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CHOOSING THE FUTURE: ECONOMIC PREFERENCES FOR HIGHER EDUCATION USING DISCRETE CHOICE EXPERIMENT METHOD

Mikołaj Czajkowski
Tomasz Gajderowicz
Marek Giergiczny
Gabriela Grotkowska
Urszula Sztandar-Sztanderska

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Mikołaj Czajkowski
Faculty of Economic Sciences
University of Warsaw
e-mail: miq@wne.uw.edu.pl

Tomasz Gajderowicz
Faculty of Economic Sciences
University of Warsaw
e-mail: tgajderowicz@wne.uw.edu.pl

Marek Giergiczny
Faculty of Economic Sciences
University of Warsaw
e-mail: mgiergiczny@wne.uw.edu.pl

Gabriela Grotkowska
Faculty of Economic Sciences
University of Warsaw
e-mail: ggrotkowska@wne.uw.edu.pl

Urszula Sztandar-Sztanderska
Faculty of Economic Sciences
University of Warsaw
e-mail: sztanderska@wne.uw.edu.pl

Abstract

This study illustrates how respondents' stated choices (the discrete choice experiment method) combined with the random utility framework can be used to model preferences for higher education. The flexibility offered by stated preference data circumvents limitations of other approaches, and allows quantifying young people' preferences for selected attributes of higher education programs that are typically highly correlated in revealed preference data. The empirical study presented here is based on a survey of 20,000 Polish respondents aged 18-30, who stated their preferences for higher education programs in carefully prepared hypothetical choice situations. The attributes we considered include tuition fee, expected salary after graduation, quality of institution, interest in the field of study, distance from home, and mode of study. Using random parameters and latent class mixed multinomial logit models, we can formally describe young peoples' preferences, and identify the financial trade-offs they are willing to make, that is, estimate their willingness to pay for specific attribute levels in terms of increased tuition fees or expected salary after graduation. Accounting for respondents' observed and unobserved preference heterogeneity, we address a few research questions related to, for example, distinct preferences of students whose neither parent attained tertiary education, students from lower socio-economic groups, or students of a particular gender. Overall, we demonstrate how stated preference methods can be a useful tool for exploring economic preferences, better understanding the determinants of choices, forecasting, and designing the services offered by higher education institutions in an optimal way.

Keywords:
higher education institution choice, random utility model, stated preferences, discrete choice experiment

JEL:
I23, D12, H52

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1. Introduction

Educational decisions have significant economic consequences, both for individual career paths and for the economy as a whole (Sianesi and Reenen, 2003; Moretti, 2004). They determine the size and the structure of human capital resources, and thus, the size of potential output and welfare, both in economic and social dimensions (Blundell *et al.*, 1999; Fukuyama, 2001; Psacharopoulos and Patrinos, 2004). The quality of the accumulated human capital determines the rate of technological progress, and the ability to absorb new technologies (Nelson and Phelps, 1966; Romer, 1990; Benhabib and Spiegel, 2005). An economy with high quality human capital resources is more shock-resistant, flexible, and adaptive. This is particularly important in the era of globalization with dynamically changing economic conditions. The consequences of human capital accumulation go well beyond economic dimension. There is evidence of the link between the level of educational attainment and health status (Winkleby *et al.*, 1992; Lleras-Muney, 2005), quality of political life (Dee, 2004; Milligan, Moretti and Oreopoulos, 2004), and public safety or incidence of crime (Chiras and Crea, 2004; Lochner, 2004; Machin, Marie and Vujić, 2011). For all these reasons, effective shaping of higher education programs is a key component of public welfare.

The past few decades have witnessed a boom in university education worldwide. A growing share of secondary school graduates continue their education at the tertiary level hoping for higher future wages and better career prospects.[1] In economic terms, the decision to continue education, particularly at the tertiary level, may be seen as an investment decision. A rational consumer decides to incur outlays (direct and indirect (alternative), including financial and time inputs) in anticipation of future benefits, which include income generated from paid work and non-material benefits (e.g., the prestige that comes with the education, the occupation, and the sense of self-accomplishment). On the other hand, the growing market for university education resulted in an increasing heterogeneity of the service offered by higher education institutions (HEIs). Students may choose between different fields of study, more or less prestigious HEI, different modes of study, and more. The alternatives also differ with respect to tuition fees and expected salaries upon completion of a degree. Higher education candidates' decisions allow an insight into their preferences for education, and hence, identifying trade-offs they are or are not willing to make with respect to attributes of

[1] For example, in the EU-15 countries the average share of persons aged 25-64 with tertiary attainment in education grew from 17.7% in 1995 to 30.8% in 2014 [Eurostat, 2015]. In many countries, college degree has become the most common level of education in this age group.

the education programs they choose. Modeling their preferences for these attributes is, therefore, crucial for better understanding of determinants of choices, forecasting, and designing the services offered by HEIs in an optimal way.

Economic models of university choice process are based on the assumption that the choice is a rational process, and that students do what is best for them.[2] This provides the basis for utilizing the random utility framework (McFadden, 1974; McFadden, 2001), and utilizing discrete choice data for quantitative modeling of their utility functions. Prospective students are often found to short list and evaluate the attributes they consider important when choosing a university (Hossler and Gallagher, 1987). Representing the available alternatives as bundles of attributes (Lancaster, 1966) allows us to investigate how choices change as one or more of a good's attributes are varied in either a continuous or discrete manner. In addition, if one of the choice attributes is monetary (e.g., tuition fee or expected earnings), random utility framework allows for calculating marginal rates of substitution of some attributes for money, and thus, estimating their implicit prices.

The data used for modeling consumers' preferences may come from two main sources – revealed or stated preferences. The former refers to the situation in which individuals' actual choices are observed, whereas the latter utilizes information on choices made in experimentally controlled hypothetical settings (Carson and Czajkowski, 2014). In each case, the choice alternatives are synthetically described using their characteristics (attributes). Observing the attribute levels of the available alternatives and individuals' choices allows for inference with respect to the importance of the attribute levels, that is, to formally model consumers' utility functions (Lancaster, 1966).

Nearly all available empirical studies utilizing a random utility framework are based on revealed preferences. The problem with this approach is that many of the attribute-level combinations are never observed in the market, and the ones that are observed are often highly correlated or even collinear (e.g., tuition fees in prestigious HEIs are usually higher). In addition, individuals may not have perfect knowledge, that is, their choices are driven by subjectively expected, rather than objectively observed, attribute levels (Goeree, 2008), possibly because acquiring and processing product information is costly (Hauser and Wernerfelt, 1990). They may also include exogenous constraints on choices resulting in not including all possible alternatives in their consideration set – for example, exclude universities in a different region or state (Roberts and Lattin, 1991; Gilbride and Allenby, 2004). As a result, the estimates resulting from revealed preference data may be biased.

[2] C.f. status attainment models, which are based on social theory and focus on processes such as socialization, the role of the family, social networks and academic conditions (Hossler, Schmit and Vesper, 1999).

