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CROSS-CULTURAL COMPARISON OF RUSSIAN AND GERMAN STUDENTS' LEARNING MOTIVATION TRAITS

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CROSS-CULTURAL COMPARISON OF RUSSIAN AND GERMAN STUDENTS' LEARNING MOTIVATION TRAITS.⁴

The Integration of Russia into European educational space invoke many questions, one of them is a cross-cultural universality of learning motivation. In this paper we discuss the methodology of a learning motivation traits questionnaire and results of its cross-cultural validation at the sample of 332 German and 865 Russian students. In our study we found measurement invariance of intrinsic orientation, test anxiety and performance avoidance scales of Russian and German form of questionnaire. We showed also invariance of learning motivation traits structure. At the same time we found differences in extrinsic orientations of Russian and German students.

JEL Classification: Z, I21

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Introduction

Modern universities seek to improve the quality of education; they introduce new technologies and promote greater mobility of students. In all these processes it is important not to forget about motivation, which is the driving factor of any behavior, including learning.

Many studies have questioned the universality of motivation. For example, in cross-cultural investigation Morling and Kitayama demonstrated that Japanese students are more motivated if they receive a task that they do not know how to solve; conversely, American students are more motivated by solving problems that they already mastered (2008). Iyengar and Lepper showed that a possibility to change options of a task increase intrinsic motivation of European American children, while knowing that the options were chosen by an important adult or important group member increases the intrinsic motivation of Asian American children (1999).

On the one hand, Russia is located both in Europe and in Asia, and Russian culture is notably different from European culture. However, most Russian Universities are situated in the European part of Russia and historically, the Russian higher education system is similar to the European system. Russia actively participates in the Bologna process and other academic initiatives. Thereby the support of students' exchange through both Russian and European grant programs and the availability of distance educational programs create a common education space.

In this situation it is particularly interesting to investigate the similarities and differences between Russian and German students' learning motivation. The changes in education influenced by introducing the new information technologies (IT) invoke another question – would resources and opportunities for communicating, learning, sharing information and knowledge provided by digital media increase learning motivation? In 2008-2009 with support of the Alexander von Humboldt Foundation we organized a research project entitled “A cross cultural study of the new learning culture formation in Germany and Russia.” In this paper, we discuss one component of our research: the measurement invariance of the learning motivation traits questionnaire (LMTQ) that was used in this project, which is based on the Motivated Strategies for Learning Questionnaire (MSLQ).

Thus, the main questions of this paper are: is there the measurement invariance of the learning motivation traits questionnaire as used in Russia and Germany, and is students' learning motivation structure the same in Russia and Germany?

Learning Motivation

Motivation is considered by many scientists as a driving force that organizes and directs an individual's actions, behavior and cognitive processes, which are all strongly influenced by different patterns of motivation (e.g. Atkinson, 1957; McClelland, 1951; Leontiev 1978; Murray, 1938; Heggstad, Kanfer, 2000; Dweck, Grant, 2008; Ryan, Deci 1985).

There are many different theoretical approaches to explain the motivation process, for example, Achievement Goal Theory (e.g. Atkinson, 1964; Eccles et al., 1983; McClelland, 1961; Weiner, 1972; Ames, 1992; Dweck & Leggett, 1988; Nicholls, 1984) and Self-Determination Theory (Ryan, Deci, 1985). Contemporary motivation researchers agreed that human action is motivated by two main orientations: intrinsic (mastery or task orientation) and extrinsic (rewards, punishment avoidance or socially focused orientation).

For example, Deci writes about this distinction: “intrinsically motivated behaviors are ones for which there is no apparent reward except the activity itself” (Deci, 1975). Activities which have an external controlling variable that can be readily identified are extrinsically motivated behaviors (Deci, 1975). According to Deci (1975), intrinsic motivation is demonstrated when people engage in an activity for its own sake and not because of any extrinsic reward. The result of such behavior is an experience of interest and enjoyment; people feel competent and self-determining, and they perceive the locus of causality for their behavior to be internal. Intrinsically motivated behavior is seen to be innate and is said to result in creativity, flexibility, and spontaneity (Deci & Ryan, 1985). In contrast, extrinsically motivated actions are characterized by a sense of pressure and tension and can result in low self-esteem and anxiety (Deci & Ryan, 1985).

The educational studies show that intrinsic motivation is tightly connected with students' interest and development.

Differences in extrinsic motivation also invoke differences in extrinsic-related behavior (Elliot, 1999). Elliot (1999) divides extrinsic orientation into performance-approach and performance-avoidance. Performance-approach goals are connected with the desire to outperform others and the feelings of pride that accompany that success; performance-avoidance goals are more connected with the desire to avoid doing worse than others and the feelings of shame that could accompany failure (Senko, Durik, Harackiewicz 2008). As it was demonstrated by researchers (e.g. Elliot & McGregor, 2001; Skaalvik, 1997; Wolters, 2004), performance-avoidance goals are connected with low self-esteem, anxiety, lack of interest etc., while the performance-approach is less connected with these negative effects.

It is worth mention that motivation can be more or less volatile and more or less dependent on the situation. In case of stable motivation, we can speak about a person's motivational traits.

According to Kanfer and Heggestad, "motivational traits were defined as stable, trans-situational individual differences in preferences related to approach and avoidance of goal-directed effort expenditures" (2000).

We suggest modifying the definition proposed by Kanfer and Heggestad, taking into account the division of extrinsic and intrinsic orientations. Thereby, we will regard motivational traits as trans-situational individual differences in preferences related to a pattern of individual intrinsic and extrinsic orientation.

It was shown by Vauras, Salonen, Lethinen and Kinnunen that 11-12-year-old school students demonstrated stable motivational traits that were modifiable only in specially organized settings with a lot of effort (2009).

We are particularly interested in learning motivation traits, as stable motivational patterns arise in the educational context (at the university level in our research).

Method

Participants

Students from 8 Universities in Germany (332 participants) and 18 Universities from European part of Russia (865 participants) took part in our study (for distribution of sample by regions and studying fields, please see, Appendix 1, Table A1.1 and Table A1.1). In both samples, all respondents had completed at least 3 years of university-level study. The selection of the universities was dictated by the intention to make the samples as comparable as possible.

The Russian sample consisted of 247 (28.5%) men and 618 (71.5%) women, while the German sample consisted of 176 (53%) women and 156 men (47%). The difference in the proportion of male and female students drew our attention and we will discuss its influence during analysis. Another difference was in the age of the Russian (average age 19.91 years, SD = 1.24) and German (average age 25.7 years, SD = 6.26) students. We think this difference exists because of the different perception of the role of higher education in Russia and Germany. In Russia, the majority of students receive support from their families to continue their education, but in Germany, varied sources of student support resulted from greater flexibility regarding if and when a student attended university.

