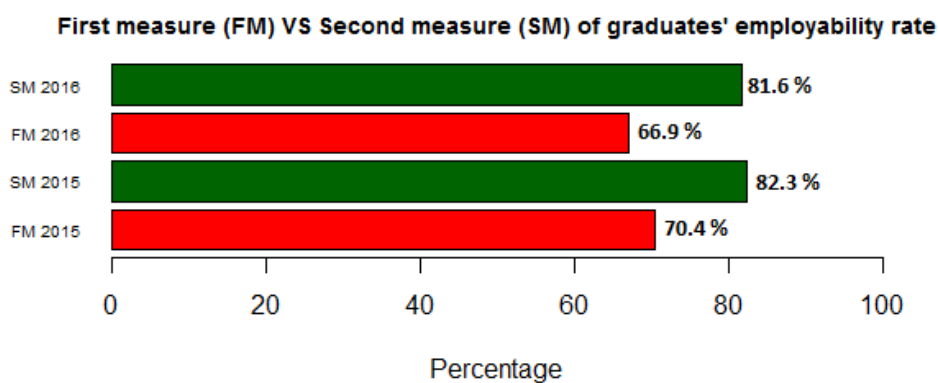
	2015 3rd Qtr	2016 3rd Qtr	increase/ decrease, %
<b>Employed population, total, thousand people</b>	<b>8634.5</b>	<b>8 586.6</b>	<b>-0.6</b>
Agriculture, forestry and fisheries	1655.5	1 432.0	-13.6
Industry	1056.1	1 096.9	3.9
Mining and quarrying	279.9	287.2	2.6
Manufacturing industry	517.4	573.7	10.9
Power supply, gas, steam and air conditioning	175.5	159.9	-8.9
Water supply; Sewage system, control over the collection and distribution of waste	83.2	76.0	-8.7
Construction	698.9	715.8	2.4

cont. table 1

Wholesale and retail trade; Repair of cars and motorcycles	1173.0	1 301.2	10.9
Transportation and storage	581.0	613.3	5.6
Accommodation and food services	205.8	178.5	-13.3
Information and communication	166.0	164.9	-0.7
Financial and insurance services	234.3	190.9	-18.5
Operations with real estate	87.4	111.7	27.8
Professional, scientific and technical activities	203.4	236.6	16.3
Activities in the field of administrative and support services	221.8	258.2	16.4
Public administration and defense; Compulsory social security	462.0	440.1	- 4.7
Education	1012.4	1 003.2	0.9
Health and social services	451.0	472.5	4.8
Art, Entertainment and Recreation	138.5	134.7	-2.8
Provision of other types of services	287.5	236.2	-17.8
Number of unemployed, thousand people	443.8	444.7	0.2

Note: shaded area are sectors corresponding to popular Narxoz university majors.

Source: Agency of Statistics of the Republic of Kazakhstan (2017).



**Figure 1.** Two measures of recent graduates' employability. First measure (FM) is employed graduates as percent of total graduates, and second measure (SM) is the employed as a percentage of graduates reporting intention to find a job. Source: Narxoz graduates telephone survey, own calculations.

#### 4. Data collection, verification and review

Conducting a large scale, reliable phone survey is a challenge, especially when respondents are asked sensitive questions, such as about their income. As literature suggests, a benefit of telephone surveys is that they have higher response rate and are more likely to be completed in full. A drawback of telephone surveys is that they limit the complexity of the questions that might be asked and have higher interviewer bias in comparison to mail surveys (Cabrera et al., 2003).

As one of the goals of this research was to create the system of regular monitoring of graduates' professional achievements, the University management decided to ask faculty, who served as graduates' diploma supervisors, to contact their former students by phone. Another option, having Career Center call graduates was not feasible, as it would require each Center's staff making hundreds of calls. Outsourcing to external call center was also ruled out, as alumni

relationships is considered one of the core business processes, where personal or personalized format of a contact plays a key role.

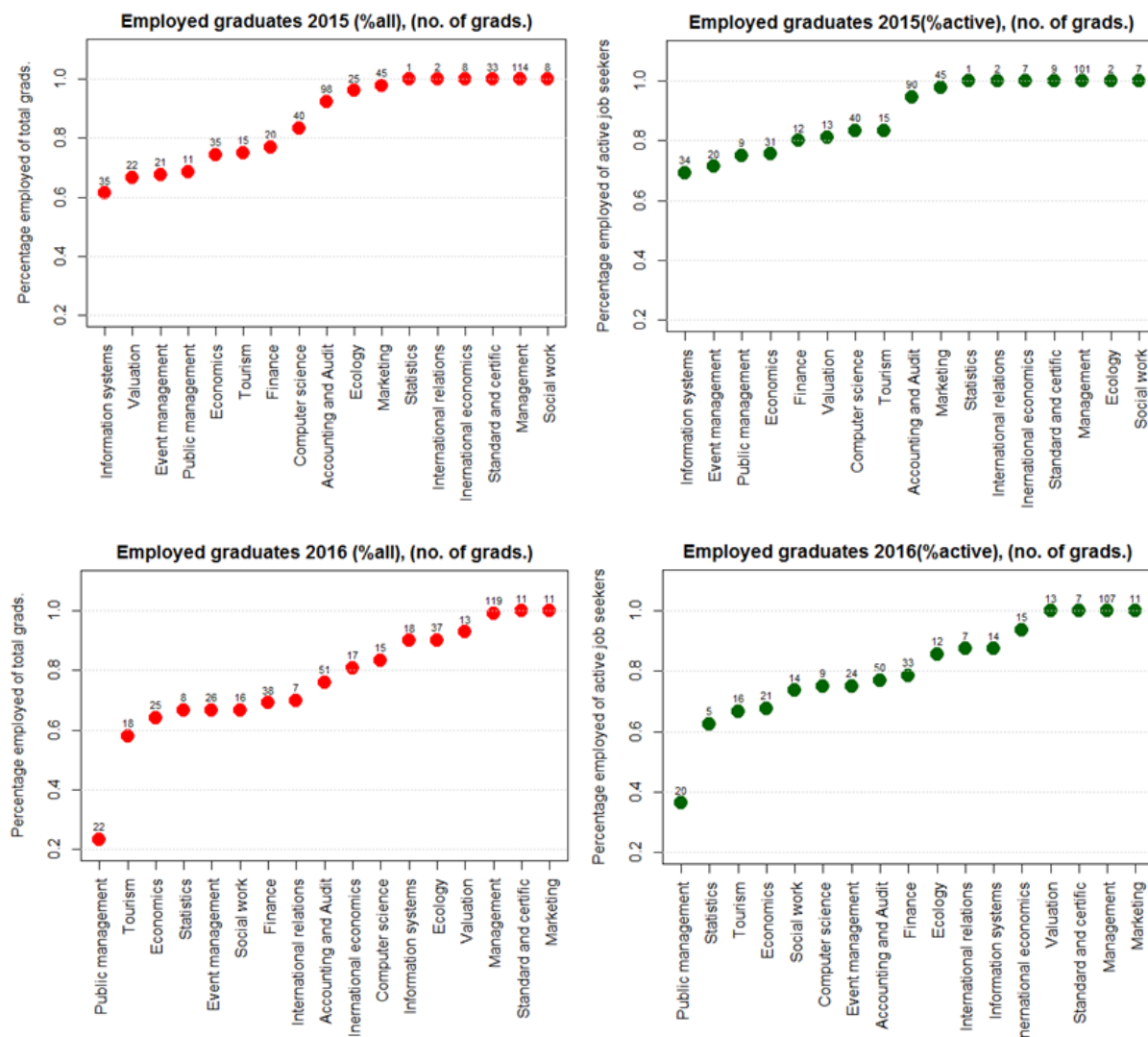
Such management decision met with resistance among faculty members, who perceived it as an additional, unpaid and uncomfortable duty. It took many meetings and explanations to convince faculty to engage in the process. However not all seemed convinced, so management suspected that such lack of commitment may negatively affect the quality of collected data. Consequently, the verification process was put in place. Data validation team made control phone calls to randomly selected sample of graduates. And indeed, in some cases it was found that data for a given graduate had been reported, but he or she had not been contacted by the university. In other words, some data were fake.

