Contributions and limitations of self assessment of competences by higher education graduates

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Institut de recherche sur l'éducation : sociologie et économie de l'éducation

DISSERTATION

Pour obtenir le grade de

Docteur de l'Université de Bourgogne

Discipline : sciences de l'éducation

par

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le 11.12.2009

APPORTS ET LIMITES DE L'AUTO-EVALUATION DES COMPETENCES PAR LES DIPLÔMES DE L'ENSEIGNEMENT SUPERIEUR

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Institute for Research in the Sociology and Economics of Education

DISSERTATION

To obtain the Doctoral Degree from

University of Burgundy

Discipline: Science of Education

by

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11.12.2009

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To

My Beloved Parents

and

Revered Teachers

especially

Thierry CHEVAILLIER

Shamim Haider TIRMAZI

Jamil Hussain SHAH

Riaz-ul-Haq TARIQ

Acknowledgements

In my life I have been blessed with such a nice and clement guys that it makes almost impossible for me who to rank less than the others. Optimistically, in future I hope for the same. One such blissful morning, he ended his meeting with students; we came out of the classroom, and discussed about doctoral registration. Crossing through the car parking, a few steps to the office of the director (he was the director of the institute at that time) bore out a significant set off. It was not less than a marvel when he, Professor Jean-Jacques PAUL, expressed his consent to escort me in the course of doctoral voyage. And, I must admit, he did his level best all through the expedition. His simple, frank, and gracious disposition inspired me throughout the cruise. This inspiration is not restricted to scholastic chores; beyond this, in his professional life as well as social spheres, I found him a vibrant and dynamic fellow. His wife, Malou, too deserves equal appreciation. She is a wonderful lady making a good match. I still remember the time I passed with them, especially the last days in Cambodia. It was a fantastic experience altogether. It is too difficult to forget, of course. Before this, no matter how long and how remote we had been, he kept on encouraging me continuously, and without his contribution this dissertation would not have been completed. I have no choice, except to express my sincerest gratitude to him. My dream to have such a wonderful mentor came true. He supported me all the way through this project with his patience and knowledge whilst allowing me the room to frame my own opinion.

I honestly acknowledge the contribution of Professor Thierry CHEVAILLIER who welcomed me at IREDU and made me stay whilst searching for doctoral supervisor. I must recognise his deep personal involvement not only during that very period of search but also at later stages.

During whole of my stay in France I found no one of his rank. He merits high regard and admiration. He made me learn the art of social adjustment in new and strange ways of life. I could not stop thinking about him as I write these lines.

I specially want to thank Professor Jean BOURDON who made me find out Growth Economics from its basics as I was novice in the domain. This was an interesting experience with him. It was he who made me accept the invitation from Professor Ronald WENDNER (University of Graz, Austria) to participate in an international conference on Growth Economics (PGPPE 09 Workshop) as a discussant and to chair a session. This was my first flight. This maiden participation lent confidence in me more than before, besides offering a scholastic activity. He has his equal contribution in the scholarship and learning I enjoyed during the stay at IREDU.

I am equally indebted to Professor Bruno SUCHAUT, the director at IREDU, for providing me all the possible facilities. He and Professor Jean-François GIRET deserve special thanks to help me learn, besides other things, the use of research analyses software like SAS and Stata. I must pay my compliments to Professor Naeem A. KHAN. He is professor of Cell Sciences at University of Burgundy. He has contributed through his supporting, motivating and convincing chat.

Teachers, fellows, colleagues from Bahauddin Zakariya University Multan (Pakistan) and University of Sargodha (Pakistan) rightly deserve regards for their love and time to time affable and jovial discussions through wireless connections. My students also merit gratitude for being devoted to knowledge. They are my future.

This project would not have been possible without the support of a galaxy of exceptional mates like Claire BONNARD, Sajjad Haider BHATTI and Amjad ALI. I take the opportunity to express my special compliments to those who during the first and second year of my stay at IREDU let me enjoy their lively and energetic company especially during the lunches at university restaurants. They are Aurore ROZIER, Lisa BYDANOVAT, Elise TENRET, Rodrigo ROCO, Noël ADANGNIKOU; and occasionally Nadia NAKHILI as she was occupied with ending up her doctoral dissertation.