Measures

For research on learning motivational traits we did not find an existing instrument. Kafer and Heggestad's Motivational Trait Questionnaire was developed to measure employees'

motivation, but there were several reasons why it was inappropriate for use in our research. Firstly, it could not be applied without adapting it to educational settings; secondly, it is a commercial questionnaire and could not be used for on-line research; and, thirdly, it has a lot of questions (about 50-70 per scale), which would cause a large dropout rate in our research (as we could not motivate students to spend a lot of time on our questionnaire).

We decided to create a questionnaire for investigation of learning motivation traits. As the basis of our survey, we used the popular and well-established Motivational Learning Strategies Questionnaire (Questionnaire (MSLQ; Pintrich, Smith, Garcia, McKeachie, 1991). MSLQ is widely used in educational practice and research in different countries (Duncan & McKeachie, 2005).

To study motivation, we took three scales of MSLQ: intrinsic orientation, extrinsic orientation, and test anxiety. We should mention that MSLQ was designed to assess college students' motivational orientations and learning strategies for a particular college course (Pintrich, et al., 1991), but in our study we wanted to measure motivation traits, so the items of MSLQ were modified in accordance with the objectives.

For example:

Intrinsic orientation scale:

MSLQ 1 "In a class like this, I prefer course material that really challenges me so I can learn new things." was changed into: "mb1 I prefer course material that really challenges me so I can learn new things."

Extrinsic motivation scale

MSLQ 7 "Getting a good grade in this class is the most satisfying thing for me right now." was changed into: "mb4 Getting a good grade is the most satisfying thing for me right now."

All questions from the test anxiety scale remained without modifications, for example:

MSLQ 3 and mb8 "When I take a test I think about how poorly I am doing compared with other students."

Necessary changes we also made to instructions for participants.

To study performance-avoidance orientation we decided to add three questions to investigate this trait. For example:

mb15 "If I know that I could find a solution to the tasks on the Internet or my group mates could give it to me, I will not do it by myself."

To analyze the validity of the developed questionnaire we used the following tools:

Two scales Help Seeking and Peer Learning of MSLQ;

Created on the basis of MSLQ scales Peer Learning and Help Seeking – two scales examining the use of Information and Communication Technologies usage learning. We included these two scales for two reasons: first, new technologies are tightly connected with the learning process (probably even more than usual peer learning). Second, we wanted to know how motivation and the use of new technologies are connected in Germany and in Russia.

Example of a question from the Help Seeking scale of MSLQ:

MSLQ #58 and mb22: “I ask the instructor to clarify concepts I don't understand well.”

And example of a created question for ICT usage scale:

mb23 “I ask questions on Internet forums to clarify concepts I don't understand well.”

Four questions about students' learning attitudes and about plagiarism:

mb5 “I complete the tasks, because otherwise I will have troubles.”

mb17 “The main target for me is to pass exams.”

mb25 “During my studying in University I became so interested in one or several subjects that it influences my choice of the future professional activities.”

mb28 “I copy and paste to my work a few paragraphs from a book/internet uncited.”

Questions about frequency of usage computer for different purposes. The main question was “How often you use the following features of the computer and Internet?” and students should specify frequency on the following scale: “Several times a day”, “About once a day”, “3-5 days a week”, “1-2 days a week”, “Every few weeks”, “Less often”, “Never”. The categories we used were the following:

14.9 Read handbooks or other materials (articles from Wiki, presentations, essays etc.)

14.10 Read scientific articles, books etc.

14.3 Communicate with Skype, email and etc.

We used a 5-point Likert scale (Strongly disagree, Disagree, Uncertain or Unsure, Agree, Strongly Agree) for all questions about students' perceptions (intrinsic orientation, extrinsic orientation, test anxiety, performance avoidance, help seeking, peer learning, and the two scales of ICT usage in learning.)

After creating the questionnaire in Russian, all questions were translated into German by a native German speaker (expert in Russian language), blind back-translated to Russian by a native Russian speaker (expert in German language). A group of Russian experts evaluated the questions' similarity and if someone from the group saw any differences between meanings, the question was reformulated and translated again using the same procedures. If in the two reformulations we did not have agreement, the question was excluded from questionnaire. For example, we exclude question 22 of MSLQ, and in its place included three newly created items

(for example mb2 “There are courses I am so interested in, that I continue studying even if I have to work more than necessary (for example, participating in research groups)”).

To control the properties of the Russian and German samples, we used the following variables: sex, birth year, specialization, and year of entrance to University.

Data collection

The data were collected using a professional subscription to the SurveyMonkey service, which allowed us to receive answers from Russian and German students located in different regions and guarantee equal conditions for participants⁵.

We organized two stages of data collection. The first was organized in September-December 2009, and the second in July-August 2010.

At the first stage main amount of data in Russia (95.7%) was collected during September-October 2009, in Germany main amount of data (97.7%) was collected during November-December 2009.

The second stage was devoted to study retest reliability and the stability of respondents' answers six months after the first data collection. We sent invitations to the retest study to students who let us collect their email addresses. 228 students from Russia and 55 from Germany participated in the second stage.

Strategy for statistical analysis

The analysis of data consists of two parts: analysis of invariance and reliability analysis. In the first part we used the procedure suggested by Byrne (2006): exploratory factor analysis (principal axis factoring with Oblimin rotation) and structural equation modeling (consisting of analysis of covariance structure (COVS) and mean and covariance structure analysis (MACS), which were done in EQS). We first randomly divided the Russian sample into subsamples, using data from the first during exploratory factor analysis. Confirmatory factor analysis was performed on the second subsample, then on the German sample, then on the second Russian subsample and the German sample simultaneously. After obtaining partial invariance of all scales, we continued investigation of three scales and tested them for measurement and structure invariance.

In the second part of analysis we tested reliability and retest reliability. Cronbach's Alpha, ρ – reliability coefficient (Raykov, 2001, 2004; Brown 2006), Spearman and Pearson correlation coefficients were used.

⁵ At this moment, links to the on-line questionnaire are closed. All questions about the questionnaire can be addressed to the first author.

Results

Since the questionnaire was developed first in Russian, we decided to start with the following strategy of invariance analysis: the sample of Russian students was randomly divided into two subsamples (subsamples tested to have no significant differences at all controlled variables with χ^2 - criteria); at the one Russian subsample exploratory factor analysis (EFA) was performed (N = 457); EFA model was compared with the expected theoretical model (items to scale distribution); next we tested the EFA model on another Russian subsample (N = 408) and German sample (N = 332) for construct comparability and measurement invariance.

The EFA was performed using Principal Axis method with Oblimin rotation (KMO=.759, Bartlett's Test: df=269, $\chi^2=2103$, $p<0.001$), as we expected that latent factors could correlate.