Stated preference data is usually free of these limitations, and hence, it is increasingly used for policy-relevant analysis in many fields of applied microeconomics, such as economics of public goods (environmental, health, transport) or marketing (see e.g., Hanley and Czajkowski, 2017). Surprisingly, with the notable exception of Sutherland (2012), to the best of our knowledge, there have been no random utility-based stated preference studies of tertiary education choices. Our study aims at demonstrating the potential of this approach for such applications. Considering the flexibility of random utility-based stated preference methods, we believe that they can greatly contribute to filling many of the research gaps in this field.

In what follows, we present the results of a large-scale stated preference study devoted to investigating young peoples' preferences for tertiary education. Using a sample of 20,000 respondents aged 18-30, we collected information about their preferred HEI choices, allowing us to quantify the influence of such attributes as tuition fees, expected salaries upon completion, quality of HEI, interest in the field of study, distance from home, and mode of study. By applying random utility framework, we are able to formally model young peoples' preferences, and identify the financial trade-offs they are willing to make, that is, estimate their willingness to pay (WTP) for specific attribute levels. Finally, accounting for respondents' observed and unobserved preference heterogeneity, we are able to address a few research questions related to distinct preferences of male versus female students, preferences of students whose neither parent attained tertiary education, and students from lower socio-economic groups (e.g., Dunnett *et al.*, 2012), among others.

2. Literature review: Modeling consumers' preferences for education

Manski and Wise (1983) were among the first to demonstrate the power of the random utility framework for understanding higher education choices. The framework assumes that students enroll the university/college that yields the highest utility. The choice data are analyzed with the use of discrete choice models, which are rooted in the economic choice theory (McFadden, 2001). Since then, many other applications followed, which investigated how institutional characteristics, such as cost, size, distance, the quality of academic programs, and the availability of financial aid, influence college decision-making.

Bergerson (2009) provided an extensive review of the most commonly studied institutional factors that students weighed when selecting tertiary education. These included entry requirements (e.g., Brown, Varley and Pal, 2009); facilities, such as computer and library equipment; quality of university accommodation and price of university-owned accommodation (e.g., Fleming and Storr,

1999; Price *et al.*, 2003; Maringe, Foskett and Roberts, 2009); location of the university within a country (e.g., Wright and Kriewall, 1980; Welki and Navratil, 1987; Moogan, Baron and Bainbridge, 2001; Foskett, Roberts and Maringe, 2006); and distance from home (e.g., Hooley and Lynch, 1981; Moogan, Baron and Harris, 1999; Price *et al.*, 2003; Drewes and Michael, 2006). Quality of teaching, in terms of the amount of contact time and qualifications of teaching staff (James, Baldwin and McInnis, 1999; Foskett and Hemsley-Brown, 2001), and academic reputation, such as position in league tables or national rankings, have been found to have a significant impact (Brooks, 2002; Pasternak, 2005; Clarke, 2007) too. Finally, economic incentives, such as tuition fees (e.g., Bergerson, 2009), graduate employment, and salary (e.g., Soutar and Turner, 2002; Maringe, 2006) have been found to be important factors in prospective students' choices.

Another line of research focused on how students aspiring to post-secondary education develop a choice set, decide where to apply, and, conditional on admission, make their enrolment decisions (Zemsky and Oedel, 1983; Hearn, 1984; Hossler, Braxton and Coopersmith, 1989; Paulsen, 1990; McDonough, 1997; Hossler, Schmit and Vesper, 1999). An important insight from these studies is that better students and those from high socio-economic status families apply to many schools, more selective schools, and more costly schools.

Although most empirical researchers concerned with investigating educational choices using revealed preference data employ the random utility framework, studies differ in how university choice sets are specified. While some analysts presume that students consider every possible postsecondary institution (e.g., Long, 2004a; b), others define subsets of institutions that granted respondents' admission (Avery and Hoxby, 2004; Niu, Tienda and Cortes, 2006). Niu and Tienda (2008) showed that how choice sets are specified has significant impact on obtained preference estimates. The ambiguity related to the alternatives that constitute choice sets of individuals' observed decisions may be an important shortcoming of revealed preference studies, potentially resulting in biased estimates (Roberts and Lattin, 1991; Gilbride and Allenby, 2004).

Finally, it is worth noting that there are several empirical studies that investigated educational choices using conjoint analysis (e.g., Dunnett *et al.*, 2012). Conjoint analysis originated in mathematical psychology (Krantz and Tversky, 1971), and has been mostly used in applied marketing (Green and Rao, 1971; Wittink and Cattin, 1989). It refers to several ways of eliciting preferences, wherein respondents rate "packages" of attributes or provide subjective attribute importance measures, and are, therefore, not consistent with the neoclassical economic theory (Louviere and Woodworth, 1983; Friedman and Amoo, 1999). In addition, classical conjoint

measurement models are not associated with any error theory, and hence, they cannot be statistically interpreted or tested (Louviere, Flynn and Carson, 2010).

3. Choice experiment of higher education institutions in Poland

In what follows, we present a stated preference study of young people's higher education institution choices in Poland to demonstrate the potential of the choice experiment method, and to investigate the isolated effects of the attributes identified in the literature as significant determinants of choices (including estimating respondents' WTP for specific attribute levels). In particular, we look at tuition fees, expected salaries upon completion, quality of HEI, interest in the field of study, distance from home, and mode of study. In addition, we account for respondents' observed and unobserved preference heterogeneity, and show how it can be used for addressing policy-relevant research questions.

3.1. Higher education market in Poland

The Polish higher education market evolved substantially during the nearly 30 years that passed since the beginning of the economic transition. On the supply side, the number of HEIs grew considerably. A major part of the newly established HEIs were private entities, usually relatively small and offering education in the fields, wherein the demand was high and the costs of delivery were relatively low (social sciences, humanities, pedagogy, etc.).

Another important feature of the Polish higher education market is the growth of atypical form of studies, including part-time studies (realized on weekends or in the form of evening classes) or distance learning. Such forms were attractive for both universities and students, since they lowered the costs of education for both sides. However, the issue of the quality of education quickly became one of the major concerns of the higher education system in Poland. Despite some effort undertaken by both the state and by some HEIs themselves, the quality remains diverse, with low quality of education offered, in general, by private institutions, particularly offering studies on part-time basis.

On the demand side, at the beginning of the transition process, we have observed a growing interest for tertiary education. It was partly related to the relatively high wage premium resulting from obtaining a university diploma, and partly as a way to avoid problems with entering the labor market. The net enrolment rate for individuals aged 19-24 grew from 9.8% in 1990 to 40.8% in 2010, and fell slightly in the following years.

With such a dynamic growth of demand, and a response from the supply side of the market, the number of students in Poland went rapidly up – from 403,000 in 1990 to 1,953,000 in 2005. Since then, due to demographic changes and a fall of enrolment rate, the number of students fell by more than a half of a million. The structure of students by fields of study changed considerably. In the first decade of transition, social sciences, humanities, and pedagogy were particularly popular and, being relatively cheap to offer, these programs often did not limit admissions. In the later years, the popularity of construction, biotechnology, IT, medicine, among others, grew.

