Economics and business administration post-graduates in transition from university to work: Labor market success factors

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Economics and Business Administration Postgraduates in Transition from University to Work: Competencies as Determinants of Labor Market Success

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Abstract

Due to rapid economic changes employers require more versatile competencies from post-graduates in economics and business administration. The goal of the current study was to develop generalizable measures for self-reported competencies in labor market surveys, and then to investigate their predictive validity. A secondary analysis was conducted on existing data from a survey study completed by more than 4000 Dutch post-graduates in economics and business administration. The Rasch rating scale model indicated that self-reported acquired competencies and self-reported required competencies are distinct constructs. Employers prioritize competencies in ways which differ from those of education programs. Regression analyses revealed that high levels of alumni's self-reported required competencies are particularly powerful positive predictors of labor market success. In contrast, self-reported acquired competencies are commonly negative or neutral predictors.

Aim of the study

This study approaches competencies from three different perspectives and elaborates upon the manner in which self-reported competencies are measured in survey studies amongst recent (post)-graduates. The use of qualitatively ordered raw scores on Likert scales in survey studies often leads to conflicting findings about the impact of different types of competencies on labor market success. Summed up ordinal scores can bias the results of statistical techniques, which assume that the measures used are interval measures (Bond & Fox, 2001).

Our aim is to create interval measures of self-reported competencies in the domain of Business Administration and Economics using the Rasch model (Rasch, 1960). The comparison of self-reported *acquired* and *required competencies* by alumni can operate as feedback on curriculum effectiveness, and as "feed forward" for connecting to and meeting the needs of important stakeholders such as employers (cf. Arthur, Brennan, & De Weert, 2007).

Three Perspectives on Competencies

The competency concept in different domains.

Traditionally, labor market research has studied the connection between education and labor market success indicators such as *having a job on the level of the education program that has been attended*, *having a job in the field of specialization*, and *monthly wages*. Classic human capital predictors of labor market success are grade point average (GPA), level of education, and years of education. Van der Loo and Semeijn (2004) have argued that predictive models of labor market success may benefit from the inclusion of competencies. Competencies may better represent rapidly changing needs in the labor market. Van der Loo and Semeijn suggest studying competencies from three perspectives: the education perspective, the labor market perspective and the human resource perspective (the fit between education and the labor market).

The education perspective.

In higher education competencies are defined as integrated knowledge, skills, and attitudes which operate as central learning goals in curricula (Van der Klink & Boon, 2003). The achievement of these educational goals leads to formal bachelor or master qualifications.

Integration is a key aspect of the competency concept in higher education (Van Merriënboer, Van der Klink, & Hendriks, 2002), particularly in interdisciplinary and multidisciplinary domains. For example, Medicine is an interdisciplinary domain, composed of many specialized sub domains (physiology; anatomy, biology, etc). Business Administration is a multidisciplinary domain, consisting of several different domains, such as macro and micro economics, law, sociology, social psychology, and organization science (QANU, 2004).

Educational scientists, such as Van Merriënboer and Kirschner (2007) stress that learning complex, multi-element issues, and the *simultaneous* acquisition of domain-specific and generic competencies optimizes the chance that transfer of learning occurs. These authors, and expertise researchers such as Boshuizen (2009) and Bransford, Brown, and Cocking (2000), criticize curricula in interdisciplinary and multidisciplinary domains. Boshuizen identifies a lack of horizontal and vertical integration of the subjects taught, which refers to a lack of multidisciplinary coherence, and a gap between theoretical and practical relevance. The constituting domains or sub domains are taught separately, and the expert teachers overemphasize their domain-specific facts, concepts, principles and practices. The coverage of many topics from different domains in an isolated manner may be a poor way to help students develop the competencies they need to prepare for practice (Bransford et al., 2000). Students have to fill in the gaps between the separately presented discipline knowledge and the integrated professional application in the workplace.

The issue of which competencies are prioritized in inter- and multidisciplinary domains is more complicated than in monodisciplinary domains (e.g. Economy). In Medicine the required body of knowledge is well-defined by professional bodies, leading to more consensus on what has to be learned and how. However, in Business Administration a well-defined body of knowledge is lacking. Consequently, the manner in which competencies are prioritized in Business Administration curricula is more arbitrary than in well-defined domains. Mintzberg (2004) criticizes the shortcomings of Business Administration curricula in terms of teaching the wrong things, in the wrong way, to the wrong people.

In the current study, and with the help of the Rasch model, the aim is to analyze which competencies are prioritized in Business Administration curricula, and which competencies are prioritized by employers, based on self-reports of alumni. The results will be compared with the competencies that are prioritized in the monodisciplinary domain of Economy.

The labor market perspective.

Economists consider competencies to be important indicators of economic growth and the allocation of wages (Borghans, 2001). Human capital theory assumes that education facilitates the development of competencies, ultimately leading to the direct productivity of each person who has attended a specific education type (e.g. secondary education; university; business schools). Economic operationalizations of competencies imply the education type and level, or number of years of formal education, and assume more or less fixed learning outcomes in terms of productivity. However, Borghans (2001), and Van der Loo and Semeijn (2004) point out that *acquired competencies* can vary, depending on the design and type of program that has been attended, as well as individual differences amongst attendees. Moreover, competency development does not stop after formal education. Rapidly changing labor markets require professionals to continuously develop their competencies. The alumni survey study of Van der Loo and Semeijn (2004) has indicated that adding self-reported *acquired* and

required competencies to predictive labor market models explains extra variance in monthly wages. *Acquired competencies* are defined as competencies which are learned in curricula. Labor market researchers have noticed that the link between competencies which are acquired in higher education and the competencies which are required in the labor market is strongest during the transition from university to work. Moreover, this link seems to be crucial for a successful transition. The transition period refers to the first one year and a half after graduation. Van der Loo and Semeijn (2004) stress that *acquired competencies* are better proxies of dynamic changes in the labour market than education programs. Hence, these labor market researchers advocate the use of self-reported competencies in predictive models. Self-reported competencies will be included in predictive labor market models in the current study.

The human resource perspective.

Transparency about the types, quality, and level of competencies acquired in higher education provides more leads for comparisons with the requirements of companies (Arthur et al., 2007). Economic assignment models play an important role in the human resource perspective on competencies (Semeijn, 2005), and assume that the fit between *acquired* and *required competencie*s determines productivity (e.g. wages). *Required competencies* represent the demands of the labor market. Different (higher) education programs lead to different levels and types of competencies, which then lead to comparative advantages within different labor market segments. Hence, competencies act as a links between education institutes and employers, and vice versa (Van der Klink & Boon, 2003).

Human Resource Management (HRM) departments in companies focus on the optimal allocation of competencies in their corporation to maximize the organization's performance and output. In addition, HRM is involved in developing programs to adjust competency deficiencies and to anticipate competency needs (Semeijn, 2005). Hence, HRM professionals in many industries are full conversation partners for curriculum developers, as they strive to

optimize the harmony between the *acquired competencies* and the *required competencies* in the labor market. Strategically involved HRM professionals are experts in determining the company's current and future key competency needs (Van Zolingen, 1995). In contrast to economists, HRM professionals appreciate the benefit of (inter)subjective measures.

Employer involvement in curriculum design, reflected in curriculum quality criteria such as "connections with the corporate world" plays an important role in formal national and international accreditation requirements for Economy and Business Administration curricula (EQUIS, 2008; QANU, 2004). The current study will analyze the fit between the *acquired competencies* during education programs and the *required competencies* by the labor market.