Results of EFA were compared with initial distribution items into scales. The analysis demonstrated that empirical and theoretical models were quite similar. Although some differences were found, but we believe they won't influence the quality of the scales:

Three items were excluded from the model as they have low communalities with factor scales:

mb30 When I take a test I think about items on other parts of the test I can't answer. (Excluded, was in Test Anxiety scale)

mb11 Even if I have trouble learning the material in this class, I try to do the work on my own, without help from anyone. (Excluded, was in test Help Seeking scale.)

mb7 I do not have time to review all recommended literature. (Excluded, was in test Performance-avoidance scale.)

Two scales Peer Learning and Help Seeking join together into one scale, we called it "Discussion scale".

The created scales about ICT usage in learning were divided into 4 and 2 question, according to the content of the items we call them Web-discussion and Web-publication. For whole list of the scales, questions and final model please see Appendix 1).

To study invariance of the factor model we used structural equations modeling procedure described in Byrne (2006). First we analyzed the goodness of fit for the second subsample (408 Russian participants). The model demonstrated good fit to the data $\chi^2/df = 525.225/256$, CFI=0.86, SRMR=0.068, RMSEA = 0.051 C.I. (0.045- 0.057), and we continued analysis with this model as a baseline model for Russian and German samples.

The baseline model showed the same level of goodness of fit also in German sample $\chi^2/df = 521.106/256$, CFI=0.857, SRMR=0.067, RMSEA = 0.056 C.I. (0.049- 0.063).

Our baseline model had a good fit to the data and met the criteria proposed by Hu and Bentler (1998): CFI>0.85, SRMR<0.08, and we continued the analysis of invariance.

The evaluation of the baseline model on the multisample data (408 Russian participants subsample and whole sample of German participants) showed an average fit to the data $\chi^2/df = 1046.345/512$, CFI=0.859, SRMR=0.068, RMSEA = 0.053 C.I. (0.048- 0.058).

After introducing factor loadings constraints goodness of fit of a model changed significantly $\Delta CFI=0.012$, as it was argued that $\Delta\chi^2$ could be impractical and unrealistic criteria (e.g. Cheung, Rensvold, 2002; Little 1997), we used suggested by Cheung, Rensvold (2002) 0.01 cutting point for ΔCFI as criteria of significant differences. The analysis showed that factor loading constraints for mb14, mb33 and mb31 are non-significant. As it was suggested by Byrne (1989) we could continue to obtain partial invariance, but we had to check the certain conditions: in each scale should be at least one more indicator with invariant measure (other than the one fixed to 1.0). In our case, there is no difficulty in meeting this requirement. Releasing three constraints provided us a good fitting multigroup model without significant different fitting from the 7F baseline multigroup model $\Delta CFI=0.003$ ($\chi^2/df = 1070.35/526$, CFI=0.856, SRMR=0.069, RMSEA = 0.053 C.I. (0.048- 0.057)).

At the next step we introduced constraints of factor covariances. Model with all covariances constraints equal on both samples showed lower fit to data ($\Delta CFI=0.017$). Following covariances are invariant across Russian and German samples: F2 (extrinsic motivation) - F4 (test anxiety) and most of correlations between motivational scales and scales F5 (Web discussion) and F7 (Web publication). In the Russian sample covariance between F2 and F4 are significant and positive, but in German sample this correlation is not significant, so we found first cross-cultural differences. Another cultural difference exists in the scales Web-discussion and Web-publication, but we could expect it as at the moment of data collection there were significant differences in internet penetration in Russia and in Germany and also in availability of computer technologies in Russian Universities and German Universities.

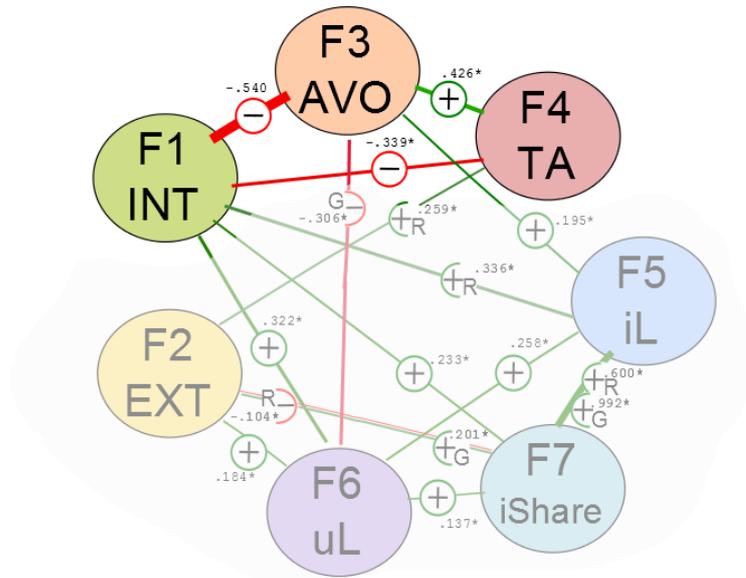
Releasing the covariance constraints F2F4, F1F5, F2F7, F5F7, F5F3 showed that the model has average fit to data $\chi^2/df = 1083.362/539$, CFI=0.856, SRMR=0.071, RMSEA = 0.052 C.I. 0.048- 0.057) and a non-significantly difference from baseline model $\Delta CFI=0.004$.

Table 1. Tests of Invariance of the 7 Factor Measurement Model: Model Fit Indexes

Level of invariance (7 factor model)	χ^2	df	CFI	SRMR	RMSEA	90% C.I. of RMSEA
Russian sample (457)	525.225	256	.860	.068	.051	(0.045- 0.057)
German sample (332)	521.106	256	.857	.067	.056	(0.049- 0.063)
Multigroup	1046.345	512	.859	.068	.053	(0.048- 0.058)
Factor loadings constraints equal	1106.462	530	.847	.072	.054	(0.050- 0.059)
Factor loadings constraints equal (constraints 14, 33, 31 released)	1070.350	526	.856	.069	.053	(0.048- 0.057)
Factor covariance constraint equal	1149.554	552	.842	.075	.054	(0.05- 0.058)
Factor covariance constraint equal (released covariance: F2F4, F1F5, F2F7, F5F7, F5F3)	1083.362	539	.856	.071	.052	(0.048- 0.057)

During invariance analysis we found out that there are differences in factor loadings of questions 14, 31, 33, so Extrinsic orientation and Discussion scales could be only partial invariant. Also Web-discussion and Web-publication could not be completely invariant because of invariance perceptions of students studying in different setting (more technological equipped in Germany, less in Russia). The analysis of factor covariances (Figure .1) showed that all covariances between F1, F3, F4 are invariant, so we could test of these three factors to establishing full invariance.