At the same time, the higher education system experienced significant institutional changes. Implementation of the Bologna process, and of the two-degree system, was one of the most important of them. It was supposed to increase labor force mobility and facilitate entry into the labor market.

Currently, the system of higher education in Poland is strongly affected by the relatively rapid decline in the number of students, resulting mainly from demographic developments. One of the consequences of this is the changing ownership structure of the higher education sector. In the first decade of the economic transition, higher education was regarded as a relatively profitable business. As a result, Poland moved from a 100% public system of higher education to a dual, public-private system. In 2005, private institutions constituted 71% of all HEIs in Poland, with 32% of all students. Starting from 2006, the role of the private HEIs has been decreasing. With falling demand, private HEIs could not withstand the competition from their public counterparts, partly offering fee-free programs, and usually associated with higher prestige and quality. Consequently, the Polish system of higher education is currently moving towards a nationalized system again, with a decreasing role of the private sector, and a dominant role of public funding. Between 2009 and 2015, the number of private HEIs decreased from 330 to 283, with the number of students falling from 633,000 (33% of all students) to 330,000 (23% of all students) (GUS, 2016b).

It should be noted that, in parallel to the development of private HEIs, public universities in Poland had begun to offer paid studies. Students who did not qualify for the free programs could still enroll in them (or their part-time equivalents) if they were prepared to pay tuition fees. Moreover, the share of privately-financed students (paying study fee) has been on the decline –from 58.6% (1.14 million) in 2006 to 42.1% (0.62 million) in 2014, to the forecasted 20% in 2022 (Kwiek, 2016).

Finally, interpretation of the results that follow requires mentioning that, since 2008, there have been government-funded programs aimed at encouraging candidates to choose particular disciplines of study. These programs have involved 16 fields that were considered of strategic

importance for the country, such as materials science, civil engineering, automatic control, robotics, environmental protection, mechanical engineering, or industrial design. The goal of the program was to increase the demand for studying these selected fields and "restore balance" between technical and social focus of higher education. Despite the lack of tuition fees and relatively high stipends offered to students, the programs have not been very popular, possibly because of a technical focus and the lack of an obvious link with employment after graduation. In addition, low entry requirements lead to relatively high dropout rates among students.[3]

Consequences of the ongoing changes in the higher education market in Poland are difficult to predict. On the one hand, public HEIs are generally regarded as offering higher quality of teaching, while private HEIs tend to lower the requirements in order to retain students. As a result, a higher share of public HEIs students may lead to an overall increase in higher education quality. On the other hand, positive effects of cost-sharing mechanisms for the students' motivation and their performance have been shown (e.g., Orr, Wespel and Usher, 2014). Therefore, the growing share of students with public funding of their studies may bring the opposite results for quality. Overall, the ownership changes in the Polish higher education system go against global trends, and thus, result in uncertain financial and quality implications for the system's future performance.

Finally, it is worth noting that the quality of HEIs and career prospects of the graduates of different programs are not commonly known. It was only in 2016 when the first results of the public tracer studies were published. As a result, students' educational decisions are made with incomplete information, which also influences their higher education preferences.

3.2. Design and implementation of the survey

Our survey was aimed at investigating young people's preferences regarding the choice of higher education. The main component of the survey consisted of a choice experiment wherein respondents were asked to choose from hypothetical alternatives, representing different hypothetical studies. The attributes that were used to describe the alternatives were selected based on the literature review, experts' opinions, and qualitative research, wherein young people (future, current, and past students) were asked about the main characteristics that drove their HEI choices.

[3] In addition to the sponsored programs, the state supports students from low-income families with a system of social stipends. It also offers scholarships for students with the best academic results. They are available to all students, whether their study is free or paid, in public or private HEIs. These stipends are typically much lower and offered to not more than a few students.

From the extensive list of attributes, we included six attributes: tuition fee (cost of the studies per semester)[4], expected average net salary five years after graduation from a given program, compliance with personal interests (the extent to which a given program of studies matches student's personal interests)[5], distance from home (when graduating from secondary school), prestige of the HEI in a particular field, representing the position of the HEI in the national rankings for a given field of studies, and the mode of studies, which represented full-time or part-time studies. The attributes and attribute levels are summarized in Table 1.

[4] One of the goals of our study was to examine the extent to which a system of stipends can be used to influence students' educational choices. The Polish Ministry of Science and Higher Education has currently proposed such a system. The negative tuition fee levels represent the case of being offered a stipend for studying in one of the sponsored departments.

[5] To familiarize respondents with these levels, before the stated choice part, respondents were presented with a list of main fields of studies, and were asked to assess how adequately their interests match a given field (using the same levels).

Table 1. The attributes and attribute levels used in the stated choice

Attributes	Attribute levels[6]
Tuition fee per semester	• -750 EUR (stipend) • -250 EUR (stipend) • 0 EUR • 750 EUR • 1,250 EUR • 1,750 EUR
Mean net monthly salary five years after graduation[7]	• 500 EUR • 750 EUR • 1,000 EUR • 1,500 EUR • 2,000 EUR
Compliance with personal interests	• Low • Medium • High
Distance from home	• 0-30 km • 31-100 km • 101-250 km • 251 km or more
Prestige of the HEI	• 1-3 position in the national ranking • 4-10 position in the national ranking • 11-30 position in the national ranking
Mode of study	• Full-time: students spend the full amount of hours per week on their program of study • Part-time: courses offered at weekends to accommodate students who want to work full-time.

The attributes and their levels were carefully explained to respondents in the survey. They were asked to assume that the alternatives were the same with respect to any characteristics not explicitly listed in the choice situations.[8]

Each respondent was presented with 12 choice situations, each consisting of three alternatives. For each choice situation, a respondent was asked to select the preferred alternative. The combinations of the attribute levels presented in each of the choice tasks (i.e., the experimental design) were

[6] All monetary attributes in the survey were presented in PLN. To facilitate interpretation, we present their equivalents in EUR. At the time of the study, 1 PLN ≈ 0.25 EUR ≈ 0.33 USD.

[7] In 2014, average monthly salary in the national economy in Poland was 3,783 PLN (approximately 900 EUR).

[8] To ensure the discrete choice experiment was understandable and credible to respondents, the development of the questionnaire was conducted according to the state-of-the-art recommendations for stated preference studies, including thorough qualitative pre-testing.

selected in a Bayesian-efficient way (Ferrini and Scarpa, 2007; Scarpa and Rose, 2008), that is, to minimize the determinant of the expected AVC matrix of the estimates (*D-error*) given the priors on the parameters of a representative respondent's utility function derived from a pilot survey.[9] An example of a choice card is given in Table 2.