I remember other fellows at IREDU (Someone have coined the term IREDUCTIBLES for those working at IREDU). If I have not missed someone, they are: Christine GUÉGNARD, Marie-Odile PONTHIER, Fabienne GRAS, Julien CALMAND, Tarik LAKHAL, Nadir ALTINOK, Cossi Venant CÉLESTIN QUENUM, Adeline SEURAT, Thomas POIRIER, Aurélie LECOCQ, Lazare Glebelho SIKA, Gabriela GOMEZ VERA, Edang N'NANG, Aliou DIOP, and Mitra ZIBANE.

It is amazing and pleasant experience to find compatriots while being in foreign lands. Muhammad Naeem CHAUDHRY, a Pakistani expatriate in Paris has much to impress in his personality. I appreciate his social services on the platform of Minhaj-ul-Quran International. He did help me in a number of ways. Whenever I went to Paris, I found him present to welcome me. Allah may bestow him more courage to serve mankind consistently.

I came to meet Pakistani doctoral students in Dijon. All of them are marvellous – full of passion, enthusiasm, and intellect. They are spontaneous and kind hearted. Muhammad ANIS comes first to have completed his doctorate this year from INRA (Dijon). He has returned to Pakistan. Sabir HUSSAIN, the most remarkable among others, came in Dijon few days before me. We passed really a very good time. He is the person who has been accompanying me

more than anyone. He went on caring me during the days I had been hospitalised. Among his too busy lab schedule he had been visiting me in hospital twice or thrice a day. I will never forget his loving company.

I would like to mention here every name with its sweet memories but I fear it may become too long. I will write here their names, at least: Muhammad ZULQURNAIN, Sumaira RASOOL, Hamid MANZOOR, Muhammad ALI, Muhammad FARHAN, Farrukh AZEEM, Muhammad ATIF-RAZA-ATTARI, Muhammad Ahmad SHAHZAD, Muhammad ABID, Shamshir HUSSAIN. They expressed always a very friendly and genial comportment.

I am grateful to Alain GAULDRY, computer technician, for his assistance in maintaining the computers, providing software and related accessories; and I feel myself equally obliged to Sylvie GERVREAU and Bertille THEUREL, besides other personnel's of university library services, for providing me the documents, books, articles etc. They are true professionals in their spirit. I found them always considerate, cooperative and open.

IREDU has provided me the support, material, and equipment I needed to complete the doctoral project and produce this dissertation. SFERE is the intermediate body between French government and Higher Education Commission Islamabad to cater for Pakistani researchers coming in French universities. This organization tries to perform her role with her maximum potential. I understand their administrative limitations; anyhow, they are playing their role and they have their contribution. I admit personal input of Somia ASHRAF on behalf of this organisation which was more than my expectation.

Higher Education Commission (HEC) Islamabad, Pakistan provided me the opportunity by awarding the doctoral scholarship grants to realise a doctoral project in France. This is

because of Professor Dr. Ata-ul-Rahman, the chairman HEC, Professor Dr. S. Sohail H. NAQVI, Executive Director HEC and all the HEC team to revolutionise higher education in Pakistan. They should, I am sure they will, be thanked on national level.

My employer, The Vice-Chancellor University of Sargodha (UoS) who granted me leave in order to avail this opportunity must be thanked in these pages. UoS granted me leave for the doctoral title; although this was 'unpaid leave' but I think it was sufficient to honour that I had won scholarship grant from HEC Pakistan after a long process of selection. I surprised to have won the laurels. I must admit that this was beyond my capacity.

Finally, I show appreciation for my parents for supporting me throughout the oceanic cruise of knowledge. Beside the parents my family includes dear Tahir Bhai, favourite Bhayya, precious Aapi, and specially my beloved and revered Lala who offered me a fatherly brotherhood; this is the real source of energy throughout my studies and life. All the efforts Lala had done so far are outstanding and can never be paid.

During the whole course of this voyage I continuously missed the kids: Sumayya, Hajra, Umm-e-Laila, Saadat Ali SHAH, Kamal-ud-Din Ali SHAH, and Ameer Ali Akbar SHAH. I am fortunate to have enjoyed utmost liberty on behalf of my family. I am indebted to them for their considerate and appreciative love, through the entire period of my studies.

I apologise for the names slipped of my memory; I am not inconsiderate; I will remain indebted to all of them; we should accept the reality that absence of their names on paper will not undermine the contribution they have made to me and to this piece of literature, as well.