Figure 1. Significant correlations between scales (Russian and German samples)



\oplus	Correlation significant ($p < 0.05$) and positive on a both samples
\ominus	Correlation significant ($p < 0.05$) and negative on a both samples
\ominus^G	Correlation significant ($p < 0.05$) only at one sample (German) and negative
\oplus^R	Correlation significant ($p < 0.05$) only at one sample (Russian) and positive

Testing invariance of intrinsic orientation, test anxiety and performance avoidance scales

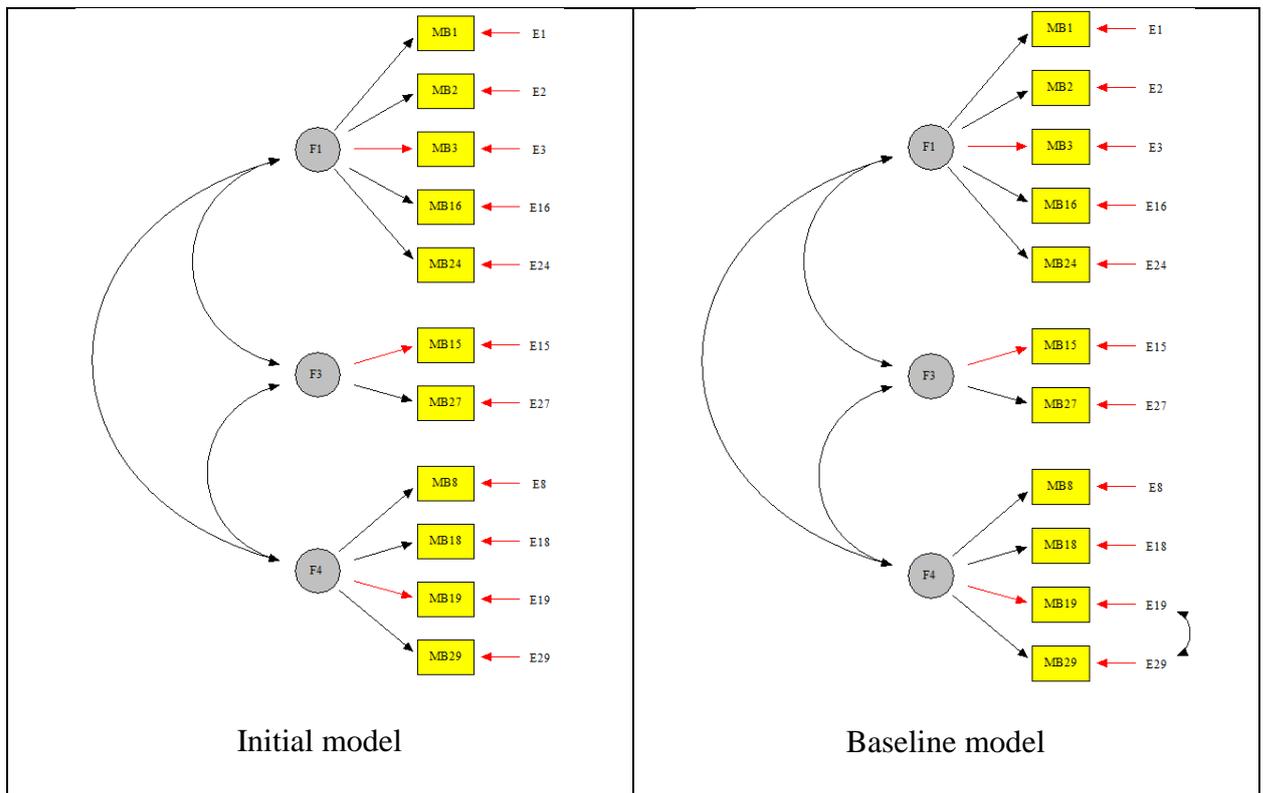
To test invariance we started with using full Russian sample (865 participants) and full German sample (332 participants).

For analysis of the invariance first we used the same strategy of COVS analysis to establish full invariance, and after this use MACS analysis to find significant differences in means (e.g. Byrne, 2006, Little 1997).

Initial testing of the hypothesized model for Russian and German group yielded a good fit to the data (Russian sample $\chi^2/df = 144.288/41$, CFI=0.936, SRMR=0.044, RMSEA = 0.054 C.I. (0.044 – 0.064); German sample $\chi^2/df = 104.150/41$, CFI=0.905, SRMR=0.056, RMSEA = 0.056 C.I. (0.052 – 0.084)), but the review of the LM Test statistics suggested the addition of an error covariance between measurement errors E29-E19. It is worth to notice that E29 and E19 both characterize emotional component of anxiety on exams, and factor of personal emotionality

influence these both variables. For these reasons we included E29-E19 error covariance in our model, which showed significantly better fit to data $\Delta CFI=0.019$ (Russian sample $\chi^2/df = 111.771/40$, CFI=0.955, SRMR=0.036, RMSEA = 0.046 C.I. (0.036-0.056); German sample $\chi^2/df = 84.212/40$, CFI=0.934, SRMR=0.051, RMSEA = 0.058 C.I. (0.04-0.075)). This three factor model with one error covariance we will use as a baseline model on both samples (Figure 2.)

Figure 2. Hypothesized models of factorial structure for three scales F1-intrinsic orientation, F3-performance avoidance, F4-test anxiety.



After establishing a well-fitting model on both samples we continued with simultaneous multigroup analysis (Table 2).

The testing model simultaneously showed a good fit to data ($\chi^2/df = 175.484/80$, CFI=0.943, SRMR=0.046, RMSEA = 0.053 C.I. (0.042-0.64)), configural invariance was established.

Imposed of constraint to factor loadings did not change goodness of fit statistics significantly ($\chi^2/df = 184.37/88$, CFI=0.942, SRMR=0.05, RMSEA = 0.051 C.I. (0.040-0.061)). All constraints were found invariant with probability of Chi-square values more than .05 .

When testing for structure invariance the equality constraints for factor covariance and factor variances were introduced. The model held to these restriction and demonstrated a good fit to the data ($\chi^2/df = 187,033/95$, CFI=0,945, SRMR=0,051, RMSEA = 0,48 C.I. (0.038-0.058)) ($\Delta CFI=0,002$). All constraints were found invariant with probability of Chi-square values more than 0.05.