Modeling Techniques

Based on the same surveys and databases, labor market researchers regularly report different competency dimensions affecting labor market success. For example, Garcia-Aracil and Van der Velden (2008) identified six competency dimensions when they analyzed data from the large international CHEERS survey with exploratory factor analyses. In contrast, Heijke and Meng (2011) distinguished two dimensions using the same CHEERS data with hierarchic cluster analyses. Such contradictory results suggest that the modeling techniques that have been used have not produced invariant measures.

As an analysis alternative, the Rasch model (Rasch, 1960) can assist in modeling test- and sample free interval person and item measures. The Rasch model offers the opportunity to position persons and items on the same scale, and to compare research results even if different sets of items, or different rating scale categories are used. Additionally, dimensionality tests, common person/common item, and anchoring techniques can assist in verifying whether or not self-reported *acquired competencies* measure the same underlying psychological phenomenon as self-reported *required competencies*.

Labor market research rarely provides useful feedback for curriculum redesign. However, the Rasch model provides opportunities to compare the postgraduates' self-reported *acquired* and *required competencies* at the composite capability level (item level) to identify residues, matches, and deficiencies.

Based on the three perspectives on competencies and the opportunities that the Rasch model offers to construct accurate, invariant interval measures (within the confidence boundaries of measurement errors; Fox & Jones, 1998), four research questions are formulated:

1. Is it possible to model invariant interval measures of self-reported *acquired* and *required competencies* in the domain of Business Administration (BA) and Economy (EC) using the Rasch rating scale model?
2. Do *acquired* and *required competencies* represent the same underlying psychological phenomenon?
3. In the analysis of the fit between *acquired* and *required competencies* can matches, deficiencies, and residues in composite capabilities be identified, and do they differ for postgraduates in Business Administration and Economy?
4. Can Rasch competency perception measures predict labor market success, and do they explain extra variance in monthly wages?

Methods

Participants.

More than 4000 post-graduates in Economy and Business Administration in the report years 2006-2008 (graduation years 2005-2007) filled out the Higher Education Monitor (HEM), a survey administered to postgraduates of 13 Dutch universities one-and-a-half year after graduation. The average age of the respondents was 26 years; 69% male and 31% female.

Design.

The study is a secondary analysis of a survey study, performed on an existing dataset that was made available by the Research Centre for Education and the Labor Market (ROA) of Maastricht University, and the Association of Universities in the Netherlands (VSNU). The dataset was exclusively composed of responses from Dutch university postgraduates in Business Administration (BA) and Economy (EC). Sets of questions in the Higher Education Monitor (HEM) were used which were relevant to address the four research questions, and which could control for other possible influencing variables (covariates).

Instruments.

The Higher Education Monitor (HEM) is composed of sets of questions regarding demographic variables (age, gender), GPA, education program perceptions, extra(curricular) activities during education, level and field of education, current job position, job level, and job field, competencies, monthly wages, and so on.

Grade point average (GPA).

GPA was self-reported and measured with the item "Approximate your graduation mark", followed by a nine point scale ranging from six to ten in half points increments. The cut-off point in the Netherlands for graduation is a six.

Education program perceptions.

Education program perceptions were measured in HEM with the item "Mark the following eleven education program characteristics with a grade between one and ten". An example of a program design characteristic that could be graded is: "The connection with current scientific theories." An example of a teaching characteristic is "Teaching skills."

Extracurricular activities

Extracurricular activities were measured in HEM with the item "Experience during the education program", followed by five yes-no questions for the following categories: a) internship in the Netherlands b) internship abroad c) other work experience that is relevant for

the domain d) education abroad and e) administrative experience. For all extracurricular activities dummy variables were assigned, using a one for *yes* answers, and a zero for *no* answers.

Level and field of education versus level and field of the current job.

All respondents in the available dataset had completed Master of Science education programs, either in the domain of BA or EC. The field of the education program that had been attended was described by the respondents addressing the HEM-item "What was the name of the MSc education program that has been accomplished in –year of graduation?" These responses were coded into national "Register Opleidingen Hoger Onderwijs" (Register Education Programs Higher Education) or CROHO rubrics of the domain of BA and EC. The two domains were transformed into a dummy variable in which a one was assigned to BA and a zero to EC.

The required level of the current job position was measured with the HEM-item "Which education program *level* was at least required by your employer for your current job position?", followed by five options: a) MSc plus doctorate (3.54%) b) MSc (57.25%) c) Higher Vocational Education (37.36%), d) Pre-university education (1.53%) and e) Other secondary education (0.32%). The responses on this item were dichotomized into the dummy variable *job level*. A one was assigned to 'a' and 'b', and a zero to 'c', 'd', and 'e'. The Dutch occupational labour market has a two-tier higher education system, consisting of Higher Vocational Education (HVE) and Universities, each with a different focus. The levels of both systems differ. HVE is more vocation-oriented, and comparable to a Bachelor level, whereas universities are more academically and research oriented, and offer higher level diplomas. Before HVE graduates can apply for admission to Master of Science programs, they first have to complete a premaster trajectory, to bridge the academic gaps between the HVE and university level. The supply of HVE graduates in the Netherlands is two thirds of all graduates and postgraduates from higher education (Dutch Inspectorate of Education, 2012).

Hence, for an academically educated postgraduate a job at the HVE level is considered a lower level job.

The required field of the current job position was measured with the item "Which field of education was required by your employer for your current job position?", followed by four options: a) exclusively my own field (7.24%); b) my own or a related field (64.84%); c) a different field (25.30%); d) no specific field (2.62%). Only if respondents selected option 'c' they had to respond to the extra item "Which field?", followed by nine options: a) Economy; b) Behavior and Society; c) Health Care; d) Agriculture; e) Nature; f) Education; g) Law; h) Languages and Culture and i) Technique. The responses on both items were verified by comparisons with the CROHO rubrics, and dichotomized into the dummy variable *job field.* A one was assigned to 'a' and 'b', and a zero to 'c' and 'd'.

In the logistic regressions *job level* and *job field* are proxies of labor market success. In the OLS regression on wages *job level* and *job field* are control variables.

Competencies.

The competency items were derived from large scale OECD competency measurement projects in the late 1990s (cf. OECD,1997; Rychen & Salganik, 2001), and actualized, tested, and refined by ROA (cf. Borghans, 2001; Meng, 2006; Van der Loo and Semeijn, 2004). In the HEM competencies were measured with 23 items, introduced by:

> Below you will find several capabilities which may be relevant in the workplace. Estimate for each capability in column one the competency level that is required in your current job position and in column two the capability level that was mastered during the education program.

Column one was composed of five response options for the *required competen*cies and column two of the same five response options for the *acquired competencies*. Both the *required* and the *acquired competencies* were scored on a five-point Likert scale, ranging

from one (insufficient) to five (excellent). Both competency series were composed of 23 items, referring to specific knowledge capabilities (e.g. the capability to apply domain-specific knowledge in practice; the capability to use interdisciplinary knowledge), or more generic capabilities (e.g. the ability to identify problems or opportunities; the ability to communicate in foreign languages), and attitudes (e.g. willingness to risk one's neck).

Monthly wages

Monthly wages were self-reported and measured with the HEM item "What is your gross monthly wage?" In the reported ordinary least square regression analysis *monthly wages* is the labor market success indicator (the dependent variable).