Table 2. Example of a choice card (translated)

Situation 1	**Alternative A**	**Alternative B**	**Alternative C**
Tuition fee per semester	-1 000 PLN (stipend)	5 000 PLN	7 000 PLN
Mean salary five years after graduation	2 000 PLN	6 000 PLN	3 000 PLN
Compliance with personal interests	Low	Medium	High
Distance from home	31-100 km	251 km or more	0-30 km
Prestige of the HEI (ranking place)	1-3	11-30	4-10
Mode of study:	Part-time (weekends)	Full-time (weekdays)	Part-time (weekends)
Your choice:	□	□	□

The main survey was administered in the form of computer-assisted personal interviews (CAPI) to a random sample[10] of 20,000 young people in Poland. The interviews were conducted by a professional public opinion polling agency in August-December 2014. All respondents were asked about their education history (especially, with respect to post-middle school education), current economic activity, and family situation at the age of 17.

[9] The order of choice situations, alternatives, and attributes was randomized to avoid potential ordering effects.

[10] The respondents were drawn from a PESEL database (Universal Electronic System for Registration of the Population). Nineteen thousand respondents were drawn from people born between 1 January 1984 and 31 December 1995 (aged 20-30), excluding students of basic vocational schools, middle and primary schools, and graduates of these schools who did not continue their education (which rules them out from going to university). In addition, 1,000 respondents were drawn from people born between 1 January 1995 and 31 December 1996 (aged 18-19, with the same exclusions). The purpose of dividing the sample into two parts was to ensure adequate representation of people who are yet to decide whether to go to a university or who were making that decision at the time of the study.

The questionnaire was module-based – the interview script for a specific respondent matched that person's level of schooling:

- Graduates of post-middle schools who have not gone to university, and do not intend to do so within the next 12 months (n = 10,936);
- Students or graduates of post-middle schools before enrolment, who declared that they intend to go to university within the next 12 months (n = 1,167);
- First degree students, second degree or third degree students, and students of master's vocational courses (n = 3,501); and
- University graduates (n = 4,396).

The choice experiment setting was tailored to each group's education path – the choices were framed as if participants were to enroll in tertiary education or could choose their course and university again (instead of what they actually chose). Even though the choices were hypothetical, they reveal our respondents' preferences. In what follows, we analyze the preferences of each of the four groups of respondents separately, as they differ in their previous educational path and experience.

3.3. Econometric framework

Modeling consumers' preferences using discrete choice data draws on theories of economic value (Lancaster, 1966) and the random utility theory (McFadden, 1974). It assumes that the utility an individual receives from an alternative chosen depends on observed characteristics (attributes) and unobserved idiosyncrasies, which are represented by a stochastic component. The utility of individual, i, resulting from choosing alternative, j, in situation, t, can be expressed as:

$$V_{ijt} = \mathbf{X}_{ijt}\boldsymbol{\beta} + e_{ijt}. \quad (1)$$

The utility expression is separable in the observed choice attributes, $\mathbf{X}_{ijt}$, with the corresponding vector of parameters, $\boldsymbol{\beta}$, and the stochastic component, e_{ijt}, accounting for factors other than those observed by an econometrician. Assuming that the stochastic component (e_{ijt}) follows an independent and identical extreme value (type I) distribution,[11] it leads to familiar logit probability specification,

[11] Note that normalizing variance does not change the ordering provided by the utility function – it still represents the same preferences.

$$P(j|J) = \frac{\exp(\mathbf{X}_{ijt}\boldsymbol{\beta})}{\sum_{k=1}^{J}\exp(\mathbf{X}_{ikt}\boldsymbol{\beta})}, \quad (2)$$

which can be used for deriving the maximum likelihood estimator of the utility function parameters, conditional on individuals' observed choices and attribute levels associated with choice alternatives.

Given that we are interested in marginal rates of substitution with respect to the monetary attribute p, it is convenient to introduce the following modification, which is equivalent to using a money-metric utility function (also called estimating the parameters in WTP space) (Train and Weeks, 2005):

$$U_{njt} = \alpha\left(p_{njt} + \boldsymbol{Y}_{njt}\boldsymbol{b}\right) + e_{njt} = \alpha\left(p_{njt} + \boldsymbol{Y}_{njt}\boldsymbol{\beta}\right) + e_{njt}. \quad (3)$$

In this specification, the vector of parameters, $\boldsymbol{\beta} = \boldsymbol{b}/\alpha$, can be directly interpreted as a vector of implicit prices (marginal WTPs) for the non-monetary attributes, $\boldsymbol{Y}_{njt}$, facilitating an interpretation of the results.

Finally, note that in the above formulations, consumers' preferences are assumed homogenous across the entire sample (the parameters, $\boldsymbol{\beta}$, are the same for all respondents). This results in a multinomial logit model (MNL). One way of relaxing this assumption – that is, allowing for some level of (unobserved) preference heterogeneity and, possibly, correlations between the alternatives and choice tasks – is to is to include consumer-specific parameters, $\boldsymbol{\beta}_i$, which leads to a mixed logit model.

Two commonly used approaches are to make mixing distributions continuous or discrete. If individual parameters are assumed continuously distributed following a parametric distribution specified a priori by a modeler, $\boldsymbol{\beta}_i \sim f(\mathbf{b}, \boldsymbol{\Sigma})$, with means, $\mathbf{b}$, and variance-covariance matrix, $\boldsymbol{\Sigma}$, the random parameters mixed logit model is formed (RP-MXL, McFadden and Train, 2000; Hensher and Greene, 2003). If, on the other hand, individual parameters are assumed to follow a discrete distribution (belong to one of C sets of parameters), the so-called latent class mixed logit model is formed (LC-MXL, Greene and Hensher, 2003). This specification assumes there is a finite set of classes of respondents of particular preferences, so that $\boldsymbol{\beta}_c$ is the vector of parameters describing the preference of class, c, from among C possible classes. Inside the classes, the probability of choosing a given alternative is described in the same way as for the MNL model. The respondent's belonging to a given class is not observable, and it is probabilistically described using a logit formula:

$$\mathrm{P}(class = c) = \frac{\exp(\mathbf{z}_i \boldsymbol{\theta}_c)}{1 + \sum_{n=1}^{C-1} \exp(\mathbf{z}_i \boldsymbol{\theta}_n)}, \tag{4}$$

where $\mathbf{z}_i$ is the vector of $C-1$ constants and individual-specific characteristics, which may have an impact on the probability of his or her belonging to a given class.

3.4. Results

Respondents' choices allow an insight into their preferences. We start by presenting the general overview of respondents' preferences through the random parameters mixed logit (RP-MXL) model. The coefficients in Table 3 correspond to money-metric utility function (aka WTP-space estimation) wherein the marginal utility of tuition fee (in 1,000 EUR per semester) is set to 1, which provides a reference for other coefficients. In effect, the coefficients can readily be interpreted as the marginal WTP for respective attribute levels. The estimated coefficients represent the means and standard deviations of distributions of individual-specific parameters, thus accounting for unobserved preference heterogeneity. All distributions are normal, except for salary after graduation, for which lognormal distribution provided a better fit (and is consistent with theoretically expected strictly positive preferences for higher salary). The model allows for correlations between random parameters – the estimated correlations are presented in the online supplement. [12,13]

[12] The models presented here were estimated using a DCE package developed in Matlab and available at https://github.com/czaj/DCE. The code and data for estimating the specific models presented in this study, as well as supplementary results, are available from http://czaj.org/research/supplementary-materials.