Table 2. Tests of Invariance of the 3 Factor Measurement Model: Model Fit Indexes

Level of invariance	χ^2	dF	CFI	SRMR	RMSEA	C.I.
Initial model Russian sample	144.288	41	.936	0.044	.054	(0.044 – 0.064)
Baseline model Russian sample (with covariance E19E29)	111.771	40	.955	0.036	.046	(0.036-0.056)
Initial model German sample	104.150	41	.905	0.056	.056	(0.052-0.084)
Baseline model German sample (with covariance E19E29)	84.212	40	.934	0.051	.058	(0.04-0.075)
Baseline model multigroup	195.982	80	.949	0.044	.049	(0.041-0.58)
Baseline model multigroup with factor loadings constraints	206.425	88	.948	0.048	.047	(0.039-0.056)
Baseline model multigroup with factor loadings constraints equal and factor covariances constraints equal	210.726	95	.949	0.050	0.45	(0.037-0.053)

Although the structure was shown invariant in our samples, differences in means could originate from the sample bias. In our case there were significant differences in proportions of male and female respondents in Russian and in German samples. To eliminate this possibility the invariance testing was conducted using the established seven-factor model to test for differences between male and female group. On the Russian sample analysis showed significant differences at means of F4-Test anxiety scale ($t=2.44$, $p<0.05$) and F2-extrinsic motivation scale ($t=3.91$, $p<0.05$). On the German sample differences existed at means of F1- Intrinsic motivation scale ($t=2.819$, $p<0.05$). Thereby before testing for means differences we have to establish equivalence between Russian and German samples.

Randomly from whole Russian sample (865 participants) we excluded 348 female respondents. Next we checked the rest of the female sample (270 female respondents) for significant differences from the whole Russian female sample (we tested all control variables and all 7 factor scales). All differences were non-significant. As a result the sample with 270 females and 247 males had a close proportion of man (47.8%) and woman (52.2%) to German sample (male - 47%; female - 53%).

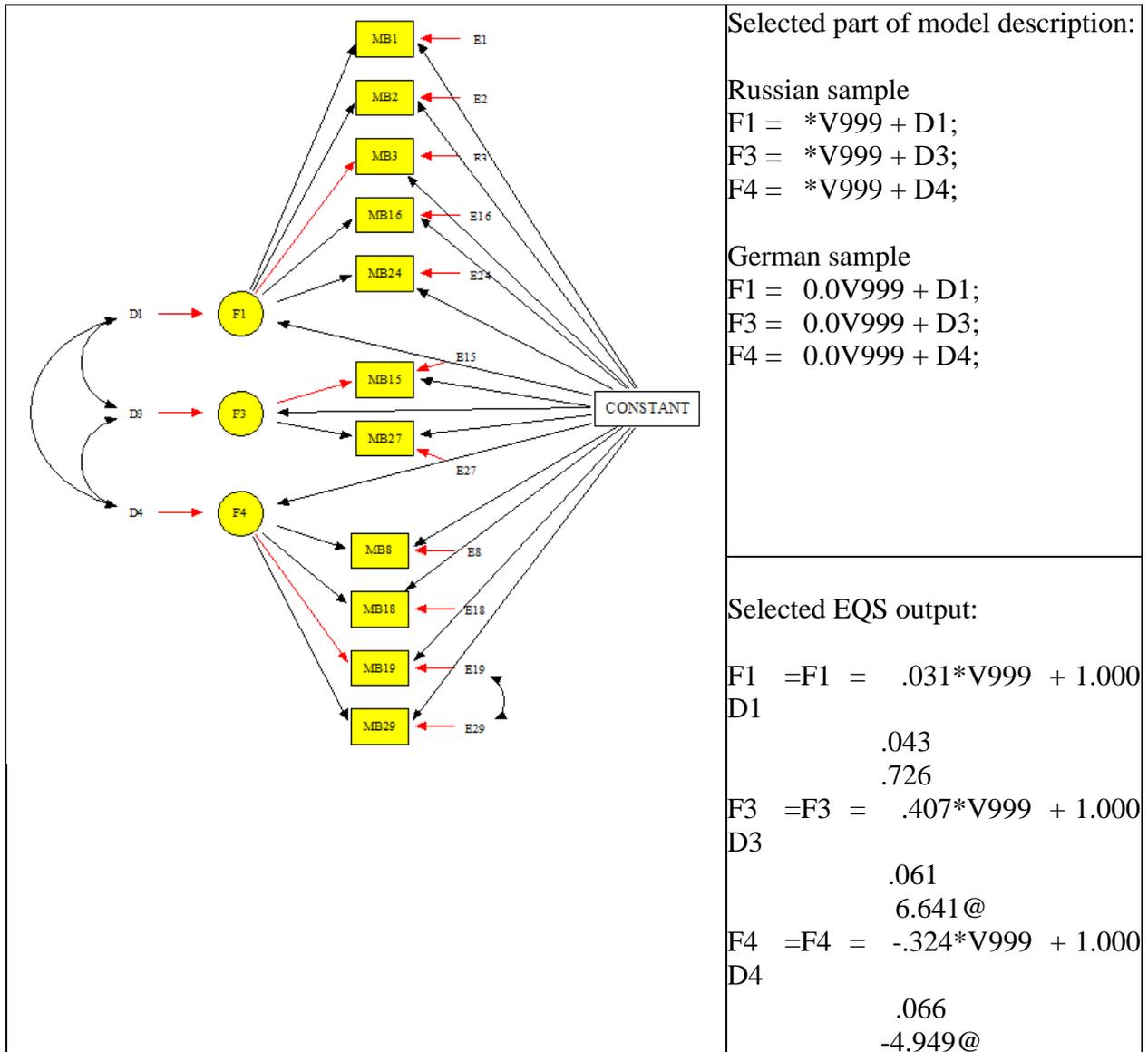
Before starting MACS analysis we also tested the model's fit to data on the Russian sample balanced by sex (517 participants) with the German sample. The baseline model showed a good fit statistics ($\chi^2/df = 91.273/40$, CFI=0.949, SRMR=0.041, RMSEA = 0.05 C.I. (0.036-0.063)). Simultaneous analysis completed on Russian sample (517 participants) and whole German sample showed full invariance of factors and a good fit to the data ($\chi^2/df = 187.033/95$, CFI=0.945, SRMR=0.051, RMSEA = 0.48 C.I. (0.038-0.058)). All factor loadings constraints and factor covariance found were invariant with probability of Chi-square values more than 0.05.

Analysis on means differences

To test significance in mean differences we used MACS analysis (e.g. Byrne 2006, Little 1997). In mean structure model constant V999 was introduced. Byrne argued that as intercepts are coefficients for regression on a constant, its addition to the model allows for the introduction of structures means (Byrne 2006). We used the standard procedure with V999 constant which is an independent variable without variance or covariance with other variables in the model and always remains fixed to 1.0. The regression path from V999 to variables represents the intercepts. Three disturbances D1, D3 and D4 one for each factor introduced to carrying their variances and covariances. As were suggested by Byrne, in testing differences in the latent factor means, the factor intercepts for one group we fixed to 0.0 (we fix intercepts in German group).

The analysis showed that in mean of factor F1 (intrinsic orientation) there was no significant difference. Two other scales had significant differences. German students in average had more test anxiety and Russian students had bigger mean for performance avoidance.