Follow-up training

Participation in follow-up training was measured with the HEM item "After accomplishing your formal Master of Science program, did you attend a course or corporate training (no leisure or hobby courses)?", which could be answered with a yes-no response. The *yes* response was transformed into a one in the dummy variable *Follow-up training*, and the *no* response was set to zero. *Follow-up training* is added to the OLS regression on wages as a control variable.

Procedures.

The data in the current study was derived from HEM reports from 2006 till 2008 (years of graduation: 2005-2007). The HEM is a survey instrument that has been employed since the late 1990s by ROA and the VSNU. HEM questionnaires are delivered by post. To improve the response rate, ROA service teams follow-up the invitation to participate in the HEM survey by contacting the postgraduates by telephone, approximately two weeks after the first invitation. The typical response rate for postgraduates in BA and EC is between 40% and 48%. Participation in the survey is voluntary, and participants are not rewarded for their contribution. Both the personal data of the individual respondents and the identities of the

participating universities are kept confidential in research reports. The survey invitation clarifies that the data will be used exclusively for scientific research purposes.

For the regression analyses in the current study, only respondents between the ages of 20 and 30 were selected. This ensured the exclusive analysis of data from respondents in the transition from university to work.

Monthly wages were transformed into the natural logarithm. Based on category infit and outfit mean square statistics, and measure-to-category and category-to-measure diagnoses all items of *acquired competencies* and *required competencies* were recoded into three-category scales in the Rasch rating scale model for BA and EC separately. Rasch dimensions were tested for one-dimensionality by residual analysis. Common person techniques were used to compare the *acquired* and *required competencies* in both domains. Item anchoring techniques were used to measure the *acquired* and *required competencies* of the graduates in BA and EC in the same frame of reference to identify deficiencies and residues in the *acquired competencies*.

Analyses.

Rasch analyses were executed in Winsteps 3.73.0 (Linacre, 2012). Stepwise logistic and ordinary least square (OLS) regression analyses were carried out in SPSS-16. The domain (BA and EC), age, gender, GPA, program perceptions, extra(curricular) activities, *job level*, *job field*, and follow-up training were included in the regression analyses as control variables, together with high, and medium levels of *acquired* and *required competencies* (reference category ‘low level’) as the independent variables. *Job level* and *job field* were the dependent variables in the logistic regressions; *monthly wages* were the dependent variable in the OLS regression.

Results

Constructing invariant interval measures in the Rasch rating scale model.

The Rasch rating scale analyses identified two different Rasch competency dimensions that were fitting the Rasch rating scale model:

1. *Acquired competencies*, 23 items, Cronbach alpha .93 (in BA and in EC)

2. *Required Competencies*, 23 items, Cronbach alpha .94 (in BA and in EC; Figure 1, BA)

<insert Figure 1 about here>

A Rasch dimension implies that all items in the dimension (and the person responses on the items) operate as a coherent set, measuring the same underlying psychological variable. When the person scores on the items of the *required competencies* were cross-plotted with the person scores on the items of the *acquired competencies*, the plot revealed that the person score patterns on the items in both variables were different (Figure 2). It implies that person estimates of both Rasch dimensions (the *acquired competencies* and the *required competencies*) should be included in regression analyses to investigate which type of competencies affects labor market outcomes in which way, for the different groups of postgraduates (BA, EC, or both).

<insert Figure 2 about here>

In the next step, the *acquired* and *required competencies* were controlled separately for one-dimensionality in BA and EC, using Rasch dimensionality diagnoses (residual analyses; Figure 3). All cross plots resembled the plot in Figure 3, indicating that *acquired competencies* were one single Rasch dimension, in BA and in EC. The same was true for the *required competencies*.

<insert Figure 3 about here>

Research question one and two have been addressed by these Rasch analyses.

Anchoring item measures.

Although *acquired competencies* and *required competencies* should be considered as separate dimensions, it is still possible to compare the item endorsability measures (corresponding with person capabilities measures) in both dimensions. Common items were anchored for that purpose. Anchoring assures that Rasch modeled variables are measured in the same frame of reference (equivalent intercepts, and equivalent logit lengths). The next step was to verify if a minimum of five common items in the *acquired competencies* could be anchored on corresponding, equivalent items of the *required competencies* in BA. First the items of the *required competencies* and *acquired competencies* in BA were cross-plotted and compared with one another. Only item measures of the *acquired competencies* in BA within the confidence intervals were anchored on item measures of the *required competencies* in BA. In the example in Figure 4 the items 3, 6, 14, 19, and 22 are within the confidence intervals, which imply that anchoring of those items is allowed, just as with anchoring the scale structure. The same procedure was repeated for the *acquired competencies* and the *required competencies* in EC. Ultimately, all four variables were measured in the same frame of reference by anchoring five items in each comparison.

Item measures in a Rasch model correspond with person positions of self-reported capability measures on the same scale, allowing comparisons of each composing item measure (person capability) in the *required competencies* with each composing item measure (person capability) in the *acquired competencies* using T-tests. After having anchored five items in each construct the item and person measures are measured in the same frame of reference. Consequently, a comparison of item measures (and corresponding person capability positions) can be used as feedback for determining the degree to which the *acquired competencies* during education correspond with the competencies *required* by the labor market (in the eyes of alumni).

<insert Figure 4 about here>

Indicators for curriculum design.

Table 1 shows the residues (the negative t-statistics), matches (the zero t-statistics), and deficiencies (the positive t-statistics) in the composing self-reported capabilities in BA as a function of the comparison of the *required competencies* with the *acquired competencies* in BA.

The analysis suggests that in BA seven composing acquired capabilities match seven composing required capabilities (2, interdisciplinary knowledge; 3, the application of own domain knowledge; 14, proposing new ideas and solutions; 23, understanding perspectives of others; 6, gathering information, 8, relating concepts, and 19, working independently).

Nine composing capabilities seem to be insufficiently mastered during education (5, foreign languages; 1, the knowledge level of the own domain; 20, the courage to risk one's neck; 21, bringing problems and issues under discussion; 22, defending one's own point of view; 4, ICT skills; 15, the capability to learn new things; 10, logical reasoning, and 17, cooperating productively). The labor market requirements for these nine capabilities are significantly higher than the mastered levels of these capabilities during education.

In contrast, seven composing capabilities show residues, suggesting that employers might underuse these mastered capabilities (18, using the capacity of others; 13, decision making; 11, being able to cope with budget constraints; 9, distinguishing relevant from irrelevant issues; 12, working under pressure; 7, identifying problems and opportunities, and 16, explaining issues to others). Regarding these seven composing capabilities, the labor market requirements are significantly lower than what postgraduates in BA perceive themselves as being able to offer.

<insert Table 1 about here>

Table 2 provides a similar analysis for EC. The analysis suggests that in EC six acquired capabilities match six counterparts of the required composing capabilities (2, interdisciplinary

knowledge; 21, bringing issues under discussion; 22, defending one's own point of view; 17, cooperating productively; 6, gathering information, and 19, working independently).

Six other composite capabilities seem to be insufficiently mastered during education (5, foreign languages; 20, the courage to risk one's neck; 4, ICT skills; 23, understanding perspectives of others; 15, the capability to learn new things, and 10, logical reasoning).

In contrast, eleven composing capabilities show residues (1, the knowledge level of the own domain; 13, decision making; 18, using the capacity of others; 3, the application of own domain knowledge; 14, proposing new ideas and solutions; 11, being able to cope with budget constraints; 9, distinguishing relevant from irrelevant issues; 12, working under pressure; 8, relating concepts; 7, identifying problems and opportunities and 16, explaining issues to others).