I feel no hesitation to accept the responsibility for any omission and/or error in the dissertation; all such discrepancies would be mine. Any indication, information and suggestion in this regard will highly be appreciated and obliged.

Ashfaque Ahmad SHAH

Dijon, France
December 2009

Résumé

Ce travail présente un large spectre de l'approche et de l'usage empirique du concept de compétences. A un extrême, on trouve la nécessaire discussion des subtilités du concept de compétence. A l'autre, des analyses économétriques rigoureuses pour répondre à une question essentielle: «Dans quelle mesure l'auto-évaluation des compétences est-elle fiable? ». Une investigation étymologique nous a aidé à fournir une justification en faveur de l'utilisation préférentielle, en anglais, du terme de « competence » par rapport à celui de « competency ». En outre, nous avons retrouvé les racines du concept dans la littérature française, où il était en service bien avant son apparition dans la littérature anglaise. De plus, nous avons trouvé que l'utilisation du concept de compétences était répandu dans les différentes régions du globe et on en a déduit que l'intérêt pour la compétence est vraiment devenu internationalisé. La littérature anglaise et française nous a aidé à cet égard. Avant de procéder aux analyses économétriques, il a été nécessaire d'analyser scrupuleusement la littérature sur l'évaluation des compétences. Les analyses rigoureuses ont révélé que l'auto-évaluation des compétences est fiable à un niveau modeste. Nous avons testé la fiabilité de l'auto-évaluation des compétences acquises et requises, effectuée par les diplômés de l'enseignement supérieur. Nous pouvons affirmer la fiabilité dans les deux cas, cependant, à un niveau modeste. Nous avons simplifié la question de recherche de la façon suivante.

1. Dans quelle mesure les niveaux de l'auto-évaluation des compétences acquises par les diplômés de l'enseignement supérieur sont-ils fiables?

2. Dans quelle mesure les niveaux de l'évaluation des compétences requises par l'emploi des diplômés de l'enseignement supérieur jeunes travailleurs sont-ils fiables?

Nous avons testé les données pour les deux questions précédentes et nous avons trouvé une réponse positive pour chacune des deux. Le critère de falsifiabilité de Karl Popper nous a aidé à conclure que :

1. l'auto-évaluation des niveaux des compétences acquises par les diplômés de l'enseignement supérieur est fiable, quoiqu'à un niveau modeste.

2. l'évaluation des niveaux des compétences requises par les jeunes travailleurs est fiable, quoiqu'à un niveau modeste.

L'ensemble des données utilisées dans cette étude a été fourni par l'équipe de Reflex. Nous avons fait usage de SPSS et Stata pour les analyses. Un certain nombre de techniques statistiques ont été utilisées, comme le probit ordonné, la régression par les moindres carrés ordinaires et des analyses paramétriques ainsi que non paramétriques sur les écarts. On a remarqué une similitude assez étonnante aux niveaux de signification pour les coefficients des estimations du probit ordonné et de régression MCO. Cela pourrait induire une réflexion plus profonde pour les statisticiens. La limitation primordiale de cette étude est le fait que nous soyons resté confiné à un ensemble de données. Nous proposons de reproduire ces analyses avec plus de variables et sur d'autres ensembles de données de taille comparable.

Mots clés : évaluation, auto-évaluation, fiabilité, diplômés de l'enseignement supérieur, travailleurs du savoir, compétences, gains, titre professionnel, niveau acquis de compétences, niveau requis de compétences, marché du travail

Abstract

This work presents a continuum of competence. On one extreme of which there is a subtlety of concept of competence. On the other, there are rigorous econometric analyses to find the answer to a critical question: "*to what extent is the assessment of competence reliable?*" Quest into the etymology helped us providing a rationale in favour of the preferred use of *competence* over *competency*. Moreover, we come to trace its roots in French literature where it was in use long before its emergence in English literature. We found that competences were common among various geopolitical locations and inferred that interest in competence has been internationalised realistically. Both English and French literature helped us in this regard. Before carrying out econometric analyses it is apt to probe into the literature on the assessment of competence. Rigorous analyses revealed that self assessment of competence is reliable to a modest level. We probed into the reliability of competence (self) assessment by the higher education graduates and by the young knowledge workers. We come to affirm reliability for both of the cases; however, to a modest extent. We simplified the research question by bifurcating it as in the following.