These findings were presented to deans and heads of chairs who took appropriate measures and at the end of this long and fairly painful effort university was able to collect reliable data about recent graduates' professional achievements.

Two graduates' employability measures are reported in this paper. Universities usually use the first measure, i.e. the number of employed graduates as a percentage of total. This measure maybe misleading in countries like Kazakhstan for two reasons. Firstly, many female graduates in Kazakhstan give priority to establishing the family life and having children, which is visible in high fertility rates for a country with medium income per capita level. Secondly, many bachelor graduates continue education at the master level. Therefore, it is preferable to report the second measure of employability: percentage of employed among graduates that reported intention to find a job upon graduation; especially when it relates to recent graduates employability. Both measures are reported in figure 2 below.

Data shows that for many specializations all students found jobs upon graduation in 2015. In 2016 the situation deteriorated due to economic crisis, but still four specializations reported 100 percent employability 3 months after graduation: Marketing, Management, Standardization and certification, and Valuation. At the other end, there is Public management, with very low – 40 percent – employment rate in 2016. It is related to the recruitment procedures in the public administration sector, which is very complicated and takes about six months. And because for the majority of Public management students public sector is their first-choice job, many were still in the recruitment process at the time of the telephone survey.

University management noticed low employment rate among Computer science graduates, below 80 percent in 2016, at times when global demand for good IT specialists vastly exceeds supply. It led to major review of the curricula and to the introduction of two new tracks for Computer science students: Cyber-security and Data science.



Note: Digits above the data point indicates the number of graduates of a given specialization that were contacted in the phone survey. Three specializations out of 21 failed to report employability data, and one – law – have not had graduates yet.

**Figure 2.** Two measures of bachelor program graduates’ employability, percent of total graduates (left) and percentage of active job seekers (right) that were employed 3 months after graduation. Source: Narxoz graduates telephone survey, own calculations.

In the third quarter of 2015 currency regime in Kazakhstan changed from fixed to float and over the course of several months tenge lost half of its value against the dollar from 185 to 330-350. It led to wage indexation in many companies, so that average wage in the country increased from 124,656 tenge in Q3’2015 to 141,187 tenge in Q3’2016<sup>1</sup>. It is not seen in the Narxoz graduates’ survey data as the average wage of the graduates declined from 94,303 tenge in 2015 to 91,404 tenge in 2016.

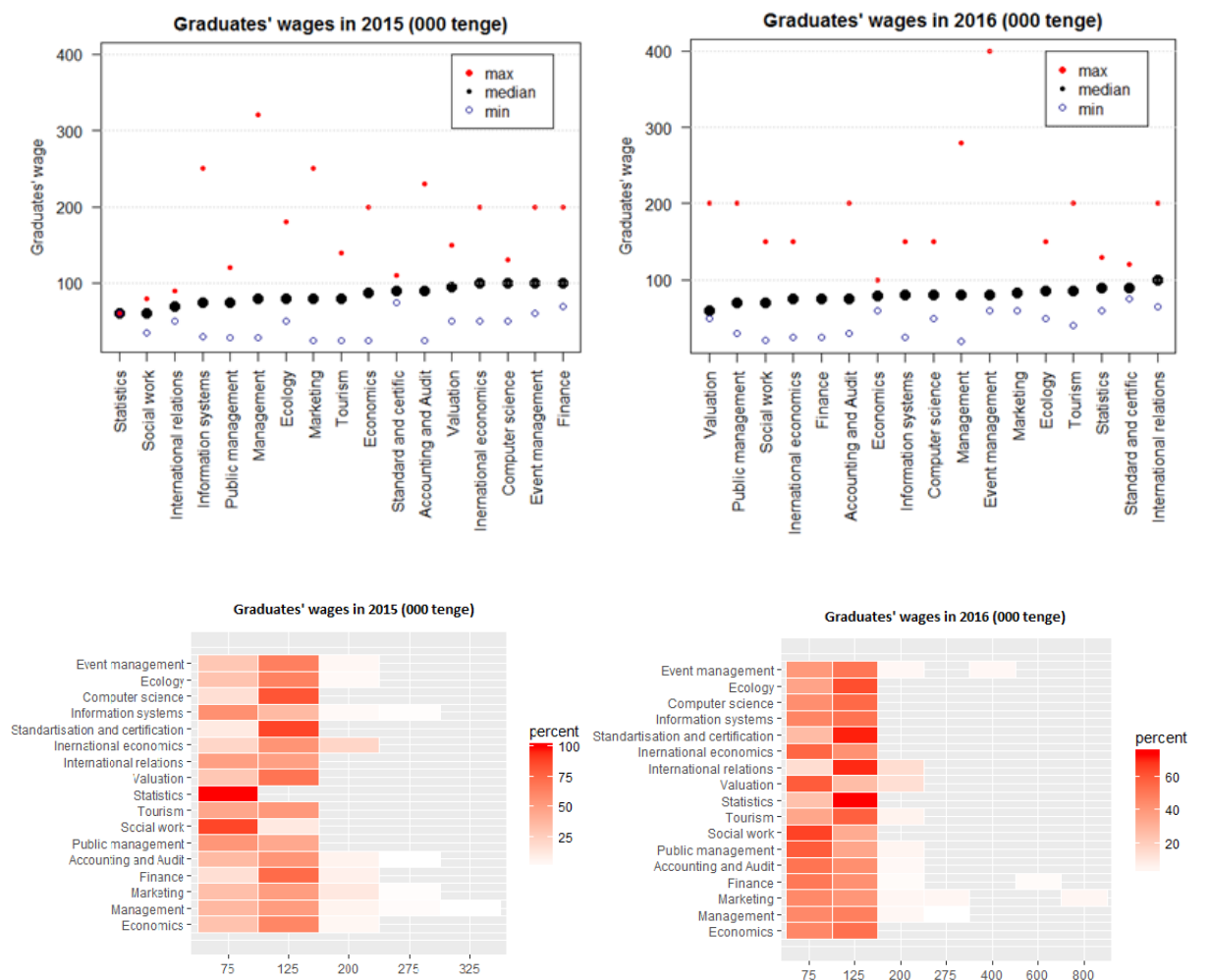
This wage decline was caused by deteriorating labor market conditions. For example commercial banks were undergoing major restructuring in 2016, including mergers, and laid off almost 20 percent of employees. There was a large supply of experienced, unemployed