<insert Table 2 about here>

Competencies as determinants of labor market success.

Both the *acquired competencies* and *required competencies* were divided into high, medium, and low levels based on the person separation indices, to verify whether different levels of these two types of competencies affect labor market outcomes in different ways. Dummy variables of high and medium levels are included in the analyses (reference category: low level. The means and standard deviations of the continuous variables and the distribution of the dummy variables are displayed in Table 3.

<insert Table 3 about here>

In all regression analyses in the first model the dummy of BA/EC is included. In Model 2, demographic characteristics and GPA are added. In Model 3 the curriculum perceptions are added. In Model 4, the extra(curricular) activities are included. In Model 5, first the medium and high levels of the *acquired competencies* are included, followed by the medium and high levels of the *required competencies* in Model 6.

The logistic regressions on *job level* (Table 4) and *job field* (Table 5) are controlled for respectively *job field* and *job level* in Model 7, since log linear analyses revealed a significant interaction between both variables. Economists have both *job field* and *job level* significantly more often, as compared to postgraduates in BA.

Determinants of job level.

<insert Table 4 about here>

The analysis in Table 4 shows that both levels of the *acquired competencies* in Model 5 add modestly but significantly to Nagelkerke R Square in the regression on *job level*. In contrast, both levels of the *required competencies* increase Nagelkerke R Square in the regression on *job level* significantly and substantially. If the medium and high levels of *required competencies* are included in Model 6, the medium level of the *acquired competencies* turns into a non significant negative determinant of *job level*, while a high level of the *acquired competencies* turns into a marginally significant negative determinant of *job level*, diminishing the likelihood of having a job that matches the level of the education program that has been attended. A high level of *required competencies* corresponds specifically with a matching job level, making it four times more likely that the graduates have obtained a matching job level, while the medium level of the *required competencies* makes it two times more likely, as compared with a low level.

Determinants of job field.

The analysis in Table 5 shows that medium and high levels of the *acquired competencies* are significant negative determinants of *job field* in Model 6, making it less likely that postgraduates have obtained a job matching their own field. In Model 6 Nagelkerke R Square has increased modestly but significantly when the medium and high levels of the *required competencies* are included in the model. For the regression on *job field*, a self-reported medium level of the *required competencies* is a slightly stronger predictor of *job field* than a

high level. The medium level makes it more than one-and-a-half times more likely that the postgraduates have obtained a job matching their own field.

<insert Table 5 about here>

Both logistic regressions on *job level* and *job field* are relevant for the regression on *monthly wages*. Ultimately it is important to gain insight in whether *job level* or *job fiel*d (or both) is contributing to *monthly wages* (Table 6).

Determinants of monthly wages.

<insert Table 6 about here>

The analysis in Table 6 reveals that only both levels of the *required competencies* modestly but significantly directly contribute to the explained variance of monthly wages. Both levels of the *required competencies* also contribute indirectly to the explained variance of monthly wages through *job level* in Model 7 (see also Table 4), even if *follow-up training* in the first year after graduation is taken into account (Model 9).

Discussion/Conclusion

Research question 1: "Is it possible to model invariant interval measures of self-reported *acquired* and *required competencies* in the domain of Business Administration and Economy using the Rasch rating scale model?" has been addressed. Accurate, reliable, and invariant measures have been constructed for self-reported *acquired competencies* and perceived *required competencies* in Business Administration and Economy. The Rasch model also supports the construct validity of the self-reported competencies.

Research question 2 was not supported. The Rasch common person analysis clearly demonstrated that the person responses and item endorsabilities in *acquired competencies* should be distinguished from the person responses and item endorsabilities in the *required competencies*. *Acquired competencies* is one coherent Rasch dimension, instead of either two

or six dimensions as reported in other studies (García-Aracil, & Van der Velden, 2008; Heijke, & Meng, 2011). However, *acquired competencies* differs from *required competencies*, since the composing capabilities in the *acquired competencies* and *required competencies* are prioritized in different ways. Nevertheless, although distinct from the *acquired competencies*, both variables are one single, coherent Rasch dimension. It means that in predictive models, both Rasch dimensions (variables) have to be included and that difference scores are not an option (cf. Edwards, 1994).

A minimum of five items for anchoring could be identified, making it possible to measure all constructs in the same frame of reference. A comparison of the item endorsabilities (self-reported person capabilities) of the anchored *required competencies* and *acquired competencies* measures suggests differing matches, deficiencies and residues for the postgraduates in Business Administration and Economy. The labor market requirements for postgraduates in Business Administration are higher and more versatile than the requirements for postgraduates in Economy.

The analyses of both domains suggest current deficiencies in foreign languages, risking one's neck, ICT skills, learning new things, and logical reasoning. In addition, postgraduates in Business Administration also seem to fall short in the capability to openly discuss problems, arguing their own point of view, and cooperating productively. Even more important, their domain knowledge is inadequate, while domain knowledge is a residue amongst economists. This particular finding supports the critiques of Boshuizen (2009), and Bransford et al. (2000) that curricula in multidisciplinary domains such as Business Administration do not enable graduates to develop the knowledge capabilities which are required on-the-job.

Obviously, the matches that were found should be maintained and cherished. However, the deficiencies should be critically re-considered. They may be regarded as future

improvement issues for curriculum development. In addition, both the deficiencies and residues might operate as items on the higher education agenda in the cooperation with important stakeholders such as employers and alumni. These comparative analyses with Rasch measures have provided an answer to research question 3.

The regression analysis on wages revealed that the perceived *required competencies* positively, directly, and indirectly predicts monthly wages, while the perceived *acquired competencies* do not operate as significant determinants of monthly wages. Only required competencies explain extra variance in monthly wages, providing an answer to research question 4.

Obviously, the current study has its limitations. Analyses were conducted on existing data, implying that there were no opportunities to influence or improve the content of the questionnaire. In addition, if it is taken into account that the response rate of the postgraduates in Business Administration and Economy is rather low, the available dataset might be affected by a restriction of range, particularly since not all respondents filled-out every item in the HEM. The selection of a specific age group -in the transition from university to work- further reduced the available data. Next, all analyses were based on self-reported data, implying for example that GPA and *monthly wages* may have been overestimated. The analyses were only conducted on data of postgraduates from Dutch universities and business schools. It would more informative to carry out the same types of analyses on international datasets. Regarding the prediction of *job field*, only a small amount of variance was explained. However, two rather homogeneous groups have been compared, thereby restricting the amount of variance. In addition, *job field* may be more sensitive for personality characteristics than the determinants which are used in the current study (cf. Semeijn, Boone, Van der Velden, & Van Witteloostuijn, 2005). The finding that a low level of *required competencies* and a high level of *required competencies* are significant positive determinants of *job field* suggests that the

Dutch occupational labour market may be divided into two *job field* needs segments: One segment which emphasizes the soft skills at the bottom of the Rasch hierarchy, and another that is in urgent need of high level composite capabilities, such as domain-specific technical knowledge, foreign languages and interdisciplinary knowledge in the top of the Rasch hierarchy.