1. *To what extent is the self assessment of acquired levels of competence by the higher education graduates reliable?*

2. *To what extent is the assessment of required levels of competence by the young knowledge workers reliable?*

We tested for both of these questions and found affirmative response each time. Karl Popper's criterion of falsifiability facilitated us to accept the theses that

1. *firstly, the self assessment of acquired levels of competence by the higher education graduates is reliable, however, to a modest extent.*

2. *secondly, the assessment of required levels of competence by the young knowledge workers' is reliable, however, to a modest extent.*

The data set used in this study was provided by the Reflex team. We made use of SPSS and Stata for the analyses. A number of statistical techniques have been manipulated including ordered probit, OLS regression, and parametric and non parametric analyses of variances. We observed startling similarity in the levels of significance of coefficient estimates of ordered probit and OLS regression. Large data sets may exhibit such behaviour. This might invoke some deeper reflection for statisticians. The fact that we remained confined to one data set is main limitation to this study. We suggest its replication with more variables and with other data sets of comparable size.

Key Words: Assessment, Self Assessment, Reliability, Higher Education Graduates, Knowledge Workers, Competences, Earnings, Occupation Titles, Acquired Level of Competence, Required Level of Competence, Labour Market

"My only justification for such a crude measure is that I can find nothing better".

(Welch, 1975, p. 67)

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INTRODUCTION

Setting the Scene

The Earth has been transformed from a globe to a village due to innovative advancement of information technology. This outbreak of information technology which is recognized by the fall of twentieth century is, undoubtedly, the fruit of industrial revolution identified, in Great Britain, with the dawn of nineteenth century. Great Britain, being motherland of industrial economy, enjoyed vast per-capita economic growth because of this revolution. Rest of Europe, North America, and then other economies of the world followed Great Britain to base their economies on industrialisation. We observe a phase of transformation on the verge of a new century. Industrial economy at its zenith gave birth to information society and remodelled itself into a novel idea of economy which is based on knowledge and which is known to us as knowledge economy. *Information society* and *knowledge economy*, the two synonymous terms used highly interchangeably, are best known to identify 21st century society inhabiting the globe. More competent and flexible graduates have been defined to nurture this knowledge economy. Knowledge is crux of this economy.

Incessant thirst for knowledge and higher adaptability to new situations are hallmarks, not only for growth but also for basic sustenance at individual as well as collective level throughout their lifespan. That is why lifelong learning and flexibility are more desirable (than they had been felt during industrialisation) among the assembly of competences believed to impart necessarily to 21st century graduates during their schooling, for their individual sustenance as well as better contribution of them to their information society. Responsibility rests upon the system of education. Although, total period of formal schooling of an individual is important; however, the terminal stage – higher education – is of crucial importance in this chain. Its vitality can be understood through the fact that it is the

conclusion of formal education process and the inauguration of social education process. In the social education process *learning* and *doing* are so intertwined that they shape a uniform identity; elements of which are almost inseparable; and that, it is not easy if not impossible to fully understand its chemistry.

Concisely, *education* is to impart knowledge, abilities, and skills. Competence encompasses all three of them. We have discussed this in detail in a separate chapter on the concept of competence. Graduates are supposed to have attained a certain level of competence in their relevant fields of study. This is attributed as specific competence of graduates. Beside these specific competences, experts have identified some other competences which are found transversal to fields of education. These are termed as generic competences. This transversality of generic competences has also been found among various professions. Generic competences, sometimes, appear to have surpassed their specific counterparts in terms of their usefulness in live situations. There are a good number of research studies to favour this thesis. Robinson (1999) declared that many specific skills now have a very short 'half life' due to high developments in knowledge and technology. According to Teichler (1999), discipline specific knowledge is rendered obsolete at an increasing rate by the pace of technological progress. However, specific competences do have their basic role and pertinent value. We are convinced to say that an ensemble with a balance mix of specific and generic competences may better help graduates to play their intended role in the information society of today.

Universities and Higher Education Institutes (HEIs) are responsible to prepare the graduates to play their roles in society as these (Universities and HEIs) are believed to address all the spheres of a social system. Higher education is sandwiched between education and society.

Graduates passing through this transitory phase should have possessed of necessary competences, both generic as well as specific, to play their future expected roles. Researchers are keen to investigate into the competence repertoires of graduates. Heijke and Meng (2006) conclude their study by confirming that the labour market in the outcome of higher education programmes strongly demands the competence.