<sup>1</sup> Agency of Statistics of the Republic of Kazakhstan, 2017.

specialists in finance looking for a job, and companies often prefer to hire people with some business experience than recent graduates. Consequently, employability for Finance specialization graduates fell and their first wage after graduation declined sharply from 106,100 tenge in 2015 to 95,600 tenge to 2016, on average.

Another explanation of this wage puzzle may be related to a fact that phone survey of 2015 and 2016 graduates was conducted in late 2016. It may have led to 2015 graduates reporting inflated level of wages, as their current wages were probably higher than their first job wage, three months after graduating in 2015.

However, one should also note that rating of specializations by median wage has significantly changed in 2016. For example, as noted earlier finance students lost the first place in the ranking in 2015 and in 2016 were placed in the lower part of the list. At the same time, International relations and Statistics advanced from the among lowest in 2015 to the leading positions in 2016.



Note: In 2016 highest reported wage was for the graduate of marketing, 750,000 tenge, not reported on figure 3.

**Figure 3.** Wages reported by Narxoz graduates, three months after graduation, cohorts 2015 and 2016. Source: Narxoz graduates telephone survey, own calculations.



Existing literature shows that graduate wages are influenced by the university quality and specialization (major) choice. Narxoz data does not fully confirm these literature findings. While there is a sizeable wage variation between specializations (major), these differences are very unstable over time. As regards university quality, Narxoz conducted major review of all its programs in 2015-2016. These and other strategic reforms led to major improvement of the university brand and quality, which was reflected in much higher number of candidates. While in 2015 only about 1000 bachelor freshmen entered the university, in 2016 the number jumped to 1600, despite declining number of high school graduates in Kazakhstan. In result Narxoz higher education market share rose markedly. In early 2017 Narxoz also took top positions in brand perception ratings and a leading position in employer's opinion ranking. And yet, despite very strong quality and brand improvement, graduate wages fell. It shows that market conditions played a much stronger role in the short-term, than internal university reforms. We expect that in the course of several years the relative importance of both groups of factors will change, and university quality will play a much more important role in determining graduates' wages. It can be noticed already. At the time of the final revision of this article (August 2017) student recruitment was significantly higher than in already strong 2016, despite more than 20 percent increase in tuition price. University management is planning to limit the intake in 2017 and prepare university entry exams, on top of state attestation, in 2018.

At Narxoz University writing diploma thesis/project and related company internships are a very important part of the learning process and achieving desired learning outcomes. In order to verify the quality of the diploma projects we conducted a fast review of all bachelor theses from 2015 and all bachelor projects from 2016 according to five criteria: (1) Is title interesting and informative? (2) Is research goal clearly stated? (3) Is thesis/project based on real data? (4) After reading conclusion can one understand the research goals, applied methods and achieved results? (5) What is the quality of referenced literature? Each diploma could receive from 0 to 10 points. On average 2015 diploma theses received 5.5 points, and diploma projects in 2016 received 6.3 points. So, quality – according to these criteria – improved in 2016.

## 5. Factors influencing employability of recent graduates

We used two types of classification models for explaining graduates' employability: logit and classification CART<sup>2</sup>. Using different modeling techniques helps to validate the results. In both models the explained variable is graduate employment 3 months after graduation (1 = employed, 0 = not employed). We began by estimating the full logit model, including

---

<sup>2</sup> Model variables are described in detail in Appendix 2. Standard data science techniques were applied such as removing outliers, selecting min AIC logit model, checking for multi-collinearity of factors, cross-validation of CART model for bucket size and preventing over-fitting. CART stands for Classification and Regression Trees, See for example Loh (2011). All estimations were conducted in R.

dummy variables for student specializations. However, specialization dummies were insignificant, hence results are not reported here. We removed dummy variables and estimated the model presented on LHS on figure 4 and followed by sequentially removing insignificant variables. The minimum AIC model is reported on the RHS of the figure 4.

Results show that students who highly value education experience at their school<sup>3</sup> (Opinion\_school) also find jobs more often. Having a strong determination to find a job (Job\_plan) is also conducive to finding employment after graduation. Students reporting that they use competences acquired during diploma thesis/project work very often also find jobs more often (Comp\_diploma). Finally employed graduates also state that the process of preparing diploma thesis/project played important role in getting their first job.

All variables				Min AIC model			
Coefficients:	Estimate	Pr(> z )		Coefficients:	Estimate	Pr(> z )	
(Intercept)	3.6814	0.3874		(Intercept)	-0.7864	0.5795	
Y2016	-0.0506	0.9142		Y2016	-0.1875	0.6186	
Student_GPA	-0.1522	0.8023		Student_GPA	-0.4363	0.3063	
Diploma_grade	-0.0602	0.2729					
FA_grade	-0.0236	0.8486					
Opinion_Narxoz	-0.2355	0.4343					
Opinion_school	0.4913	0.0599	.	Opinion_school	0.4544	0.0104	*
Stud_life	0.1281	0.5688					
Job_plan	2.2963	0.0000	***	Job_plan	1.7010	0.0000	***
Comp_dipl	0.7900	0.0009	***	Comp_dipl	0.6453	0.0001	***
Comp_Narxoz	-0.0050	0.9810					
Dipl_job_role	0.3895	0.2177		Dipl_job_role	0.5015	0.0627	.

**Figure 4.** Results of estimated logit model. Explained variable is graduate employment (0/1). Source: Own calculations. 1312 observations removed due to missing data.

Quite surprisingly, and contrary to other studies we found that GPA is not significant, and even has the unexpected, negative sign. Also, variable representing academic policy change (Y2016 = 0 for 2015 and =1 for 2016) and economic crisis at the same time is insignificant.

However due to missing data we lost about 1300 observations out of 1956. In next step, we used very effective<sup>4</sup> predictive mean matching (PMM) algorithm<sup>5</sup> proposed in Little (1988) and implemented in R MICE package (Multivariate Imputation by Chained Equations) to replace missing values. Results<sup>6</sup> of logit model estimation using modified data are reported in figure 5.