Despite the limitations, the current study has provided new and important insights in the benefit of including self-reported competencies, transformed in Rasch interval measures. Anchoring techniques have allowed the analysis of matches and mismatches between the acquired and required composing capabilities. Most labour market studies do not provide curriculum designers with relevant feedback. However, if existing labor market data are analyzed with more advanced measurement techniques, such as the Rasch model, and when domain specific differences are taken into account, the same data can provide highly relevant information to improve existing curricula. The findings from the current study can be placed in the center of the curriculum reform agenda in the domain of Business Administration, specifically for the dialogues with the corporate world. The study has provided valuable feedback to Dutch designers of curricula in Business Administration and Economy, by highlighting strengths and weaknesses of current Business Administration and Economy education programs. It is likely that the findings can be generalized to other occupational labor markets such as Germany and Austria. Just like the Netherlands, these labor markets prioritize a high level of professional and technical/rational capabilities (Eyraud, Marsden, & Silvestre, 1990; Gangl, 2001).

In addition, the study has shed light on the distinct contributions of the *acquired competencies* and *required competencies* in predictive labor market success models. Using ordinal competency measures, Van der Loo and Semeijn (2004) found that *required competencies* exclusively predicted wages of graduates from HVE, but not for postgraduates

from universities. However, the current study with Rasch interval measures indicates that *required competencies* also exclusively predict wages for postgraduates from universities. Put differently: The market is leading, stressing the need for close connections with the corporate world (EQUIS, 2008). Finally, the current Rasch competency measures can serve as a starting point for item banking in international comparisons and comparisons between domains, for example.

The fact that alumni's self-reported composite *acquired competencies* significantly differ from alumni's self-reported *required competencies* suggests the presence of serious mismatches in the Dutch occupational labor market. Closer connections with the corporate world, as recommended by accreditation committees in this domain (EQUIS, 2008; QANU, 2004), may close the gap between the competing priorities that are assigned to the composing capabilities by education programs (*acquired competencies*), and those assigned by employers (*required competencies).*The findings suggest that the lack of predictive power of *acquired competencies* is not a static phenomenon. More agreement between the priorities assigned to composing capabilities by curriculum designers and those assigned by employers could turn the *acquired competencies* into positive predictors of labor market success. Curriculum designers and employers can negotiate which composite capabilities are likely to be (further) developed in the workplace, and which should preferably be developed and mastered in education programs, and at which levels. The dialogue may lead to both better designed formal curricula for Business Administration and Economy, and in-company training programs.

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Table 1

Residues, Matches, and Deficiencies in Self-reported Composing Capabilities in BA

Item	REQ	SE	ACQ	SE	*t*
2 interdisciplinary knowledge	1.36	0.05	1.40	0.05	-0.57
5 foreign languages	0.81	0.04	0.03	0.04	13.79**
1 knowledge of own domain	0.73	0.04	0.56	0.04	3.01**
3 application own domain knowledge	0.64	0.04	0.64	0.04	0.00
18 use capacities of others	0.39	0.04	0.67	0.04	-4.95**
20 risking one's neck	0.36	0.04	0.04	0.04	5.66**
21 bringing issues under discussion	0.28	0.04	0.10	0.04	3.18**
13 making decisions	0.25	0.04	0.49	0.04	-4.24**
22 arguing own point of view	0.14	0.04	-0.04	0.04	3.18**
4 information-&communication technology	0.11	0.04	-0.04	0.04	2.65**
14 proposing new ideas and solutions	0.09	0.04	0.09	0.04	0.00
11 respecting budget and constraints	0.00	0.04	0.30	0,04	-5.30**
23 understanding perspectives of others	-0.05	0.04	-0.05	0,04	0.00
15 learning new things	-0.24	0.04	-0.92	0.04	12.02**
9 distinguishing relevant from irrelevant issues	-0.26	0.04	0.05	0.04	-5.48**
10 logical reasoning	-0.34	0.04	-0.61	0.04	4.77**
17 cooperating productively	-0.34	0.04	-0.45	0.04	1.94*
6 gathering information	-0.48	0.04	-0.48	0.04	0.00
8 relating concepts	-0.48	0.04	-0.47	0.04	-0.18
12 working under pressure	-0.62	0.04	-0.33	0.04	-5.13**
7 identifying problems and opportunities	-0.69	0.04	-0.29	0.04	-7.07**
16 explaining to others	-0.77	0.04	0.11	0.04	-15.56**
19 working independently	-0.90	0.04	-0.90	0.04	0,00

** significant at the .01 level; *significant at the .05 level; light grey = high level of *required competencies*; dark grey = medium level of *required competencies*. Unmarked = low level.

Table 2

Residues, Matches, and Deficiencies in Self-reported Composing Capabilities in Economy

	REQ	SE	ACQ	SE	*t*
2 interdisciplinary knowledge	1.54	0.05	1.54	0.05	0.00
5 foreign languages	0.81	0.04	0.32	0.04	8.66**
20 risking one's neck	0.57	0.04	0.17	0.04	7.07**
1 knowledge of own domain	0.48	0.04	0.73	0.04	-4.42**
13 making decisions	0.46	0.04	0.70	0.04	-4.24**
18 using capacities of others	0.39	0.04	0.77	0.04	-6.72**
3 application own domain knowledge	0.33	0.04	0.64	0.04	-5.48**
21 bringing issues under discussion	0.28	0.04	0.20	0.04	1.41
22 arguing one's own point of view	0.14	0.04	0.12	0.04	0.35
4 information-&communication technology	0.11	0.04	0.00	0.04	1.94*
14 proposing new ideas and solutions	0.09	0.04	0.34	0.04	-4.42**
23 understanding perspectives of others	0.06	0.04	-0.05	0.04	1.94*
11 respecting budget and constraints	0.00	0.04	0.45	0.04	-7.95**
9 distinguishing relevant from irrelevant issues	-0.26	0.04	0.19	0.04	-7.95**
17 cooperating productively	-0.34	0.04	-0.34	0.04	0.00
15 learning new things	-0.39	0.04	-0.80	0.04	7,25**
6 gathering information	-0.48	0.04	-0.48	0.04	0.00
10 logical reasoning	-0.50	0.04	-0.71	0.04	3.71**
12 working under pressure	-0.62	0.04	-0.21	0.04	-7.25**
8 relating concepts	-0.63	0.04	-0.41	0.04	-3.89**
7 identifying problems and opportunities	-0.69	0.04	-0.05	0.04	-11.31**
16 explaining to others	-0.77	0.04	0.21	0.04	-17.32**
19 working independently	-0.90	0.04	-0.81	0.04	-1.59

** significant at the .01 level; *significant at the .05 level; light grey = high level of *required competencies*; dark grey = medium level of *required competencies*. Unmarked = low level.

Table 3

Means, and Standard Deviations of Continuous Variables, and Distribution of Dummy variables (Age selection >= 23 & age <= 30)

Continuous variables	*M*	*SD*	*n*
natlog monthly wages	7.88	0.22	2232
Age	26.03	1.68	3614
GPA	7.27	0.53	3601
Zscore Design	0.00	1.00	3454
Zscore: Teachers	0.00	1.00	3464
Medium level Acquired Competencies BA	0.10	0.31	647
High level Acquired Competencies BA	1.33	0.69	204
Medium level Required Competencies BA	0.13	0.33	573
High level Required Competencies BA	1.45	0.64	332
Medium level Acquired Competencies Economy	-0.01	0.29	726
High level Acquired Competencies Economy	1,28	0.75	278
Medium level Required Competencies Economy	-0.16	0.28	624
High level Required Competencies Economy	1.27	0.84	433