Many questions have been invoked by them. For example, how competences are produced? What factors are important for better acquisition of competences? What are the key competences? Which competences are more useful than the others, and, why? How competences could be measured? These are some of many questions which have been provoking insights; and still they are at stake. Rudimentary to all of these questions, in our opinion, is the concept of competence. We have tried to deal with this issue in first chapter (Part I). Curious readers are referred to that chapter for detailed discourse on the topic.

Another important issue is the measurement of competence. McClelland (1973), an American psychologist, advocated for the competence measurement rather than intelligence testing. There are a number of methods for the measurement of competences. The literature is replete with good discussions on these methods. According to Oates (2003), competence can only be assessed indirectly. Assessment of competences acquired (during their formal education process) by the individuals (graduates) themselves, and assessment of competences (required in the labour market) by the individuals (young knowledge workers) are two measurement methods. Former is termed as self assessment of acquired competences and the latter is known as assessment of required competences. These are the individuals who are stating the competences. Consequently, these methods are charged with subjectivity and bias. Allen and van der Velden (2005) have discussed these issues in detail in a working paper under the

Reflex project. We are introducing this project in subsequent pages. We have used the data set provided by the Reflex team. We are indebted to them for this kindness.

Our main concern is the reliability of assessment of competences. It is intelligent to break a big problem in to smaller parts. Self assessment of acquired competences and assessment of required competences could be two major aspects of competence assessment we are interested to study. It is interesting to mention that each time the individuals who rated the competence are same. During the survey conducted by the Reflex team they were asked to rate on an ordinal scale of seven, their acquired competences after graduation and also, the competence required in the labour market if they are in labour force. We call them *graduates* while exploring their self assessment of competences levels, and *young knowledge workers* while exploring their assessed competences levels.

Part I of the dissertation deals with the theoretical framework whereas Part II includes econometric analyses. Both parts contribute to understand the answer of the same question which is related to the reliability of self assessment of competences.

PART I

CONCEPT AND ASSESSMENT OF COMPETENCE

(Theoretical Framework)

This part of the dissertation includes three chapters and presents theoretical framework for the study under focus. First chapter discusses the concept of competence. Second chapter studies competences in internationalised context. The last chapter of this part gives an overview of competence assessment.

CHAPTRE 1

COMPETENCE CONCEPT

SUMMARY

In this chapter after a brief introduction and competence movement we trace the historical imprints along with a short but comprehensive look into the etymology of the term i.e. *competence*. Then we try to give some logical justification for the choice of the term before going to review the definitional design from English as well as French literature (from where the term was inherited into English). Then we differentiate the term in the myriad of its synonyms. For the concept of competence we illustrate, after scrutinising the literature, a unique three dimensional (3D) representation of *competence vector* and its transformation from the world of education to work; to add this we identified and included certain characteristics and few of the elements of *competence* in order to paint the picture more realistically. In the last portion of the chapter we discuss classification of *competence*. This discourse is provided with two glossaries. These are on competence synonyms and competence definitions.

1.1. Introduction

Competence is a focal point in the life, individual as well as social, of international citizen of today's knowledge economy. McClelland (1973) found that person's success in a job could not be predicted solely on the basis of intelligence tests. He insisted on the need of competence testing rather than intelligence testing. For the demand for protean character of international citizen has been emphasised unequivocally amidst rapid changes occurring in the nascent knowledge economy. For better contribution to this economy only the competent members of information society are believed to be successful. In order to achieve total competence, Basford & Slevin (2003) reflected, one is required to demonstrate the knowledge, skill and understanding of each component of related practice that develops into a comprehensive portfolio. They further asserted, for example, a nurse may develop the skill component of the competence without having the knowledge and understanding, and then total competence is not achieved at all.

Despite being hot slogan among human resource circles the concept of competence is not as clear as it should have been so far. It is perplexing for several reasons. Social and behavioural scientists have to borrow their terminology most commonly from the language used in daily life which often becomes the cause of fuzziness. Transition from *word* to *term* is not a simple phenomenon, so is the case with *competence*. Furthermore, selection of one specific *word* among plethora of its synonyms, to be transformed into *term*, remains problematic due to differing research, geopolitical and language perspectives. Different experts define the same (or similar) *term(s)* differently for their respective vested research interests. Time is another important factor besides consistent interest of researchers in a particular area. Size and purpose in the various lists of such competences derived from employers' surveys as well as

those found in government reports are evidence of this. The same difficulty is faced while classifying the *term*. Although among its counterparts *competence* is about to win, yet the race is not over. In the ensuing pages we intend to explore into the dynamism of the concept of *competence*.