Figure 3. Mean structure model and selected EQS input and output



Analysis of reliability

Analysis of scales reliability showed that only few of scales have suggested level of Cronbach's Alpha coefficient (>.7). Although, as it emphasized by Brown (2006) in many researches Cronbach's Alpha does not provide a dependable estimate of scale reliability of multiple-item measures and could underestimate reliability. We follow Browns recommendations and used CFA-based method of estimating developed by Raykov (2001, 2004). Brown made a detailed description for calculation of CFA-based ρ – reliability coefficient; also he provided two formulas (2006) for scales with and without items with error covariance.

In Table 3 we provide ρ - reliability coefficients for each scale on both Russian and German samples. Calculation of coefficients based on factor loadings and error variances from 7 factor partial invariant model and 3 factor full invariant model.

Table 3. ρ - reliability coefficient and Cronbach's Alpha for motivational traits scales

Scale	Cronbach's Alpha		7F model		3F model	
	Russia	Germany	Russia	Germany	Russia	Germany
F1 – intrinsic orientations	.71	.70	.88	.88	.91	.90
F4 – test anxiety	.68	.73	.85	.86	.76	.77
F3 – performance avoidance	.52	.47	.79	.79	.81	.82
F2 – extrinsic orientation	.61	.69	.74	.81	-	-
F5 – Web-discussion	.70	.71	.85	.84	-	-
F6 – Discussion	.60	.71	.91	.94	-	-
F7 – Web-publication	.67	.51	.81	.72	-	-

The analysis showed a good reliability of the learning motivation traits scales, all ρ -coefficients are higher than 0.7. Difference in reliability of test anxiety scale in 3F model arises because of error covariance was added. For further analysis we will use 7F factor scales as they provide equal conditions for each scale.

Learning Motivational traits Scale validity analysis

First we concentrate on three invariant scales: intrinsic orientations, performance avoidance, test anxiety. To analyze validity of the learning motivational traits scales we investigated scales correlations with questions: mb5, mb17, mb25, mb28, 14.3, 14.9, 14.10 (all validity questions described above) and also with the scale Discussion (combined from Help Seeking and Peer learning of MSLQ). We expected that F1, F3, F4 scales will have same patterns of correlation (significance and sign in both samples) with validity questions. For example mb5 would have a positive correlation with performance avoidance and negative correlation with intrinsic motivation (on both samples), 14.3 will have no correlation with all

three scales (is it about communicating with Skype and e-mail, not about learning) and so on. The correlations between scales and questions are presented in table 4.

Looking at the correlations patterns we saw the picture we expected, all validity questions and scales have the same patterns of correlation in Russia and in Germany.

Although, we found one difference in correlation performance avoidance scale with item v14.9 (no correlation at German sample, negative correlation at Russian), this does not contradict with the meaning of the scale, and only points to different level of avoidance (in Russia it is significantly higher).

The correlation patterns between motivation scales and Web-publication, Web-publishing scales are different, as we already see there are significant cultural differences and probably significant different strategies for usage ICT in studying which need a special analysis (we plan to made it in another article)

Table 4. Correlations between intrinsic orientations, text anxiety, performance avoidance scales and validity questions

Spearman's ρ	Germany			Russia		
	INT	AVO	TA	INT	AVO	TA
mb5 I complete the tasks, because otherwise I will have troubles.	-.240**	.355**	.303**	-.121**	.113**	.252**
mb17 The main target for me is to pass exams	-.376**	.447**	.397**	-.285**	.282**	.445**
mb28 I copy and paste to my work a few paragraphs from a book/internet uncited.	-.220**	.273**	.193**	-.303**	.403**	.334**
v14.3 Communicate with Skype, email and etc.	.104*	-0.023	-0.065	.139**	-.061*	-0.047
v14.9 Read handbooks or other materials (articles from Wiki, presentations, essays etc.)	.190**	-0.043	-.098*	.218**	-.151**	-.082**
v14.10 Read scientific articles, books etc.	.271**	-.129**	-.181**	.265**	-.206**	-.150**
Discussion	.784**	-.218**	-.312**	.904**	-.560**	-.342**
ICT discussion	.240**	.466**	.148**	.613**	-.115**	-0.021
ICT publication	.354**	.347**	0.034	.596**	-.110**	-.109**

** . Correlation is significant at the 0.01 level (1-tailed).

* . Correlation is significant at the 0.05 level (1-tailed).

Analysis of F2-Extrinsic orientation scale.

As showed above this scale has only partial invariance and its correlation with other scales are non-invariant. Comparing correlations we found out that in Russian sample extrinsic orientation scale correlated with mb5. Although, this question should be connected with performance avoidance, like it happened in German sample. Comparing F2 with mb17, we could see that the correlation is significantly higher in the Russian sample. In structural equations modeling analysis we found out that items 4 and 26 have invariant factor loadings across the samples, but item 14 “mb14 If I can, I want to get better grades than most of the other students” not. We could hypothesize that extrinsic motivation questions for the Russian students measure extrinsic orientation to achieve minimum level of grades, which allow them to pass to the next educational level. For the German students the same set of questions measure extrinsic orientation to achieve better grades than other students. This could explain why extrinsic motivation correlates with test anxiety, as for Russian students failing in their extrinsic goals means also failing test or exam. Another argument is the correlation between extrinsic orientation scale and discussion scale, in Germany students want to outperform peers and this is why they communicate. In Russia student extrinsic orientation is not correlated with discussion learning materials not with peers, not in internet. Russian extrinsic oriented students are less oriented toward performance. We could conclude that extrinsic orientation is cross-cultural different in our countries: in the German sample it is an intention to outperform peers, and in the Russian one it is an intention to have an average level of results allowing student to pass tests and exams.

Table 5. Spearman's ρ correlation between extrinsic orientation scale and validity questions

Sample	mb5	mb17	mb28	v14.3	v14.9	v14.10	HS	ICT D	ICT P
Russia	.355**	.524**	.093**	0.04	0.015	0.052	-.071*	-.067*	-.228**
German	-0.042	.116*	-0.001	-0.015	-.111*	-.092*	.256**	.194**	.297**

** . Correlation is significant at the 0.01 level (1-tailed).

* . Correlation is significant at the 0.05 level (1-tailed).

Thus, the intrinsic orientation, performance-avoidance and test anxiety scales showed similar patterns of correlation with validity questions and Discussion scale. While the extrinsic orientation scale are non-invariant in our two samples.

Retest Reliability

Creating the questionnaire we wanted to measure stable traits and it was important to analyze retest validity of our instrument. After a half-year from first stage (organized in October-December), we conducted second stage (in July-August). We ask participants (who let us to use their e-mails) to answer our questions again (we use only learning motivational traits items, other questions were not asked, to minimize drop rate). 228 students from Russia 228 and 55 from Germany participated in both stages of our research. Coding emails allowed us to merge data and join answers of participants from the first and second stages.