[13] In simulation of the log-likelihood function, we used 10,000 Sobol draws with a random linear scramble (Czajkowski and Budziński, 2017).

Table 3. Respondents' marginal willingness to pay (WTP) for attribute levels – the results of the random parameters conditional mixed logit model in WTP-space (relative to tuition fee in 1,000 EUR per semester)

Utility function of those who:	Never went to university		Currently consider university		Students		Graduates	
Parameters / Attributes	Means	St. Dev.	Means	St. Dev.	Means	St. Dev.	Means	St. Dev.
Mean salary five years after graduation (1,000 EUR)	0.8971***	1.2799***	0.8700***	1.0738***	0.9797***	1.3137***	0.8886***	1.0344***
	(0.0257)	(0.1007)	(0.0574)	(0.1442)	(0.0426)	(0.1327)	(0.0298)	(0.0763)
Stipend (250 EUR)	-0.1556***	0.3309***	-0.1458***	0.4048***	-0.2416***	0.3727***	-0.2490***	0.3535***
	(0.0142)	(0.0105)	(0.0430)	(0.0367)	(0.0271)	(0.0246)	(0.0223)	(0.0201)
Stipend (750 EUR)	0.0321*	0.5571***	0.0827	0.6894***	0.0442	0.6134***	0.0487*	0.5677***
	(0.0186)	(0.0139)	(0.0547)	(0.0425)	(0.0351)	(0.0310)	(0.0275)	(0.0253)
Compliance with personal interests (medium vs. low)	0.4000***	0.4295***	0.5776***	0.5264***	0.7398***	0.7239***	0.6355***	0.6569***
	(0.0120)	(0.0112)	(0.0321)	(0.0374)	(0.0276)	(0.0284)	(0.0210)	(0.0221)
Compliance with personal interests (high vs. low)	0.5154***	0.6980***	0.7582***	0.8907***	0.9208***	1.2265***	0.8026***	1.0323***
	(0.0150)	(0.0139)	(0.0426)	(0.0453)	(0.0360)	(0.0355)	(0.0256)	(0.0263)
Prestige of the HEI (program ranked 4-10 vs. 11-30)	0.0366***	0.0679***	0.1819***	0.2223***	0.0939***	0.0792***	0.0615***	0.0544***
	(0.0082)	(0.0109)	(0.0309)	(0.0316)	(0.0201)	(0.0234)	(0.0141)	(0.0202)
Prestige of the HEI (program ranked 1-3 vs. 11-30)	0.0444***	0.0426***	0.1435***	0.2337***	0.0969***	0.1961***	0.0808***	0.1061***
	(0.0084)	(0.0093)	(0.0311)	(0.0298)	(0.0212)	(0.0345)	(0.0150)	(0.0184)
Distance from home (100 km)	-0.2087***	0.2753***	-0.1984***	0.2589***	-0.2150***	0.3239***	-0.2169***	0.2799***
	(0.0069)	(0.0056)	(0.0188)	(0.0180)	(0.0126)	(0.0119)	(0.0101)	(0.0102)
Mode of study (full time vs. part time)	-0.3527***	0.5167***	-0.2359***	0.8916***	-0.0826***	0.9468***	-0.2554***	0.8009***
	(0.0128)	(0.0117)	(0.0475)	(0.0431)	(0.0290)	(0.0271)	(0.0221)	(0.0203)
Model Diagnostics								
LL at convergence	-113,094.39		-12,268.60		-37,215.64		-46,444.05	
LL at constant(s) only	-144,150.54		-15,384.29		-46,143.71		-57,941.94	
McFadden's pseudo-R^2	0.2154		0.2025		0.1935		0.1984	
Ben-Akiva-Lerman's pseudo-R^2	0.4380		0.4289		0.4242		0.4266	
AIC/*n*	1.7246		1.7614		1.7748		1.7633	
BIC/*n*	1.7294		1.7965		1.7881		1.7742	
n (observations)	131,232		14,004		42,012		52,752	
r (respondents)	10,936		1,167		3,501		4,396	
k (parameters)	65		65		65		65	

Note: *, **, *** indicate significance at 10%, 5%, and 1% level, respectively. Standard errors given in parentheses.

The results presented in Table 3 show that all groups of respondents are quite similar with respect to their preferences for expected salary after graduation. Their choices show that, on average, they are willing to trade approximately 1,000 EUR in a tuition fee per semester for 889 EUR (graduates) to 978 EUR (students) in expected salary per month.

Preliminary analysis indicated that marginal utility of increased tuition fees was significantly different (with respect to its absolute value) than marginal utility of stipends offered in funded programs.[14] For this reason, we model the two parameters separately – while mean marginal utility

[14] Asymmetry of marginal preferences with respect to 0, and can be related to i.a. prospect theory (Kahneman and Tversky, 1979) It is usually observed in empirical studies. See, for example, Bartczak *et al.* (2017).

of tuition fee is normalized to 1, and represents a reference in our WTP-space model, the marginal utility of stipends (effectively, negative tuition fees) is allowed to differ. All groups of respondents are quite similar with respect to their preferences for programs offering stipends. While programs offering low stipends are perceived as less preferred on average (negative coefficients representing mean WTP for programs that offer a stipend of 250 EUR), the estimated coefficients for programs with higher level of stipends become positive, although in most cases not statistically different from zero. This result may seem unexpected, since being offered a stipend is expected to be beneficial compared to no tuition fee or even having to pay. However, as revealed by the qualitative analysis that preceded the survey, respondents associated programs that offered stipends with a requirement to meet certain criteria (e.g., choosing a particular program or excellent academic results). Consequently, our results show that the current stipend program is not viewed as particularly attractive, on average. A stipend of 750 EUR is barely able to compensate students for the disutility associated with other perceived characteristics of the programs offering stipends. However, we note the presence of substantial preference heterogeneity in the population with respect to this attribute, as indicated by relatively high estimates of standard deviations around the means.

Next, we observe preferences for programs that are more in line with one's personal interests. This effect is the weakest for young people who never went to university (they would be willing to pay, on average, 400 EUR or 515 EUR per semester more for studies that can be characterized with medium- or high-compliance levels, respectively) and the highest for current students (740 EUR and 921 EUR, respectively). Note that similar calculations can be made for trade-offs between compliance with personal interests and expected salary. The online supplement to our paper presents estimation results of a model wherein WTP for attribute levels is expressed in terms of expected mean salaries after graduation. We find that respondents who are willing to enroll in programs moderately or below in line with their interests require an increase of expected monthly salary of 659 EUR to 1,428 EUR.