Results are similar, but now more parameters are statistically significant due to larger data set. While student official diploma grade (Diploma\_grade) and fast assessment grade (FA\_grade) are insignificant, it turns out that students with higher GPA have smaller probability

<sup>3</sup> At the time of both cohorts' graduation Narxoz University had four schools: Finance and Accounting, Economics and Management, Applied Sciences and International Educational Programs. The structure has changed in the Fall of 2016.

<sup>4</sup> See Yu, Burton and Rivero-Arias (2007).

<sup>5</sup> Predictive mean matching (PMM) algorithm imputes missing values by means of the nearest-neighbor with distance based on the expected values of the missing variables conditional on the observed covariates.

<sup>6</sup> We validated PPM procedure by testing a wide range of PMM parameters and re-estimating the model. Results were stable and always similar to ones reported in figure 5.

of finding a job (Student\_GPA). This is puzzling, contradicts findings by other researchers and calls for an audit and major revision of the university grading policy. Graduates who intensively engaged in the student life (Stud\_life) are more successful on the labor market. Jobs are found more often by graduates who had firm plans to find jobs (Job\_plan), who acquired valuable, market relevant competences when completing diploma (Comp\_diploma) or acquired such competences at Narxoz during their education (Comp\_Narxoz). Graduates who found jobs also report that the process of writing diploma positively contributed to this outcome (Dipl\_job\_role). One important difference in comparison with the previous model is that the dummy variable for year 2016 (Y2016) is significant, indicating that the likelihood of finding employment declined in 2016 in comparison with 2015 due to economic stagnation and rising unemployment.

All variables, NA's replaced			
Coefficients:	Estimate	Pr(> z )	
(Intercept)	-0.4303	0.6987	
Y2016	-0.5345	0.0001	***
Student_GPA	-0.3652	0.0428	*
Diploma_grade	-0.0206	0.1554	
FA_grade	-0.0429	0.1991	
Opinion_Narxoz	0.1318	0.1573	
Opinion_school	0.1058	0.1998	
Stud_life	0.1969	0.0016	**
Job_plan	1.6923	0.0000	***
Comp_dipl	0.3840	0.0000	***
Comp_Narxoz	0.2797	0.0000	***
Dipl_job_role	0.3163	0.0003	***

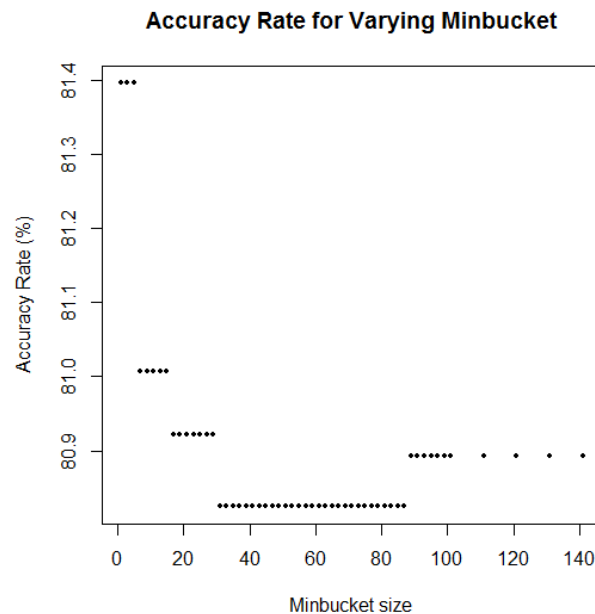
**Figure 5.** Results of estimated logit model with missing values replaced using PMM algorithm. Explained variable is graduate employment (0/1). Source: Own calculations. Full set of 1956 observations used, with outliers replaced.

We also estimated CART model, using full set of data, including dummy variables for each specialization. Models based on trees try to split the dataset into a number of parts that contain similar outcomes. In our case, the CART model tries to find a set of rules so that the model correctly separates in the tree leaves those who found employment upon graduation (1) and those who remained unemployed (0). Final model<sup>7</sup> after 10-fold cross-validation is shown in figure 7. Key decision variables in the estimated tree are similar to those obtained from the estimation of the logit model. Most important variable is student opinion about Narxoz. Those with above average opinion are employed more often than those who have below average opinion. This is not a surprise as the fact of being employed or not probably influences recent graduates' opinion about the university. Next in importance is the ability to use competences formed during diploma preparation very often or on daily basis. Finally, students who have good opinion about their school, had firm employment goal or graduated in 2015 (not in 2016,

<sup>7</sup> In order to compare results with the logit model, specialization dummy variables were not included.

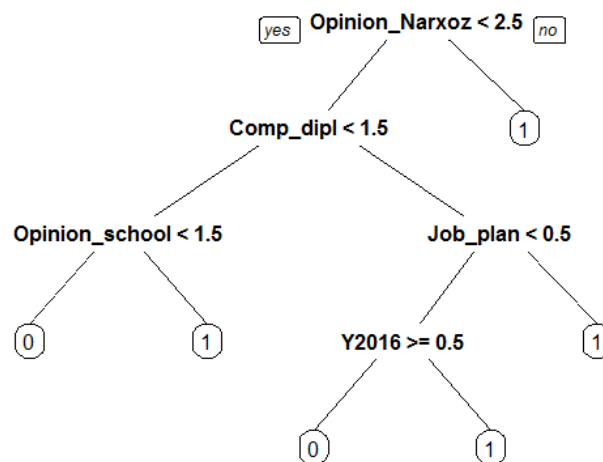
the crisis year) had better chances to find a job. Participation in student life was not important in the CART classification model.

Both types of models confirm that practical, market oriented bachelor diplomas, that help to form competences demanded on the labor market are conducive to higher graduates' employability.



**Figure 6.** Classification CART model accuracy, 10-fold cross-validation. Source: Own calculations.

As shown in figure 6 cross-validated best model accuracy is 81.4%, slightly above the 79% accuracy of the base model, that predicts employment for every recent graduate.



**Figure 7.** Cross-validated CART model. Explained variable is graduate employment (0/1)<sup>8</sup>. Source: Own calculations. Minbucket = 5, optimized using 10-fold cross-validation.

<sup>8</sup> Numbers in leaves are employability forecasts. 1 predicts that student with characteristics meeting tree nodes' conditions on the way to a given leaf has high likelihood of finding a job. 0 predicts that he or she will not find a job easily (three months after graduation).

## 6. Factors influencing wages of recent graduates

For wage analysis, we selected only those graduates who declared themselves as being employed during the phone interview. In this part of the analysis, we also included specialization dummy variables, as preliminary data inspection showed significant wage differences for students of different specializations<sup>9</sup>. Linear regression model presented in figure 8 below tries to capture factors controlled by the university that could have significant impact on wages of recent graduates.