Dummy variables	Percentage
BA	47
Gender (male)	69
Dutch internships	54
Foreign internships	86
Relevant work experience	56
Education abroad	73
Administrative experience	56
Medium level Acquired Competencies BA	44
High level Acquired Competencies BA	14
Medium level Required Competencies BA	39
High level Required Competencies BA	22
Medium level Acquired Competencies Economy	43
High level Acquired Competencies Economy	17
Medium level Required Competencies Economy	38
High level Required Competencies Economy	26
Job level	61
Job Field	74
Follow-up training	54

Table 4

Stepwise Logistic Regression of Determinants of Job Level

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	B	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*
BA	-0.10	0.08	-0.18**	0.08	-0.21**	0.08	-0.24***	0.08	-0.23**	0.08	-0.19**	0.09	-0.14	0.09
Age			-0.03	0.02	-0.03	0.02	-0.05**	0.03	-0.06**	0.03	-0.05*	0.03	-0.04	0.03
Gender			0.19**	0.09	0.19**	0.09	0.22**	0.09	0.21**	0.09	0.30***	0.09	0.29***	0.09
GPA			0.84***	0.08	0.81***	0.08	0.71***	0.09	0.70***	0.09	0.69***	0.09	0.70***	0.09
Design					0.13**	0.05	0.06	0.05	0.04	0.05	0.03	0.05	0.02	0.05
Teaching					-0.08*	0.05	-0.01	0.05	-0.02	0.05	-0.01	0.05	0.00	0.05
Internship NL							-0.35***	0.08	-0.34***	0.08	-0.33***	0,09	-0.35***	0.09
Internship abroad							-0.88***	0.14	-0.88***	0.14	-0.85***	0.14	-0.86***	0.14
Rel.work							-0.26***	0.08	-0.24***	0.08	-0.20**	0.09	-0.19**	0.09
Education abroad							-0.44***	0.10	-0.42***	0.10	-0.41***	0.10	-0.42***	0.11
Admin exp							-0.52***	0.09	-0.50***	0.09	-0.48***	0.09	-0.52***	0.09
ACQcomp.medium									0.21**	0.09	-0.12	0.10	-0.10**	0.10
ACQcomp high									0.41***	0.13	-0.28*	0.15	-0.26*	0.15
REQcomp.medium											0.71***	0.10	0.67***	0.10
REQcomp high											1.46***	0.13	1.44***	0.13
Job field													0.51***	0.10
Constant	0.48***	0.05	-4,84***	0,92	-4,66***	0,92	-1,54	0.99	-1,53	0.99	-2.20**	1.02	-2.81**	1.03
n	2813		2813		2813		2813		2813		2813		2813	
Model chi square	1.62		120.51		128.51		291.28		302.81		442.84		470.15	
df	1		4		6		11		13		15		16	
p	.20		.00		.00		.00		.00		.00		.00	
Nagelkerke R Square	-		0.06		0.06		0.13		0.14		0.20		0.21	

*** Significant at the .01 level; ** Significant at the .05 level; * Significant at the .10 level

Table 5

Stepwise Logistic Regression of Determinants of Job Field

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	B	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*
BA	-0.52***	0.09	-0.52***	0.09	-0.53***	0.09	-0.55***	0.09	-0.56***	0.09	-0.55***	0.09	-0.53***	0.09
Age			-0.08**	0.03	-0.08**	0.03	-0.08**	0.03	-0.08**	0.03	-0.07**	0.03	-0.07**	0.03
Sexe			0.06	0.35	0.05	0.09	0.05	0.10	0.06	0.10	0.09	0.10	0.06	0.10
GPA			-0.02	0.05	-0.05	0.09	-0.04	0.09	-0.04	0.09	-0.05	0.09	-0.13	0.09
Design					0.10**	0,05	0.12**	0.05	0.13**	0.05	0.13**	0.05	0.12**	0.05
Teaching					-0.01	0.05	-0.04	0.05	-0.04	0.05	-0.04	0.05	-0.04	0.05
Internship NL							0.18**	0.09	0.18**	0.09	0.19**	0.09	0.23**	0.09
Internship abroad							0.07	0.13	0.07	0.13	0.09	0.13	0.17	0.13
Rel.work							-0.10	0.09	-0.11	0.09	-0.10	0.09	-0.08	0.09
Education abroad							0.05	0.10	0.04	0.10	0.04	0.10	0.08	0.10
Admin exp							0.38***	0.09	0.37***	0.09	0.39***	0.09	0.44***	0.09
ACQcomp.medium									-0.09	0.10	-0.22**	0.10	-0.21**	0.10
ACQcomp high									-0.14	0.13	-0.31**	0.15	-0.28*	0.15
REQcomp.medium											0.45***	0.11	0.36***	0.11
REQcomp high											0.37***	0.13	0.21***	0.13
Job level													0.51***	0.10
Constant	1.31***	.06	3.48***	0.98	3.71***	0.99	3.30***	1.05	3.32***	1.05	3.12***	1.05	3.16***	1.08
n	2813		2813		2813		2813		2813		2813		2813	
Model chi square	36.32		45.06		49.57		75.10		76.49		95.45		123.79	
df	1		4		6		11		13		15		16	
p	.00		.00		.00		.00		.00		.00		.00	
Nagelkerke R Square	.02		0.02		0.03		0.04		0.04		0.05		0.06	

*** Significant at the .01 level; ** Significant at the .05 level; * Significant at the .10 level

Table 6

Stepwise Linear Regression of Determinants of Monthly Wages

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7		Model 8		Model 9	
	B	*t*	*B*	*t*	*B*	*t*	*B*	*t*	*B*	*t*	*B*	*t*	*B*	*t*	*B*	*t*	*B*	*t*
BA	0.01	0.80	0.01	0.58	0.01	0.67	0.01	1.13	0.01	1.36	0.02*	1.70	0.02**	2.06	0.02**	2.08	0.02**	2.11
Age			0.03***	9.75	0.03***	9.76	0.03***	9.15	0.03***	9.08	0.03***	9.44	0.03***	9.91	0.03***	9.91	0.03***	9.71
Sexe			0.05***	5.34	0.05***	5.28	0.05***	5.44	0.05***	5.30	0.06***	5.73	0.05***	5.38	0.05***	5.37	0.05***	5.16
GPA			0.06***	6.61	0.06***	6.32	0.05***	5.46	0.05***	5.24	0.04***	4.91	0.03***	3.68	0.03***	3.69	0.03***	3.71
Design					0.00	-0.11	-0.01	--0.99	-0.01	-1.31	-0.01	-1.39	-0.01	-1.57	-0.01	-1.58	-0.01*	--1.73
Teaching					0.01	1.09	0.01**	1.95	0.01*	1.83	0.01**	1.98	0.01**	2.00	0.01**	2.01	0.01**	2.15
InternshipNL							-0.04***	-4.58	-0.04***	-4.61	-0.04***	-4.47	-0.04***	-4.08	-0.04***	-4.08	--0.04***	-4.06
Intern.abroad							-0.07***	-5.38	-0.07***	-5.24	-0.07***	-5.05	-0.06***	-4.22	-0.06***	-4.22	-0.06***	-4.34
Rel.work							-0.02**	-2.51	-0.02**	-2.33	-0.02**	-1.98	-0.02*	-1.70	-0.02*	-1.70	-0.01	-1.34
Edu abroad							-0.01	-0.50	0.00	-0.35	0.00	-0.25	0.00	0.24	0.00	0.23	0.00	0.14
Admin exp							-0.02**	-2.49	-0.02**	-2.25	-0.02**	-2.06	-0.01	-1.27	-0.00	-1.30	-0.01	-1.12
ACQcompmed									0.01	1.19	-0.01	-0.63	0.00	-0.44	0.00	-0.42	-0.01	0.51
ACQcomphigh									0.05***	3.48	0.01	0.78	0.02	1.02	0.00	1.04	0.02	1.03
REQcompmed											0.05***	4.19	0.03***	3.06	0.03***	3.03	0.03***	2.93
REQcomphigh											0.08***	5.98	0.06***	4.21	0.06***	4.19	0.05***	3.98
Job level													0.08***	8.34	0.08***	8.26	0.08***	8.50
Job field															0.00	0.33	0.01	0.59
Fu-training																	0.04***	4.85
Intercept	7.87***	1259.33	6.70***	64.06	6.70***	63.71	6.93***	63.78	6.93***	63.94	6.90***	64.09	6.89***	65.05	6.89***	64.56	6.88***	64.78
n	2232		2232		2232		2232		2232		2232		2232		2232		2232	
Adj.R Square	-		0.07		0.07		0.10		0.10		0.11		0.14		0.14		0.15	