This concept demands a thorough investigation into historical perspective; there are three convergent streams: (1) taxonomy of educational objectives in Education; (2) measurement of behaviour in Psychology; and (3) human capital approach in Economics. We bypass this detail in order to avoid the prolixity. We leave the venture to future interests.

1.2. Competence Movement

During the 1970s and early 1980s US academics turned their attention to strategic management as the key to competitive success. The *competence* movement in the UK emerged out of the same environmental context as the US, i.e. changing technology, increasing competition, declining profitability, and the search for competitive advantage and improved performance. It was also a response, especially in the 1990s, to widespread organisational developments including changes in working practices, such as a greater focus on team working and customer service; flatter organisational structures, which meant less opportunity for traditional staff development through promotion, cultural changes leading to a greater emphasis on employees taking responsibility for continuous learning and self-development; and the need for increased flexibility in work, requiring employees to develop a wider range of skills over time.

Many of the ideas, concepts and theories developed in the USA have been exported to the UK through management consultancy firms, educational institutions, and US companies located

in the UK. But there has also been a reverse movement and transfer of policies. There is, however, a distinction between the USA and UK approaches, which is partly reflected in different terminology and spelling. The Training Standard Agency defined *competence* as:

> "… an action, behaviour or outcome which the person should be able to demonstrate"

Whereas occupational *competence* is defined as the ability to apply knowledge, understanding, practical and thinking skills to achieve effective performance to the standards required in employment. This includes solving problems and being sufficiently flexible to meet changing demands (NCVQ, 1997). One step further, the "distinctive competence" idea was promoted by Prahalad and Hamel (1990).

> Core competencies are the collective learning in the organisation especially how to co-ordinate diverse production skills and integrate multiple streams of technologies … core competency does not diminish with use, competencies are enhanced as they are applied and shared

1.3. Historical Imprints and Etymology of the Term

According to Woodruffe (1993), the catalyst for the use of the word competence (or competency) in the management field was Richard Boyatzis' book *The Competent Manager* (1982). It has since received much attention in both literature and company practice (Albanese, 1989). According to Bradley (1991), the reason why competence is such an attractive notion stems largely from the idea that "competence is about 'being able to do things' and so is management".

Two words *competence* and *competency* are of keen interest as the two have been used in the literature with little difference at all and have had been considered as exact match of each other; yet variations in the terms exist. Boyatzis (1982), Klemp (1980), and Morgan (1988) refer to "competence"; Kolb *et al*. (1986) refer to both "competence" and "competency" while the Training Commission (1988) used "competence/competences.[1] According to the historical account of *Merriam–Webster* the noun *competency* (pl. *competencies*) appeared in 1596[2] in the printed English literature and later on in the same sense *competence* was found to be used in 1632; whereas, *competent* is believed to be used since 14th century[3]. They defined *competent* as "having requisite or adequate abilities"; and *competence* (or *competency*) as "a sufficiency of means for the necessities and conveniences of life". They thought that both *competence* and *competency* have the same sense and could be used interchangeably.

English words *competence* and *competency* are believed to be inherited from same French ancestor *compétence*. Morphologically there is greater resemblance between French *compétence* and English *competence* (as compared to *competency*). However, mere aesthetic reason is not sufficient for the preferred use of *competence*. Dr. Ernest Klein (1966) deduced that *competency* is derivatively identical to *competence*. To him both English words (*competence* and *competency*) come from the same French origin – *compétence* – which came in French language from a Latin word *competentia* which means 'agreement'. He interprets the word *competent* in three ways: fit/suitable, sufficient and legally qualified. We attribute same meanings to the term *kompetent* in German.

[1] Heffernan and Flood (2000)

[2] Editors' note: the printed date should not be taken to mark the very first time that the word – or even the sense – was used in English. Many words were certainly in spoken use for decades or even longer before they passed into the written language. The date is for the earliest written or printed use that the editors have been able to discover. This fact means further that [this] date is subject t change as evidence of still earlier use may emerge, and [the] dates given now can confidently be expected to yield to others in future printings and editions.

[3] Editors' note: the style that names only a century (as 14th century) is the one used for the period from the twelfth century through the 15th century, a span that roughly approximates the period of Middle English.