Pearson correlation coefficients correlation between first stage and second stage values of scales (Table 6) are high and significant ($p < 0.01$). Extrinsic orientation showed lower correlation coefficients: 0.651 (Russian sample) and 0.682 (German sample). Intrinsic orientations, test anxiety and performance-avoidance demonstrated correlations higher than 0.7 on both samples.

Table 6. Retest reliability of learning motivation traits scales (Pearson correlation coefficients).

Scale	Russian sample (228)	German sample (55)
F1 – Intrinsic orientation	.701**	.775**
F2 – Extrinsic orientation	.651**	.682**
F3 – Performance avoidance	.723**	.747**
F4 – Test anxiety	.739**	.772**

** . Correlation is significant at the 0.01 level (1-tailed).

* . Correlation is significant at the 0.05 level (1-tailed).

Discussion

In our study we found measurement invariance of the intrinsic orientation, test anxiety, and performance avoidance scales of Russian and German forms of the Learning Motivational Traits Questionnaire. We showed also invariance of the structure of learning motivation traits. At the same time, we found that extrinsic orientation scale measures slightly different things in the Russian and German samples. In the Russian sample, questions on this scale measure students' motivation to perform at an average level, while in the German sample, these questions measure students' motivation to outperform peers.

In our study we confirm the hypothesis that intrinsic and extrinsic orientations are independent, instead of opposite, and this was observed in both samples (e.g., Ames, Archer, 1988; Miller, Behrens, Greene, 1993; Nicholls, Cheung, Lauer, Patashnick, 1989).

Similar results were obtained by Chirkov and Ryan (2001), who showed cross-cultural invariance of the following motivational constructs in their study on 16-19-year-old Russian and American students: external, introjected, identified, and intrinsic motivations.

The surprising fact of greater performance avoidance by Russian students may be explained by analysis of the educational situation before and during the time of study (data were collected in 2009). In Russian higher education, it is normal for students to help other students cheat on exams, and most Russian companies do not regard a student's grades as an important indicator of his achievements. Alternately, we could formulate another explanation for the greater performance-avoidance of Russian students. In most Russian universities, students made few decisions about the courses they would take and could hardly influence their learning path. According to Self-Determination, they would feel their lack of autonomy and that could lead to the avoidance of externally imposed activities. We could admit that sometimes performance-avoidance strategy found support from teachers willing to tolerate plagiarism or cheating on assignments that they considered less important for students. The German students have more freedom to choose their learning trajectory, so performance avoidance was expressed less often in this sample. It is worth noting that both explanations of the greater performance-avoidance of Russian students are not controversial and can work together.

The LMTQ questionnaire developed here (both the German and Russian forms) can be used to monitor processes at the University, for example to study the impact of new courses and other research purposes. However, we did not investigate characteristics of questionnaire for individual diagnosis, and applying the questionnaire to study personal motivational differences requires further research. Further studies are needed to specify the extrinsic orientation scale. We expect that influenced by the Bologna process and Russian education initiatives, cross-cultural differences in learning motivational traits may disappear in the future.

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Appendix 1.

Scales of the learning motivation traits questionnaire⁶

F1 - Intrinsic orientations

mb1. I prefer course material that really challenges me so I can learn new things. (MSLQ item 1)

mb2 There are courses I am so interested in, that I continue studying even if I have to work more than necessary (for example, participate in research groups). (created)

mb3 Some of task provide me such a pleasure from using my creativity, that I want to spent more time doing them than it is necessary for the exam. (created)

mb16 If I have a choice between creative exercise and formal one I prefer the creative, even if it could be more complicated (created)

mb24 When I have the opportunity in this class, I choose course assignments that I can learn new things. (MSLQ item 24)

F2 - Extrinsic orientation

mb4 Getting a good grade is the most satisfying thing for me right now (MSLQ item 7)

mb14 If I can, I want to get better grades than most of the other students (MSLQ item 13)

mb26 I want to do well because it is important to my family, friends, employer, or others. (MSLQ item 30)

F3 - Performance-avoidance

mb15 If I know that I could find solution to the tasks in Internet or my group mates could give it to me, I will not do it by myself. (created)

mb27 If I have possibility to avoid doing the tasks, I will use it. (created)

F4 - Test anxiety

mb8 When I take a test I think about how poorly I am doing compared with other students (MSLQ item 3)

⁶ The rough English version, for precise German and Russian versions used in survey please contact first author

mb18 When I take tests I think of the consequences of failing. (MSLQ item 14)

mb19 I have an uneasy, upset feeling when I take an exam. (MSLQ item 19)

mb29 I feel my heart beating fast when I take an exam. (MSLQ item 28)

F5-Web-discussion

mb12 If I have the trouble in learning I use to use Internet communities. (created)

mb23 I ask questions on Internet forums to clarify concepts I don't understand well. (created)

mb32 During the course I used to discuss the materials on-line. (created)

mb34 I have several favorite Internet communities to found and discuss information about my profession in future. (created)

F6 - Discussion

mb9 When studying for this course, I often try to explain the material to a classmate or a friend. (MSLQ item 34)

mb20 I try to work with other students from this class to complete the course assignments. (MSLQ item 45)

mb31 When studying for this course, I often set aside time to discuss the course material with a group of students from the class. (MSLQ item 50)

mb22 I ask the instructor to clarify concepts I don't understand well. (MSLQ item 58)

mb33 When I can't understand the material in this course, I ask another Student in this class for help. (MSLQ item 68)

F7-Web-publication

mb10 I share my works in Internet (in the blog, site or forum), because I want to receive feedback. (created)

mb21 I share my works in Internet (in the blog, site or forum), because I like to help others. (created)

Figure A1.1 Hypothesized model of factorial structure for seven scales F1-intrinsic orientation, F2- extrinsic orientation, F3-performance avoidance, F4-test anxiety, F5-Web-discussion, F6 – Discussion, F7-Web-publication