Although respondents' display significant preferences for better HEIs, their mean WTP for higher-ranked programs is relatively low. This time, there are also larger differences between distinct groups of respondents, with those who never went to university willing to pay at least 44 EUR or 37 EUR per semester more for programs ranked as the top three or top 10 in the country, respectively. This is followed by graduates (80 EUR or 62 EUR), current students (around 97 EUR or 94 EUR), and those currently considering going to a university (144 EUR or 182 EUR). There are a few potential interpretations of this finding. It is possible that consumers do not have extensive knowledge about the differences in quality between HEIs in Poland. They are perceived

as quite similar with respect to offered quality (students care about a degree, not necessarily the quality of the institution that issues it) or simply that the job market does not recognize the differences resulting from the quality of programs and HEIs. Alternatively, because the best HEIs in Poland are public, and approximately 60% of enrolments are free (no tuition fee), it is possible that respondents would rather choose a different program that is free, than be required to pay for one that may be on top. Finally, since the estimates presented here correspond to the mean, it is possible that on average, respondents do not necessarily want to enroll in top universities, expecting higher requirements, expected effort, and cost in terms of time devoted to studying, and thus, associating them with higher probability of non-completion. In what follows, we shed more light on this issue by exploring what socio-demographic groups of respondents care about the quality of the course the most.

The last two attributes represent respondents' preferences for HEIs that are relatively closely located to their hometowns and average preferences for full-time (i.e., regular weekday programs) versus part-time programs. The former may be related to the Polish real estate market, with its relatively low availability of apartments for rent. As a result, educational choices may be significantly affected by the costly requirement of long-distance transfer. Regarding the latter, we find that respondents on average prefer part-time programs that can be combined with working part- or full-time during one's studies (particularly high for respondents who never went to university and already started their careers). This finding is in line with average respondents' relatively low preferences for highly ranked HEIs, possibly expecting a requirement of higher inputs of students' time. Once again, however, high standard deviations around this effect indicate the existence of substantial preference heterogeneity, with many respondents likely preferring full-time weekday programs.

Next, we turn into the latent class model, which allows us to identify discrete latent classes of preferences, rather than assuming that the distribution of preferences in the population is continuous. The model also makes the probability of respondents' belonging to these classes a function of their socio-demographic variables. The number of latent classes is always a trade-off of explanatory power, the number of additional parameters, and the possibility of interpretation. In what follows, we present the model with four latent classes, which we found the most insightful, yet manageable. The results are presented in Table 4.[15]

[15] The model is estimated in preference space, rather than in WTP-space, because this time we are interested in the distribution of preferences, including marginal sensitivity to tuition fees, which was otherwise confounded with WTP

Table 4. Respondents' preferences classified into latent classes – the results of the latent class conditional logit model

	Latent class 1	Latent class 2	Latent class 3	Latent class 4
Utility function				
Mean salary five years after graduation (1,000 EUR)	2.2541***	1.0617***	0.5593***	0.3020***
	(0.0409)	(0.0157)	(0.0259)	(0.0084)
Tuition fee per semester (1,000 EUR)	-0.7515***	-2.5945***	-0.9503***	-0.5105***
	(0.0347)	(0.0321)	(0.0328)	(0.0098)
Stipend (250 EUR)	-0.1008**	-0.0863***	-0.3203***	-0.0839***
	(0.0478)	(0.0190)	(0.0407)	(0.0131)
Stipend (750 EUR)	0.2773***	0.0691***	-0.0715	-0.0004
	(0.0461)	(0.0230)	(0.0445)	(0.0141)
Compliance with personal interests (medium vs. low)	0.5041***	0.4597***	0.6313***	0.4638***
	(0.0338)	(0.0183)	(0.0359)	(0.0113)
Compliance with personal interests (high vs. low)	0.1260***	0.4154***	0.9378***	0.7460***
	(0.0460)	(0.0204)	(0.0445)	(0.0119)
Prestige of the HEI (program ranked 4-10 vs. 11-30)	-0.0311	0.1162***	0.1303***	0.0411***
	(0.0311)	(0.0176)	(0.0328)	(0.0096)
Prestige of the HEI (program ranked 1-3 vs. 11-30)	-0.0530*	0.1552***	0.0329	0.0800***
	(0.0305)	(0.0188)	(0.0313)	(0.0099)
Distance from home (100 km)	-0.0869***	-0.1592***	-0.3351***	-0.2242***
	(0.0162)	(0.0086)	(0.0172)	(0.0051)
Mode of study (full time vs. part time)	-0.2649***	-0.3234***	-2.5780***	0.0900***
	(0.0279)	(0.0162)	(0.0689)	(0.0104)
Class probability				
Constant	-1.5074***	-0.8736***	-3.2311***	0.0000
	(0.1537)	(0.1059)	(0.1731)	(fixed)
Never went to university (vs. graduates)	0.1385*	0.1921***	0.1393*	0.0000
	(0.0774)	(0.0538)	(0.0845)	(fixed)
Currently consider university (vs. graduates)	-0.3146**	0.1159	0.5694***	0.0000
	(0.1541)	(0.0950)	(0.1411)	(fixed)
Students (vs. graduates)	-0.0305	-0.1769***	0.0651	0.0000
	(0.0950)	(0.0684)	(0.1077)	(fixed)
Works (dummy)	-0.1150	0.0261	0.4729***	0.0000
	(0.0982)	(0.0695)	(0.1095)	(fixed)
Hours per week worked	0.0070***	0.0004	0.0088***	0.0000
	(0.0022)	(0.0016)	(0.0024)	(fixed)
Age (years)	0.1684**	0.2336***	0.2704***	0.0000
	(0.0830)	(0.0582)	(0.0926)	(fixed)
City 10-100k (vs. < 10k)	0.0325	0.2044***	0.2785***	0.0000
	(0.0859)	(0.0594)	(0.0940)	(fixed)
City >500k (vs. < 10k)	0.1681	0.0911	-0.3222**	0.0000
	(0.1119)	(0.0817)	(0.1542)	(fixed)
City >2M (vs. < 10k)	0.0632	0.4284***	-0.6057***	0.0000
	(0.1406)	(0.0937)	(0.2285)	(fixed)
Parents with primary education (vs. middle)	0.0185	0.2805***	0.3733***	0.0000
	(0.0679)	(0.0444)	(0.0698)	(fixed)
Parents with higher education (vs. middle)	0.4867***	-0.0585	-0.1173	0.0000
	(0.0824)	(0.0669)	(0.1142)	(fixed)
Financial situation of parents' household (1-5)	-0.1008**	-0.0832***	-0.0323	0.0000
	(0.0431)	(0.0298)	(0.0482)	(fixed)
Household size	-0.0445	0.0169	0.1655***	0.0000
	(0.0286)	(0.0193)	(0.0289)	(fixed)

expressed as an equivalent of their increase. The online appendix presents the results of latent class models with different numbers of classes.