All variables, adj. R2 = 0.012			Best adj. R2 model = 0.02				
Coefficients:	Estimate	Pr(> z )		Coefficients:	Estimate	Pr(> z )	
(Intercept)	64.58	0.0737	.	(Intercept)	80.08	0.0000	***
Y2016	-7.34	0.0635	.	Y2016	-5.49	0.0483	*
Student_GPA	-3.29	0.5039					
Diploma_grade	0.33	0.3672					
FA_grade	-0.61	0.5217					
Opinion_Narxoz	0.29	0.9176					
Opinion_school	-0.94	0.7263					
Stud_life	3.97	0.0973	.	Stud_life	1.74	0.2613	
Job_plan	0.67	0.9240					
Comp_dipl	2.46	0.2115		Comp_dipl	2.30	0.0760	.
Comp_Narxoz	0.01	0.9971					
Dipl_job_role	-1.73	0.5073					
Mana	0.33	0.9862		Mana	1.53	0.7622	
Mark	16.90	0.4029		Mark	13.98	0.0794	.
Fina	-1.90	0.9214		Fina	2.11	0.7598	
Acco	-1.01	0.9568		Acco	0.32	0.9531	
PubM	13.88	0.6792		PubM	-10.42	0.2084	
SocW	-37.59	0.1143		SocW	-17.89	0.0572	.
Tour	-10.13	0.6142		Tour	-4.07	0.6197	
Valu	1.05	0.9812		Valu	-3.86	0.6636	
IntR	7.64	0.7363		IntR	8.99	0.5166	
StCe	-12.12	0.5619		StCe	-5.72	0.4460	
InfS	-19.38	0.3224		InfS	-10.46	0.1455	
ComS	-9.91	0.6109		ComS	-2.51	0.7131	
Ecol	-5.81	0.7829		Ecol	-9.56	0.1688	
EveM	1.10	0.9555		EveM	10.34	0.1563	

Note: Model was estimated for students who declared that they have jobs and non-zero income. Outliers (three graduates reporting very high income in the range 600,000-750,000) were removed.

**Figure 8.** Linear regression model, dependent variable is graduate's wage (000 tenge). Source: Own calculations.

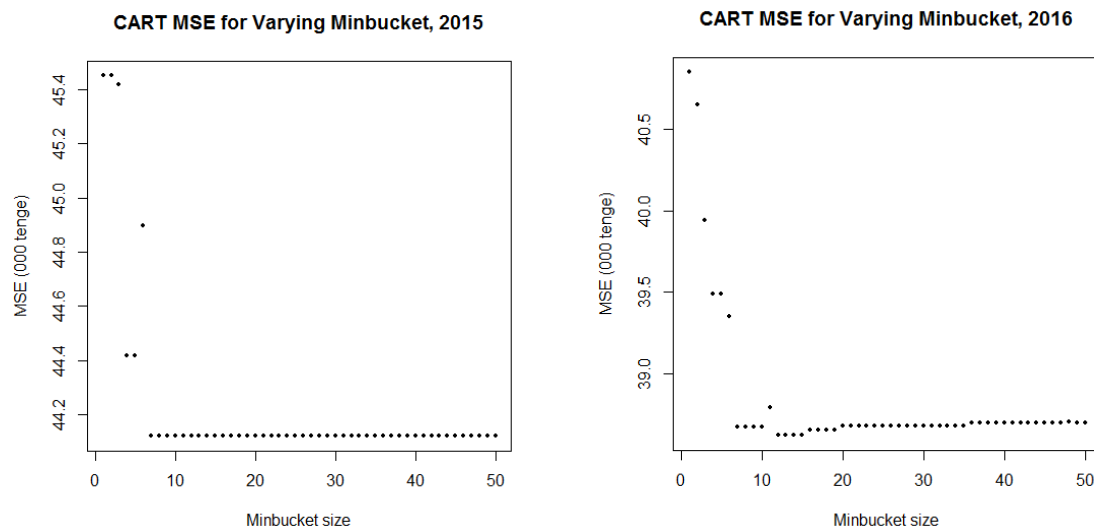
Very low  $R^2$  shows that university-related factors do not have strong explanatory power and that demand side factors (labor market situation) probably play a much more important role on Kazakhstan job market, at least in the short-run. After controlling for specialization and other factors, graduates in 2016 on average received 5,500 tenge lower salaries than their one-year older colleagues upon graduation (variable Y2016). Graduates of marketing (Mark) have much

<sup>9</sup> We excluded one specialization dummy from estimation – economics – to avoid singularity. Therefore, of specialization effects are relative to graduates of economics specialization.

higher earnings than other specializations, while graduates of social work (SocW) specialization are on the other end of the wage distribution. Graduates reporting that competences acquired during preparation of bachelor diploma were valuable on the labor market, also enjoy higher wages. Active student life helps to achieve higher wage after graduation, although it is not significant in the best adjusted- $R^2$  model.

As in the case of the employability analysis we also replaced missing values with predictions obtained from PMM algorithm in R MICE package. Results were very close to estimations reported in figure 8. However, estimation of the CART regression model for wage determination did not give good results. Model was very sensitive to small parameter changes. We also defined new variable “high income” equal to 1 when graduate income was above sample median income and 0 for values below median income. But accuracy rate of such CART classification model, irrespectively of the size of the minimum bucket, was close to the base model accuracy (50% for median threshold). So, the classification CART estimation results are not reported here.

Finally, we decided to split the sample into 2015 and 2016 and conduct analysis separately, as it seems that wage determination processes in both years were very different. Cross-validated results are reported in figures 9 and 10 below.



**Figure 9.** Regression CART<sup>10</sup> model mean square error, 10-fold cross validation. Source: Own calculations.

<sup>10</sup> In case of regression CART model leaf value is a prediction of the forecast variable (graduate wage in this case) for a graduate that “falls” into this a given leaf after following rules in the tree nodes.

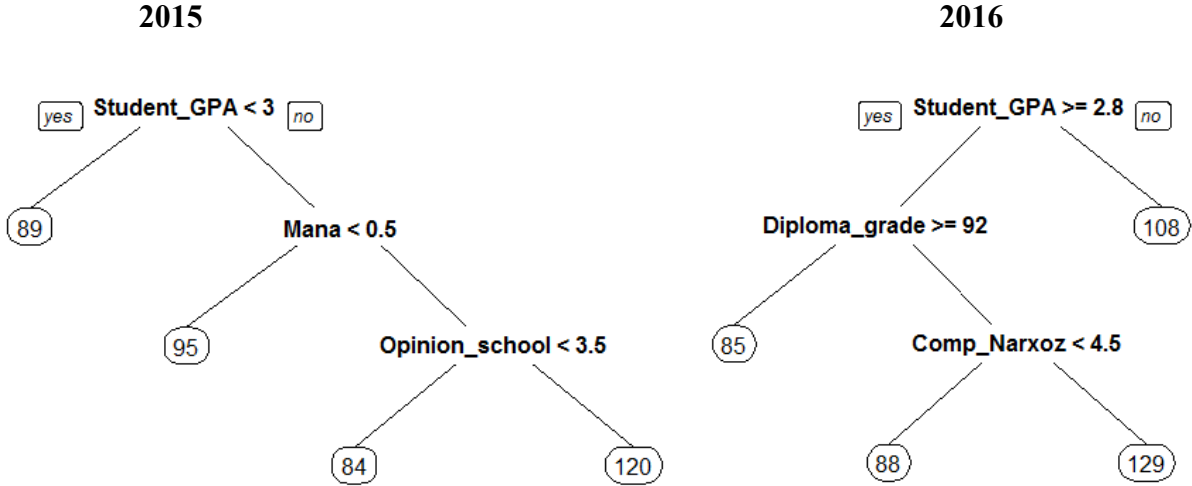


Figure 10. Results of CART regression model. Explained variable is graduate wage. Source: Own calculation. Optimal minimum bucket size set to 15 in both cases, as suggested by cross-validation.