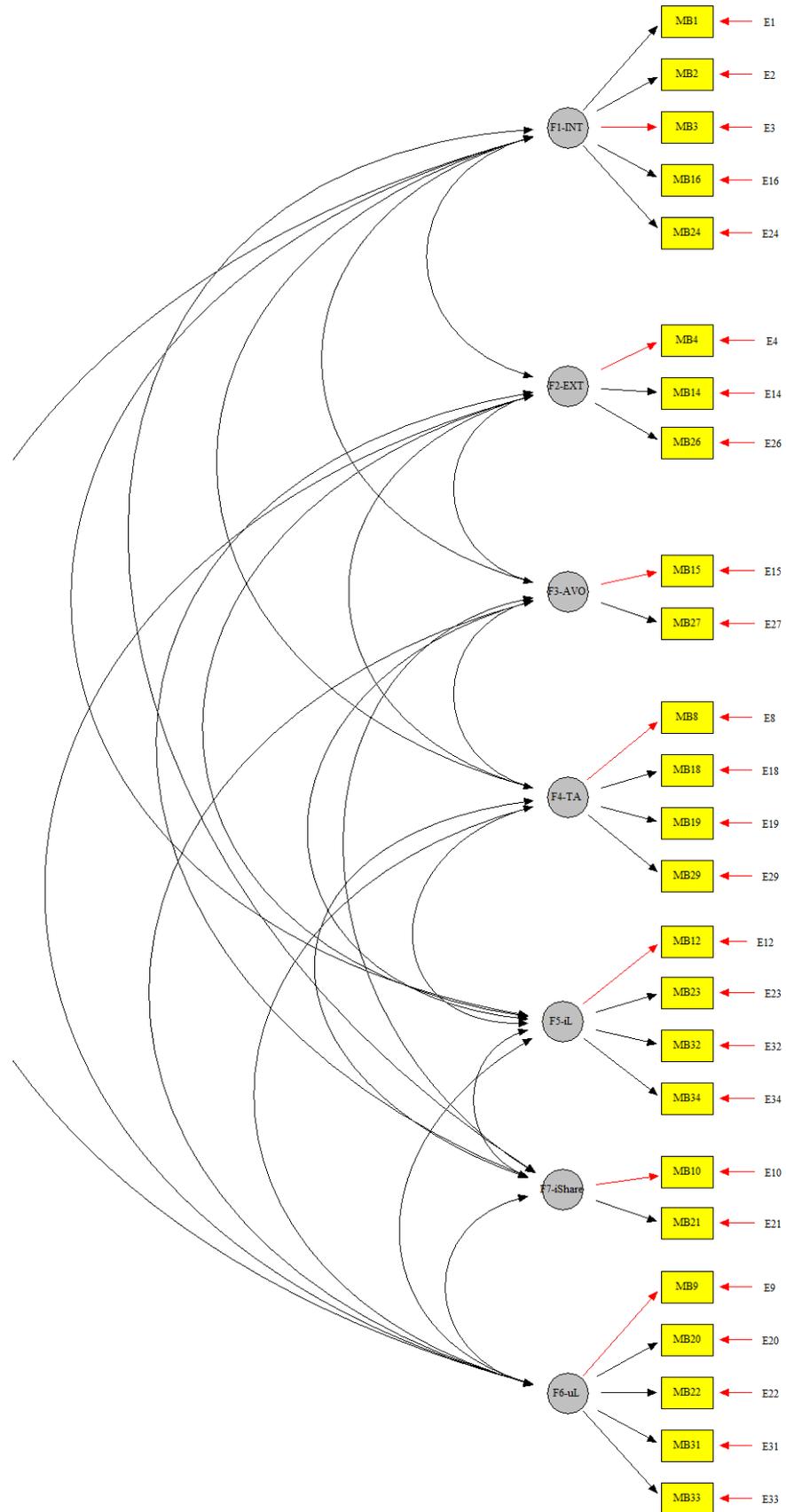


Figure A1.2 Specialization distribution at Russian and German samples.

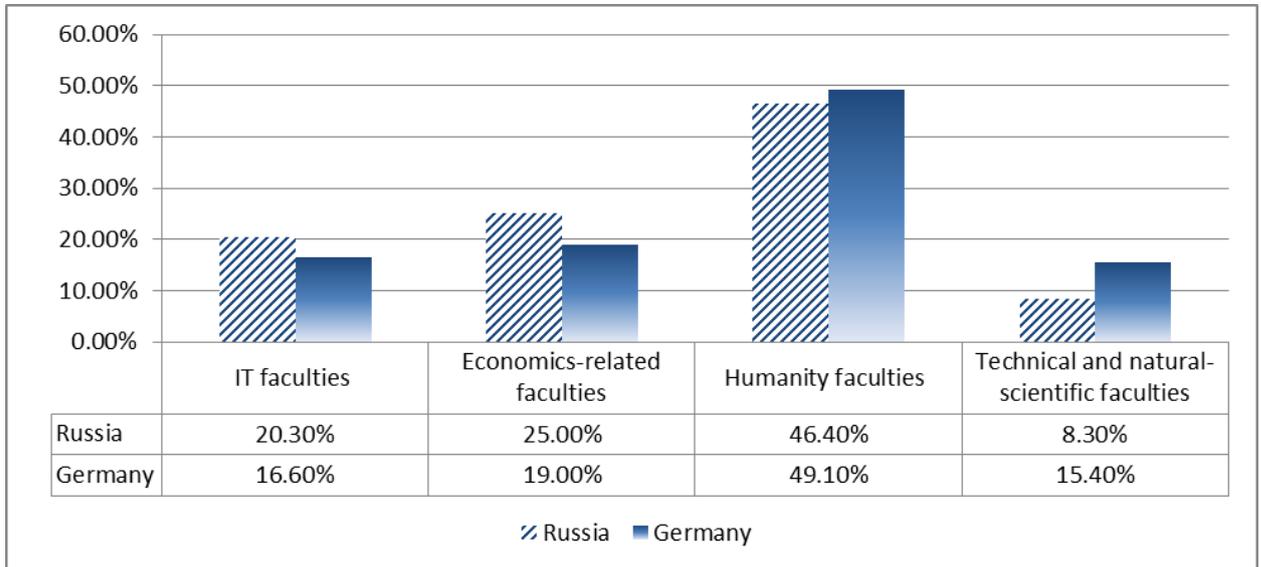


Table A1.1 Specialization distribution at Russian and German samples.

		Specialization				Total	
		IT faculties	Economics-related faculties	Humanity faculties	Technical and natural-scientific faculties		
Land	Russia	Count	176	216	401	72	865
	% within Russia		20,3%	25,0%	46,4%	8,3%	100,0%
Germany	Count	55	63	163	51	332	
	% within Germany		16,6%	19,0%	49,1%	15,4%	100,0%
Total	Count	231	279	564	123	1197	
	% within Land		19,3%	23,3%	47,1%	10,3%	100,0%

Table A2.2 Russian sample distribution by regions

Moscow	215	24.9%
Petrozavodsk	112	12.9%
Saratov	100	11.6%
Kirov	93	10.8%
Perm	84	9.7%
N.Novgorod	62	7.2%
Ekaterinburg	58	6.7%
Moscow region	52	6.0%
Izhevsk region	41	4.7%
St.Peterburg	32	3.7%
Astrakhan	14	1.6%
Other regions	2	0.2%
Total	865	100.0%

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