*** Significant at the .01 level; ** Significant at the .05 level; * Significant at the .10 level

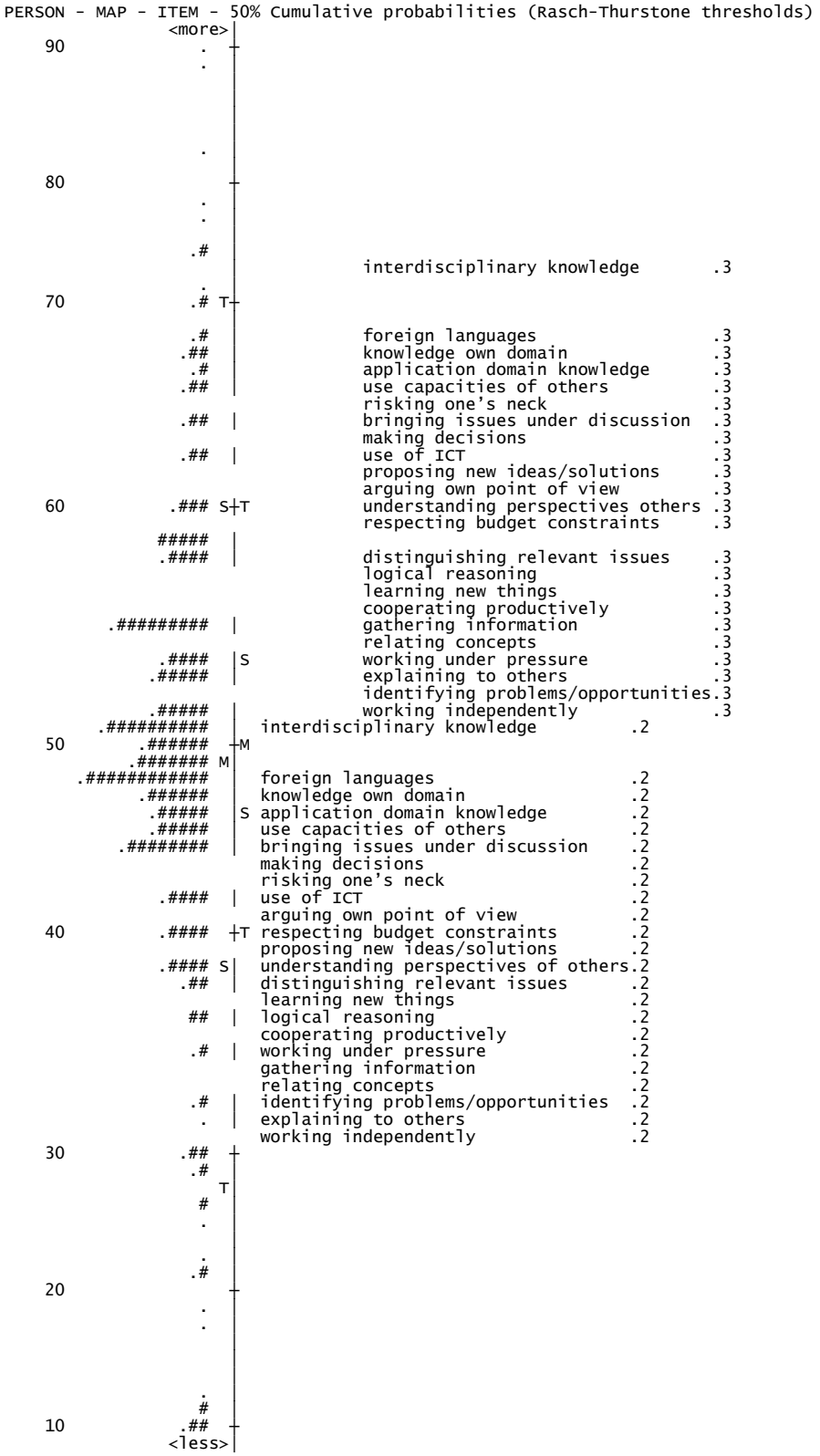

Figure 1. Item-category map *required competencies* in BA

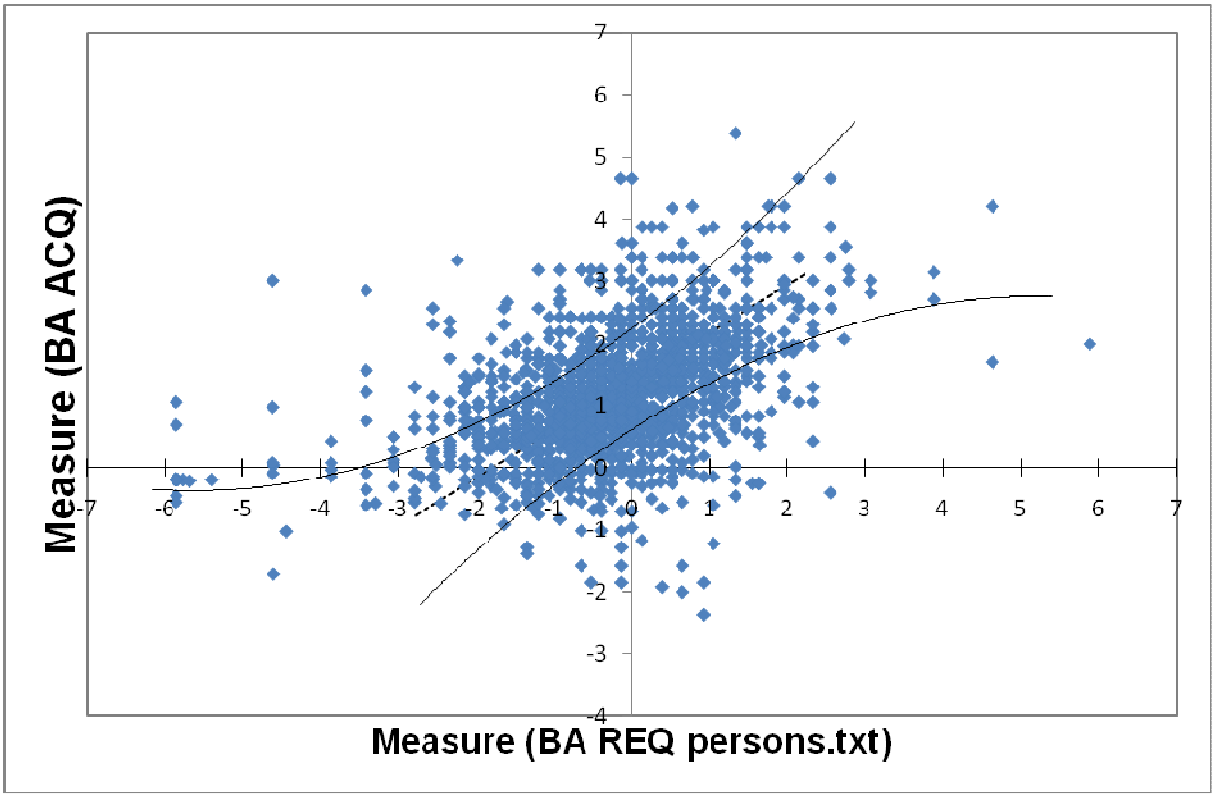

Figure 2. Persons plot *required competencies* (x-axis) versus *acquired competencies* (y-axis) in BA (> 5% beyond confidence intervals)