The split-sample idea worked and estimated regression CART models were stable with respect to the minimum bucket size. Analysis revealed very interesting developments. Firstly, it seems that the introduction of diploma projects radically changed the relationship between the graduate first job wage and her/his performance while at the university. In 2015, when still traditional diploma theses were prepared and defended, graduates with low GPA received lower wages, graduates of Management major made more than others and students that enjoyed highest wages on average were those with the highest opinion about the university.

But the situation appears to have changed significantly in 2016. Firstly, student GPA was the most important factor, as in 2015. But this time it worked in the opposite way, graduates with lower GPA enjoyed on average higher wages. Some 40 graduates out of 442 in total with GPA below 2.8 received average wage of 108,000 tenge, some 20,000 tenge more than – on average – the remaining 402 ones. But the puzzle does not end here. 65 graduates with diploma grade below 92 earned their first wage of 97,000 tenge, 12,000 tenge higher on average than 337 graduates that received diploma grade of 92 and more. These results call for a more detailed analysis of all unexpected cases. At this stage, we can only conclude that the introduction of the diploma projects cause major disruption and possibly revealed significant problems in the learning outcomes assessment process.

It seems that explaining graduates’ employability is a much easier task than explaining their first job wage level. It may be related to a fact that respondents were reluctant to reveal their true incomes during the phone conversation or reported biased values. Or simply other factors, not controlled by the university, are much more important for determination of the graduates’ wages in the short run.

## 7. Conclusions and recommendations for further research

This paper presents results of analysis of a telephone survey conducted among Narxoz University recent 1956 graduates. Such analysis, as shown above, provides deep and interesting insights into the learning and assessment processes and should be a part of annual quality assurance review in every university. For example, these results indicate that grading process at Narxoz requires a major review, as graduates with higher GPA exhibited lower employability and earned lower wages. Or that curriculum of Computer science specialization should undergo deep change, as employment of Computer science graduates is near 80 percent, at time when demand for good IT specialists globally exceeds their supply. In fact, appropriate changes have already taken place at Narxoz in 2017. Pre- and post-moderation of exams was introduced and Computer science students can now join two new tracks: Cyber-security and Data science.

Students that are determined to find jobs, acquire valuable competences when preparing bachelor diploma and actively participate in student life, have higher probability to find jobs and achieve higher wages. It means that the process of writing bachelor diploma thesis/project should be carefully designed and monitored and that student learning outcomes also depend on their extra-curricular activity.

We found that it is much harder to explain recent graduates' wages than their employability. Models have very low explanatory power or were unstable. It can be related to the low quality of collected wage data (with graduates reporting untrue or biased figures) or may simply mean that in the short-run other factors, not controlled by the university – are much more important when it comes to wage setting. We did find data patterns that contradict literature findings, for example while there is wide wage gap between graduates of various majors, the ranking of highest wage majors is not stable over time.

Unfortunately, we were not able to verify what was the impact of Narxoz academic policy change on employability and wages of recent graduates. While Narxoz graduates' first wages in 2016 fell in comparison with 2015, it should be attributed to a major economic shock (falling oil price and deep devaluation) that led to labor shedding in many sectors, that traditionally employed Narxoz graduates.

Finally, we established a reliable process of connecting with Narxoz graduates and collecting data about their professional progress. It was done in a form of a telephone survey, and calls were made by students' former scientific supervisors. This way one person makes only a few phone calls to people she or he knows, as opposed to delegating this task to alumni or career center, when few people have to make hundreds of calls each. Such phone survey will be repeated every year at Narxoz University.

Obtained results raised many research questions. In the Narxoz context we need to understand why a modification of academic policy resulted in such a dramatic change in relationship between assessment procedures and graduates' wages. Why distribution of wages



across specializations (majors) is so unstable, contrary to results in the literature. But there are also more general research questions. What is the relative importance of university-related factors and external factors in determining graduates' employability and wages. How quality assurance and accreditation procedures should change to account for a proper measurement market valuation of learning outcomes. And how to properly design alumni feedback mechanism such that it can be used in a timely manner to update HEI curricula.

## Bibliography

1. Artess, J., Hooley, T., and Mellors-Bourne, R. (2017). *Employability: A Review of the Literature 2012-2016*. York: Higher Education Academy.
2. Blicblau, A.S., Nelson, T.L., and Dini, K. (2014). Outcomes for students working in industry. In A. Bainbridge-Smith, Z.T. Qi, G.S. Gupta (Eds.), *Engineering the Knowledge Economy: Collaboration, Engagement & Employability – Proceedings of the 25th Annual Conference of the Australasian Association for Engineering Education* (pp. 796-803). Barton, ACT: School of Engineering & Advanced Technology, Massey University.
3. Borden, V.M.H., and Rajecki, D.W. (2009). First-year employment outcomes of psychology baccalaureates: relatedness, preparedness, and prospects. *Teaching of Psychology*, 27(3), 164-168 (first published July 1, 2000).
4. Braun, E.M.P., Sheikh, H., and Hannover, B. (2011). Self-rated competences and future vocational success: a longitudinal study. *Assessment & Evaluation in Higher Education*, 36(4), 417-427, doi: 10.1080/02602938.2010.534762.
5. Bristol, D.G. (2002). Using alumni research to assess a veterinary curriculum and alumni employment and reward patterns. *Journal of Veterinary Medical Education*, 29(1), 20-27.
6. Bruni, F. (2015). *Where You Go Is Not Who You'll Be: An Antidote to the College Admissions Mania*. Grand Central Publishing (17 March 2015).
7. Brunello, G., and Cappellari, L. (2008). The labour market effects of alma mater: evidence from Italy. *Economics of Education Review*, 27(5), 564-574. doi: 10.1016/j.econedurev.2007.05.004.
8. Cabrera, A.F., Weerts, D.J., and Vidal, J. (2003). Alumni surveys: Three conceptualizations to alumni research. In J. Vidal (Ed.), *Métodos de análisis de la inserción laboral de los universitarios* (pp. 55-80). León, España: Universidad de León Press.
9. Cabrera, A.F., Weerts, D.J., and Zulick, B.J. (2005). Making an Impact with Alumni Surveys. In Weerts, D.J., and Vidal, J. (Eds.), *Enhancing Alumni Research European and American Perspectives*. New Directions for Institutional Research, No.126. San Francisco: Jossey-Bass.