Female	-0.1985***	-0.0180	0.1218	0.0000
	(0.0677)	(0.0464)	(0.0752)	(fixed)
Personal interests – engineering (vs. economics)	0.0270	-0.0870***	-0.0689*	0.0000
	(0.0314)	(0.0226)	(0.0366)	(fixed)
Personal interests – history (vs. economics)	-0.1148***	-0.0572**	-0.0325	0.0000
	(0.0394)	(0.0260)	(0.0414)	(fixed)
Personal interests – law (vs. economics)	-0.0403	-0.0668***	0.0268	0.0000
	(0.0343)	(0.0232)	(0.0359)	(fixed)
Personal interests – philology (vs. economics)	0.0511	-0.0161	-0.0706*	0.0000
	(0.0384)	(0.0263)	(0.0424)	(fixed)
Personal interests – sociology (vs. economics)	0.0016	-0.0342	-0.0294	0.0000
	(0.0381)	(0.0259)	(0.0408)	(fixed)
Personal interests – psychology (vs. economics)	-0.0648*	-0.0676***	0.0829**	0.0000
	(0.0360)	(0.0238)	(0.0369)	(fixed)
Personal interests – mathematics (vs. economics)	0.0621**	-0.0290	0.0341	0.0000
	(0.0308)	(0.0220)	(0.0350)	(fixed)
Personal interests – physics (vs. economics)	-0.0358	-0.1335***	-0.2386***	0.0000
	(0.0404)	(0.0299)	(0.0510)	(fixed)
Personal interests – environment (vs. economics)	-0.0235	-0.0330	-0.0697*	0.0000
	(0.0364)	(0.0251)	(0.0406)	(fixed)
Personal interests – agriculture (vs. economics)	0.0210	-0.0131	-0.0277	0.0000
	(0.0347)	(0.0239)	(0.0381)	(fixed)
Personal interests – medicine (vs. economics)	-0.0705*	-0.0713***	-0.0947**	0.0000
	(0.0403)	(0.0272)	(0.0448)	(fixed)
Personal interests – physical (vs. economics)	-0.0170	0.0180	0.0389	0.0000
	(0.0328)	(0.0223)	(0.0350)	(fixed)
Personal interests – art (vs. economics)	-0.1352***	-0.0738***	-0.0752*	0.0000
	(0.0402)	(0.0262)	(0.0429)	(fixed)
Average class probabilities				
	0.1140***	0.3120***	0.0976***	0.4763***
	(0.0040)	(0.0052)	(0.0036)	(0.0058)
Model Diagnostics				
LL at convergence	-201,532.51			
LL at constant(s) only	-249,109.35			
McFadden's pseudo-R^2	0.1910			
Ben-Akiva-Lerman's pseudo-R^2	0.4249			
AIC/*n*	1.7784			
BIC/*n*	1.7840			
n (observations)	226,788			
r (respondents)	18,899			
k (parameters)	124			

Note: *, **, *** indicate significance at 10%, 5%, and 1% level, respectively. Standard errors given in parentheses.

The latent classes differ with respect to preference parameters of each class. The first class is characterized by the strongest preferences for mean salary upon graduation and programs offering a stipend. Interestingly, students are not concerned with the prestige of the institution offering the program and its compliance with their personal interests. Latent class 2 members are the most sensitive to tuition cost and prestige of HEI. Parameters of class 3 indicate that respondents with high probability of belonging to this class are the most concerned with compliance of the program with their personal interests. These respondents appreciate prestige of the institution, although do not necessarily aim for the very best universities. They are also the most unlikely to enroll in the full-time model of study, and are most sensitive to distance from home. The last class comprises

of individuals who prefer full-time mode of study, care about compliance with their personal interests, and are the least sensitive to mean salary upon graduation.

Next, we are able to identify socio-demographic characteristics that allow for predicting which class the individual respondents are more or less likely to belong to, in comparison with the reference class 4. We find that those who never went to university have preferences most similar to class 2; those who currently consider enrolling in higher education are less likely to belong to class 1, and more likely to belong to class 3; and current students are less likely to belong to class 2. Respondents who currently work are more likely to have preferences similar to those described by class 3. Older respondents are less likely to belong to class 4, so they are less concerned with compliance with personal interests, care about their salary more, and are less likely to prefer full-time studies.

Respondents from small cities are more likely to belong to class 2, and less likely to belong to class 3 – they are, therefore, more sensitive to tuition costs, care about the prestige of the HEIs more, and are less sensitive to the distance from home, possibly because they have the most substitutes available nearby. Interestingly, we find that respondents whose parents are less educated are more likely to belong to class 2 or 3, while those whose parents have higher education are more likely to belong to class 1. It may be surprising at first to see that having parents with higher education is correlated with caring less about the prestige of the HEI. It should be noted, however, that the quality of higher education of the older population, obtained before transition, was not necessarily concerned with today's standards. In addition, we observe that respondents whose households were financially better off are more likely to belong to class 3 and 4, those from larger households prefer class 3, and female respondents are less likely to belong to class 1.

Finally, the model includes a set of variables representing self-declared personal interests of respondents. They show that, relative to economics, people interested in engineering are less likely to belong to class 2 or 3, those interested in history are less likely to belong to class 1 or 2, law students are less likely to belong to class 2, and being interested in psychology is correlated with preferences for class 3. Mathematics students are more likely to have similar preferences of class 1, physics and medicine students are less likely to be in class 2 or 3, while those interested in art are more likely to have preferences described by the parameters of class 4.

Overall, this analysis illustrates the insights allowed by applying the discrete choice experiment method to study consumer's preferences for higher education. Basing the econometric approach in the random utility framework allows for providing the general outlook of respondents' preferences and calculating their WTP for the attributes of interest, while using modern microeconometric methods allows accounting for unobserved, as well as observed preference

heterogeneity. As a result, the method is a great tool for addressing important research questions in the fields of higher education. We discuss some of them in the next section.

4. Discussion and conclusions

Modeling preferences for higher education allows for better understanding of determinants of choices, forecasting demand, and designing the services offered by HEIs in an optimal way, all of which are important for social welfare. Although revealed preference data can also be used for this purpose, the availability of such data, along with its inherent limitations associated with reflecting only the attribute level combinations actually observed in markets and consumers' limited knowledge on the true attribute levels of the education alternatives, limit its applicability. In this paper, we show how respondents' stated choices (the discrete choice experiment method) combined with the random utility framework (McFadden, 2001) can help this cause.

We use a sample of 20,000 Polish respondents aged 18-30 to infer about their preferences for higher education. We apply the random utility framework to estimate the relative importance of selected attributes of higher education programs (tuition fees, expected salaries upon completion, quality of HEI, interest in the field of study, distance from home, and mode of study), and calculate respondents' WTP for them in terms of tuition fees and future earnings.

Overall, we find that young people's preferences are highly heterogeneous. Part of this heterogeneity can be associated with whether they currently consider higher education, are students, are graduates, or have never gone to college or university. Much heterogeneity remains unobserved, however. We show that, when latent classes of preferences are identified, they can be probabilistically associated with respondents' socio-demographic characteristics, revealing easy-to-observe-and-identify patterns in the sensitivity of consumers with different backgrounds to various higher education attribute levels.