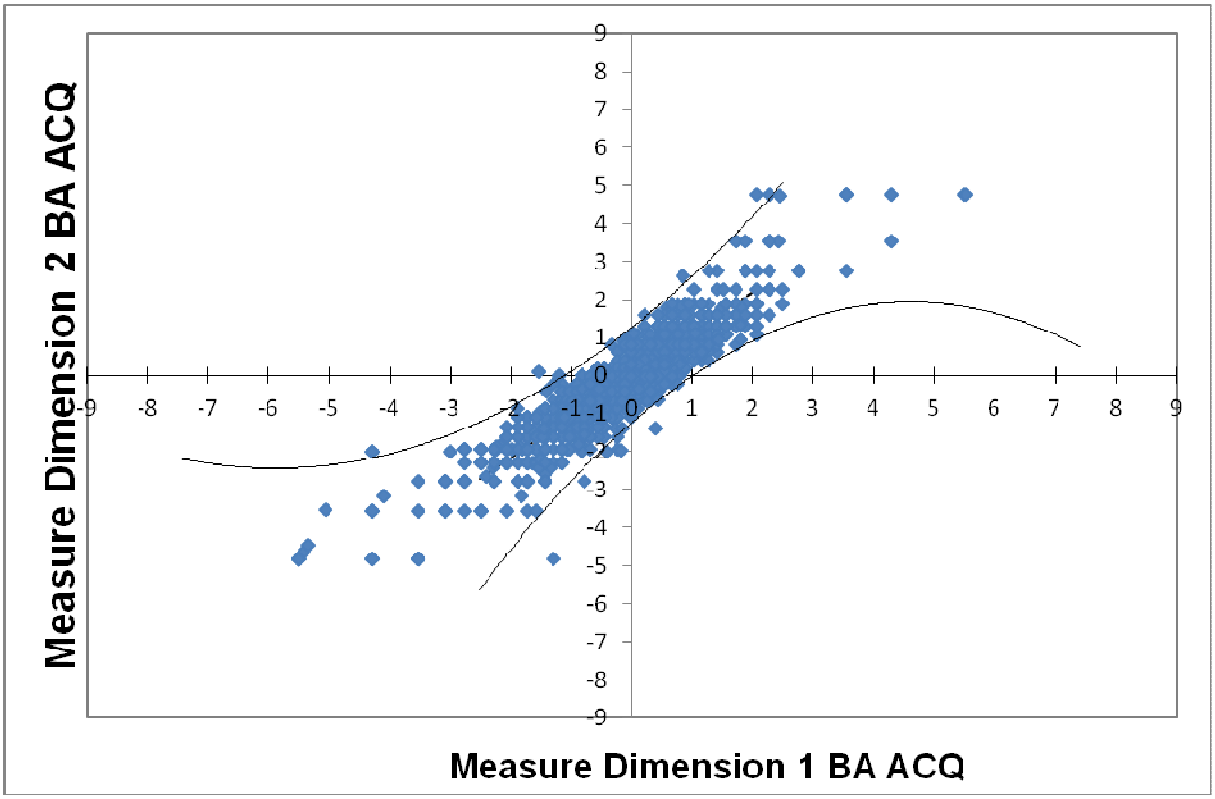

Figure 3. Cross plot of dimensions in *acquired competencies* in BA (Dimension 1 on the X-axis, and dimension 2 on the Y-axis)

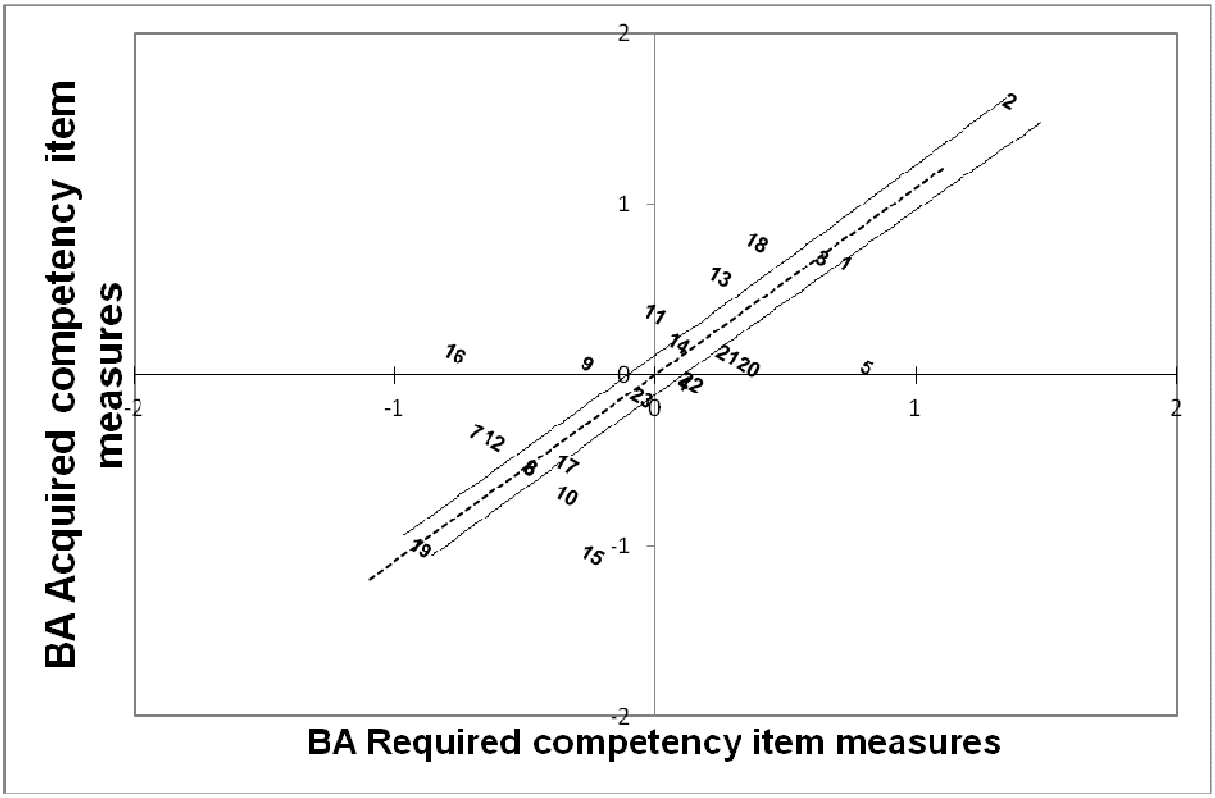

Figure 4. Comparisons of item measures in the *required competencies* in BA (X-axis) against the *acquired competencies* in BA (Y-axis)