10. Cranmer, S. (2007). Enhancing graduate employability: best intentions and mixed outcomes. *Studies in Higher Education*, 31 (2), 169-184. doi: 10.1080/03075070600572041.
11. El-Temtamy, O.K., O'Neill, K., and Midraj S. (2016). Undergraduate employability training and employment: a UAE study. *Higher Education, Skills and Work-Based Learning*, 6(1), 100-115.
12. Gault, J., Leach, E., and Duey, M. (2010). Effects of business internships on job marketability: the employers' perspective. *Education + Training*, 52(1), 76-88.
13. Gault, J., Redington, J., and Schlager, T. (2000). Undergraduate business internships and career success: are they related? *Journal of Marketing Education*, 22(1), 45-53.
14. Gokuladas, V.K. (2011). Predictors of employability of engineering graduates in campus recruitment drives of Indian software services companies. *International Journal of Selection and Assessment*, 19, 313-319. doi:10.1111/j.1468-2389.2011.00560.x.
15. Hergert, M. (2009). Student perceptions of the value of internships in business education. *American Journal of Business Education*, 2(8).
16. Humburg M., Velden R., and Verhagen A. (2013). *The employability of higher education graduates: the employers' perspective*. Luxembourg: Publications office of the European Union.
17. Hurst, J.L., and Good, L.K. (2010). A 20-year evolution of internships: implications for retail interns, employers and educators. *The International Review of Retail, Distribution and Consumer Research*, 20(1), 175-186. doi: 10.1080/09593960903498342.
18. Iftikhar, H., McNally, S., and Shqiponja, T. (2009). University quality and graduate wages in the UK. *IZA Discussion Paper, No. 4043*.
19. Jackson, D. (2013). Factors influencing job attainment in recent bachelor graduates: evidence from Australia. *Higher Education*, 68(1), 135-153. doi:10.1007/s10734-013-9696-7.
20. Jackson, D. (2015). Employability skill development in work -integrated learning: barriers and best practice, *Studies in Higher Education*, 40(2), 350-367. doi: 10.1080/03075079.2013.842221.
21. Javier, B. (2015). Determinants of employability of the information technology graduates in Cagayan State University, Philippines. *Countryside Development Research Journal*, 3(1), 43-52.
22. Jolly, R.W., Yu, L., and Orazem, P.F. (2009). *After they graduate: an overview of the Iowa State University alumni survey*. Economics Working Papers (2002-2016), 134. Retrieved from [http://lib.dr.iastate.edu/econ\\_las\\_workingpapers/134](http://lib.dr.iastate.edu/econ_las_workingpapers/134).
23. Knouse, S.B., Tanner, J.R., and Harris, E.W. (1999). The relation of college internships, college performance, and subsequent job opportunity. *Journal of Employment Counseling*, 36, 35-43. doi:10.1002/j.2161-1920.1999.tb01007.x.

24. Kumarasinghe, P.J., and Udeshika K.A.A. (2015, December 7-8). *Extra-Curricular Activities and Employability of Undergraduates in Sri Lanka*. Paper presented at the 12<sup>th</sup> International Conference on Business Management (ICBM) 2015, Colombo, Sri Lanka.
25. Lalanie, P.P., and Withanawasam, M.P.K. (2012). *Internship of undergraduates, their academic performance and future employability*, presented at First International Economic Research Conference of the Sri Lanka Forum of University Economists. Colombo: University of Colombo.
26. Lau, H-H., Hsu, Y., Acosta, S., and Hsu, T-L. (2014). Impact of participation in extra-curricular activities during college on graduate employability: an empirical study of graduates of Taiwanese business schools, *Educational Studies*, 40(1), 26-47, doi: 10.1080/03055698.2013.830244.
27. Li, T., and Zhang, J. (2010). What determines employment opportunity for college graduates in China after higher education reform? *China Economic Review*, 21(1), 38-50.
28. Little, R. (1988), Missing-data adjustments in large surveys, *Journal of Business and Economic Statistics* 6, 287-296.
29. Loh, W-Y. (2011). Classification and regression trees, *Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery*, 1(1), January 2011.
30. Mason, G., Williams, G., and Cranmer, S. (2009). Employability skills initiatives in higher education: what effects do they have on graduate labour market outcomes? *Education Economics*, 17(1), 1-30. doi: 10.1080/09645290802028315.
31. Millican, J., and Bourner, T. (2011). Student-community engagement and the changing role and context of higher education, *Education + Training*, 53(2/3), 89-99, <https://doi.org/10.1108/00400911111115645>.
32. Nunley, J.M., Pugh, A., Romero, N., and Seals R.A. (2016). College major, internship experience, and employment opportunities: estimates from a résumé audit. *Labour Economics*, 38, 37-46.
33. Park, C.K. (2015). Student factors on employment of engineering graduates: a Korean University case. *Asian Journal of Innovation and Policy*, 4(3). doi:10.7545/ajip.2015.4.288.
34. Park, C.K., and Seol, S.S. (2016). Role of university on undergraduate employment by disciplines. *Asian Journal of Innovation and Policy*, 5(1). doi:10.7545/ajip.2016.5.1.035.
35. Pinto, L.H., and Ramalheira, D.C. (2017). Perceived employability of business graduates: The effect of academic performance and extracurricular activities. *Journal of Vocational Behavior*, 99, 165-178. <http://dx.doi.org/10.1016/j.jvb.2017.01.005>.
36. Qenani, E., MacDougall, N., and Sexton, C. (2014). An empirical study of self-perceived employability: Improving the prospects for student employment success in an uncertain environment. *Active Learning in Higher Education*, 15(3), 199-213.