The analysis presented here provides an overview of the relative importance of selected attributes that determine young people's choice of university, but also addresses a few research questions that generate attention in the literature (e.g., Dunnett *et al.*, 2012). To this end, we show that utility patterns differ significantly for students from "non-traditional" backgrounds (i.e., families where neither parent attended university) compared to students from families where at least one parent attended university (cf. Maringe, 2006; Clarke, 2007; Bergerson, 2009). Controlling for all other observed differences, such as income or one's own experience with higher education to date, we find that the former are more likely to be more sensitive to tuition cost and prestige of HEI. Students are also more concerned with compliance of the program with their personal interests,

while being more unlikely to enroll in full-time model of study, and less sensitive to salary upon graduation. Similarly, we find that students from higher socio-economic groups (cf. Leppel, Williams and Waldauer, 2001; Bergerson, 2009; Dunnett *et al.*, 2012) are more likely to care about compliance with their personal interests, and are not necessarily more sensitive to tuition fees and mean salary upon graduation. Finally, we do not observe systematic differences between male and female respondents.

Despite cross-sectional character of our data, our results allow us to draw some conclusions regarding the issue of information barriers as experienced by participants of the higher education market in Poland. One may expect that as respondents become older and more experienced, their preferences change. We find that this is not necessarily the case. With respect to characteristics directly related to the labor market success, preferences for salary after graduation are relatively similar across those who currently consider enrolling in tertiary education programs, students, and graduates. Current students predominantly appreciated compliance of the study program with one's personal interests. This is likely because they are the ones who actually experience the consequences of the lack of such compliance the most – secondary school graduates rely on their expectations, while graduates have an opportunity to readjust career paths to their interests. Prestige is mostly important for tertiary school candidates, less important for students, and even less for graduates. This suggests that the labor market, at least in the perception of young employees, does not differentiate employees based on the prestige of HEIs. Most respondents, independently of their position in the educational and professional career, prefer to study on part-time basis. This may mean that they want to have the opportunity to combine their studies with work and/or that they know that part-time studies involve less time and effort. In general, one important conclusion that emerges is that respondents, on average, prefer the characteristics of the study programs related to low-effort intensity (even if this means lower quality).

In summarizing our results, we may also refer to a discussion on the link between educational system and the labor market in Poland. It concerns the role of higher education and an extent to which it leads to higher competences and the accumulation of human capital (human capital theory), and to which it is merely a signal for the employer of the desirable, yet unobservable, characteristics of a job candidate (signaling theory). Our results indicate that – at least in the perception of our respondents, including those already active in the labor market – higher education is more related to signaling than accumulation of human capital. Content of the study program seems generally less important than obtaining a diploma. This is a somewhat surprising result. It could be expected that the increase in the share of graduates of HEIs among younger cohorts has caused the diploma itself to lose its signaling character. At the same time, it should

increase the strength of such signals as prestige of HEI, study mode, field of study, among others. In the light of the results of our study, this does not seem to be the case, at least not for the averaged results for the whole population.

On the other hand, the data on the employment of individuals with tertiary education indicates that the demand for their work mainly comes from public services.[16] This part of the economy is dominated by the public sector with relatively rigid rules on promotions and remuneration, which may encourage the "diploma-is-important" attitude. This leads us to hypothesize that the characteristics of a diploma are relevant, but only for higher education graduates who are focused on work in the private sector, particularly in highly skilled occupations, big companies, and the largest cities. This issue clearly requires further research.

In terms of policy relevance, our results provide Poland's first comprehensive description of what determines people's higher education choices. What makes it interesting is that the findings can be interpreted in light of the Polish institutional framework for two different higher education systems, with the coexistence of public and private universities. Knowledge of preferences towards higher education is crucial for HE stakeholders in order to improve the effectiveness of the education system. On the other hand, our study provides valuable inputs to political decision-makers, who have the power to change the ways in which the Polish higher education system is organized, regulated, and funded. For example, our study offers insights with respect to the public perception of government-sponsored programs, and surprisingly low appreciation for the prestige of the HEI programs. The educational reform is currently one of the most vivid areas of public debate. If supported by quantitatively described insights about public preferences for higher education, such as those contributed by this study, the currently designed reform can be more evidence-based and avoid populism.

Our study has limitations that need to be acknowledged. First, stated preference methods have been criticized for behavior thought to be potentially at odds with standard neoclassical economic theory describing consumer choice (Carson and Hanemann, 2005). Many of these effects were later shown to be quite robust across a range of non-market and market situations (e.g., WTP versus willingness to accept disparity). The key criticism of stated preference methods that remains

[16] According to the Labor Force Survey data (GUS, 2016a), public services (administration, defense, healthcare, and education) provided 42.3% of the demand for employees with tertiary education in Poland. For persons aged 35 or less, this share was smaller; however, it was still 30.1%. Other parts of economy generating demand for the highest qualifications were information, communication finance, professional, and scientific activity – 15.9% for all workers and 18.6% for workers aged 35 or less, respectively. Significant demand was also generated by trade (11.6% and 13.0%, respectively) and manufacturing (10.6% and 13.0%, respectively).

is related to the so-called hypothetical market bias. Simply put, this means people may over- or under-state their WTP values in a systematic fashion because no actual payment is made. The economics response was improving survey design methods and developing ex-ante/ex-post methods to reduce hypothetical bias, thus improving survey design methods. It is clear that poor survey design and administration could easily induce numerous anomalous behaviors, including a hypothetical bias. On the other hand, studies that invested considerable time and effort into understanding what people believed, and in preparing a credible choice scenario with a well-defined good, generally appear to produce results that are well-behaved (Johnston *et al.*, 2017). In our case, our survey has undergone a rigorous process of qualitative and quantitative pretesting to ensure respondents' choices reflected their true preferences. Even though the WTP estimates are necessarily associated with considerable uncertainty, we believe the observed rankings of attribute levels and the preference structures, in general, likely reflect respondents' true preferences, and hence, provide useful empirical and policy information. In addition, by relying on stated preference data, we avoided the problems associated with revealed preference data, such as respondents' imperfect knowledge, exogenous constraints on choices, and unobserved consideration sets, which may all contribute to biased estimates.

The second limitation of the results presented here is associated with our modeling choices. Stated preference data estimation involves trade-offs between the use of parsimonious and more-complex models. In this paper, we demonstrated the possibilities offered by random parameters and latent class mixed logit models, particularly with respect to estimating WTP, and accounting for unobservable and observable preference heterogeneity. We note, however, that other model specifications are possible – they should always be tailored to specific research questions and informed by fit to data.

In conclusion, our study demonstrates how stated preference studies, and the discrete choice experiment method, in particular, can be used to explore economic preferences for higher education. Combining the flexibility offered by stated preference approach with random utility-based data analysis allows avoiding limitations of other approaches, particularly, relying on revealed preference data. Our empirical results for Poland may be useful for higher education institutions for tailoring their offer to young peoples' preferences and political decision-makers in the process of changing how the higher education system is organized, regulated, and funded. Finally, we demonstrated how stated preference studies could be used to address more general research questions, such as distinct preferences of students with neither parent experienced in tertiary education, from lower socio-economic groups, or of a specific gender. Overall, our study shows that the discrete choice experiment method can be a valuable tool for exploring economic

preferences, and thus, for more effective shaping of higher education programs and increasing public welfare.

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Faculty of Economic Sciences
University of Warsaw
44/50 Długa St.
00-241 Warsaw
www.wne.uw.edu.pl