37. Ramalheira, D.C. (2015). *The effect of the grade point average and of extracurricular activities on the perceived employability of business job applicants* (Master's dissertation). Retrieved from <http://www.rcaap.pt/detail.jsp?id=oai:repositorio-aberto.up.pt:10216/80399>.
38. Rayner, G., and Papakonstantinou, T. (2015). Student perceptions of their workplace preparedness: making work-integrated learning more effective. *Asia-Pacific Journal of Cooperative Education*, 16(1), 13-24.
39. Reddan, G., and Rauchle, M. (2016). Quality WIL + CDL = Employability. In M. Harvey & A. Rowe (Eds.), *WIL 2020: Pushing the boundaries – Proceedings of the 2016 ACEN National Conference* (pp. 28-31). Springvale South: Australian Collaborative Education Network Limited.
40. Richardson, J., Jackling, B., Henschke, K., and Tempone, I. (2013). Developing a collaborative model of industry feedback for work placement of business students. *Asia-Pacific Journal Of Cooperative Education*, 14(1), 27-43.
41. Rigsby, J.T., Addy N., Herring, C., and Polledo, D. (2013). An examination of internships and job opportunities. *Journal of Applied Business Research*, 29(4), 1131-1144.
42. Roshchin, S., and Rudakov, V. (2015). Do graduates wages measure the quality of education? A review of existing studies. *Voprosy obrazovaniya/Educational Studies (Moscow)*, 1, 138-171.
43. Rothman M., and Lampe, M. (2010). Business school internships: sources and resources. *Psychological Reports*, 106(2), 548-554.
44. Rumberger, R.W., and Thomas, S. (1993). The Economic returns to college major, quality and performance: a multi-level analysis of recent graduates, *Economics of Education Review*, 12(1), 1-19.
45. Sahama, T.R., Yarlagadda, P.K., Oloyede, A., and Willet, G. (2008, November). *Impact of Work Integrated Learning (WIL) on graduate preparation for the manufacturing industry*. Paper presented at the 9th Global Congress on Manufacturing and Management, Gold Coast, Australia.
46. Saunders, G., and Stivason, C. (2010). How are your graduates doing? Do they still love you? *Contemporary Issues in Education Research*, 3(5), 9-20.
47. Shoenfelt, E.L., L. Kottke, J.L., and Stone, N.J. (2012). Master's and undergraduate industrial/organizational internships, *Teaching of Psychology*, 39(2), 100-106.
48. Thomas, S.L., and Zhang, L. (2005). Post-baccalaureate wage growth within four years of graduation: the effects of college quality and college major. *Research in Higher Education*, 46(4), 437-459. doi:10.1007/s11162-005-2969-y.
49. Varghese, M.E., Parker, L.C., Adedokun, O., Shively, M., Burgess, W., Childress, A., and Bessenbacher, A. (2012). Experiential internships: understanding the process of student learning in small business internships. *Industry and Higher Education*, 26(5), 357-367.
50. Yu, L., Burton, A., and Rivero-Arias, O. (2007). Evaluation of software for multiple imputation of semicontinuous data. *Statistical Methods in Medical Research*, 16, 243-258.

**Appendix 1. Graduates' phone survey questions****1. How would you rate each of the following aspects of your study experience at Narxoz?  
(Low (L) / So-so (SS) / Good (G) / Very Good (VG) / Excellent (Ex))**

- A) In general, the study experience at Narxoz (L) / (SS) / (G) / (VG) / (Ex)  
B) In general, the study experience at your school (L) / (SS) / (G) / (VG) / (Ex)  
C) Experience of student (extracurricular) life at Narxoz (L) / (SS) / (G) / (VG) / (Ex)

**2. Have you planned to start looking for a job immediately after graduation from Narxoz?**

- A) Yes  
B) No

**3. Have you been employed 3 months after graduating from the University?**

- A) Yes, within 3 months  
B) Yes, after a longer time (indicate the number of months)  
C) No, I did not get a job

---

If the answer to question 3 is **NO**, the survey ends

**4. Have you got a job in line with your specialization?**

- A) Yes  
B) No

**5. What kind of company do you work for?**

- A) I have my own business  
B) In a small Kazakhstani company  
C) In an average size Kazakhstani company  
D) In a large Kazakhstani company  
E) In an international company  
F) In public administration

**6. What was your first position after graduation from Narxoz?**

- A) Head of the organization  
B) Head of structural unit  
C) Specialist  
D) Other (please specify) \_\_\_\_\_

**7. What was your income per month when you got your first job after graduation from Narxoz (the sum of all earnings per month (net): wages + other sources of income)?**

7.1. The sum in tenge \_\_\_\_\_

7.2. If the answer is “I don’t remember” or “I/m not willing to say that”, ask:

- |  |       |    |
|--|-------|----|
| 7.2.1. 100 000 tenge or more?            | YES / | NO |
| A) If YES, then 200 000 tenge or more?   | YES / | NO |
| B) If YES, then 250 000 tenge or more?   | YES / | NO |
| C) If NO, then 150 000 tenge or more?    | YES / | NO |
| 7.2.2. If NO, then 50 000 tenge or more? | YES / | NO |
| A) If YES, then 75 000 tenge or more?    | YES / | NO |
| B) If NO, then 25 000 tenge or more?     | YES / | NO |

**8. How often do you use (1) never (2) very rarely (3) from time to time (4) often (5) almost daily?**

A) Knowledge and skills acquired when preparing your thesis / project

(1) (2) (3) (4) (5)

B) Knowledge and skills acquired when studying at Narxoz, in general

(1) (2) (3) (4) (5)

**9. What role did the diploma project / diploma thesis play in your job placement?**

A) No role

B) In general, it was useful

C) I was hired because of writing a diploma thesis / diploma project

## Appendix 2.

### Description of variables used in the models:

**Y2016** – 1 if graduated in 2016; 0 graduated in 2015

**Spec** - specialization according to list with spec codes

Economics – 1, Management – 2, Marketing – 3, Finance – 4, Accounting and Audit – 5, Public management – 6, Social work – 7, Tourism – 8, Hospitality management – 9, Statistics – 10, HR Management – 11, Valuation -12, International relations – 13, International economics – 14, Law – 15, Customs – 16, Standardisation and certification – 17, Information systems – 18, Computer science – 19, Ecology – 20, Event management – 21

**School** – Narxoz school according to school code list

EconMan – 1, FinTech – 2, AppSci – 3, FIEP – 4

**Opinion Narxoz** – overall opinion about Narxoz experience, 1 – low, 5 – high

**Opinion\_school** – opinion about School (department) experience, 1 – low, 5 – high

**Stud\_life** – opinion about student life at Narxoz, 1 – low, 5 – high

**Job plan** – 1 if planned to get a job, 0 otherwise

**Job\_found** – 1 if job found in 3 months after graduation, 0 otherwise, 2 found later

**Job\_months** – NA, or value in months if job found but longer than during 3 months

**JobOnSpecialty** – 1 if job on specialty was found, 0 otherwise

**Company** – type of company that got a job

Own – 1, Small KZ – 2, Medium KZ – 3, Large KZ – 4, International – 5, Public sector – 6

**Job\_type** – type of job found

HeadOrg – 1, HeadUnit – 2, Spec – 3, Other – 4

**Other\_type** – NA or name of job if does not match Job\_type, or Master\_studies

**Income** – income in tenge, net, at first job

**Comp\_used\_Dipl** – do diploma related competences help you in your job:

Never – 1, Rarely – 2, Sometimes – 3, Often – 4, Everyday – 5

**Comp\_used\_Narxoz** – did Narxoz experience in general help you in your job:

Never – 1, Rarely – 2, Sometimes – 3, Often – 4, Everyday – 5

**Dipl\_job\_role** – did diploma writing helped to get a job:

No – 1, to some extent – 2, Yes – 3

**FA\_grade** – fast assessment grade, from 0 (worst) to 10 (best)