Dr. Ernest Klein (1966) finds the roots of English suffixes (i. e. *–ence, –ency, –ce,* and *–cy*) in the Latin language (either directly or through the French language).

i. The suffix *–ence* is used in English in order to form abstract nouns denoting action, process, state, or quality. This suffix has descended from the Latin suffix *–entia,* either directly or through the medium of French *–ence*.

ii. The suffix *–ency* is used in English in order to denot quality or state. It has descended from the Latin suffix *–entia* (either directly, or through the medium of French *–ence*). Hence it is derivatively identical with *–ence.*

iii. The suffix *–ce* is used in English to form abstract nouns. It descended from the Latin suffix *–tia,* either directly or through the medium of French *–ce.*

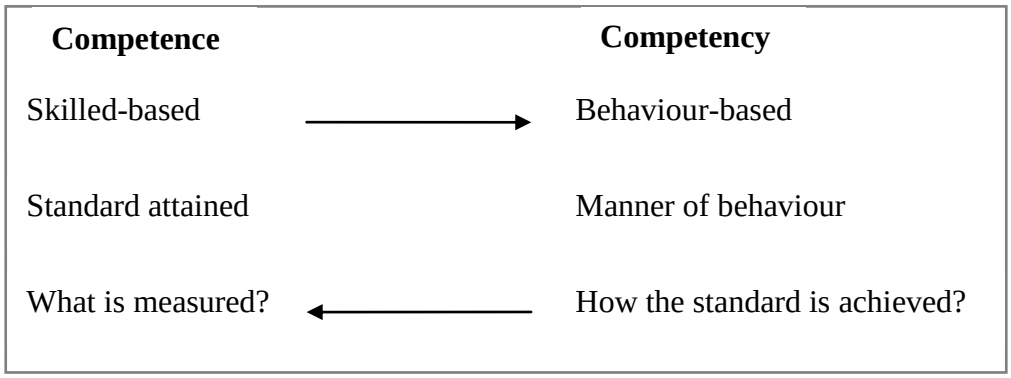
iv. The suffix *–cy* is used in English to form abstract nouns denoting quality or rank, It descended from the Latin suffix *–tia,* and *–cia* (either directly, or through the medium of French *–ence*). Hence it is derivatively identical with *–ence*.

1.4. Choice of the Term

Although the two words are found almost perfectly synonymous; yet we prefer to make a clear distinction. For Professor Paul says, "I stress an adequate terminology because it requires adequate thinking and adequate thinking is needed for adequate acting. In several papers I have described severe economic and political problems that arose out of inadequate thinking". Following is the logical justification for the preferred use of competence.

Rowe (1995) is decisive to suggest that it is useful to use *competence* to mean a skill and the standard of performance reached, while *competency* refers to the behaviour by which it is achieved. To him, one describes *what* people can do while the other focuses on *how* they do it. There is, therefore, an interface between the two, i. e. the competent application of a skill is likely to make one act in a competent manner, and vice versa (see Figure). Rowe (1995) is keen to differentiate the two words even further. He says that the plural of each word gives us two different meanings - for *competences* and *competencies* are not the same things. *Competences* refer to the range of skills which are satisfactorily performed while *competencies* refer to the behaviours adopted in competent performance. He considers this distinction vital to the whole debate and comprehends that the failure of many to recognize it largely explains the problems. From now onward we will use *competence* as a term.

Figure 1: The interface between *competence* and *competency*



Source: Rowe (1995)

1.5. Defining Competence

By definition, competence described within a changing kaleidoscopic framework is clearly not a static entity and requires a total rethink when defining competence for practice and purpose (Basford & Slevin, 2003). According to Bradley (1991), our ways of thinking and

describing competence are “primitive and clumsy”; for all the definitions and articles, “few are certain in their own minds what it means” (Woodruffe, 1993). In the literature on competences, many different definitions appear. This is partly due to the fact that competences are relevant in a number of distinct research fields with different disciplinary roots. It will be interesting to have glimpses of them.

There is a strong relationship between (intelligence) testing and competence. Although the term competence is in vogue in human resource circles; however, it has its roots in cognitive psychology as well as educational measurement and evaluation. McClelland, an American psychologist, while advocating for the competence measurement rather than intelligence testing, referred competences “what traditionally have been called personality variables” (McClelland, 1973). By evaluating people for competencies, McClelland said, it would be possible to predict their performance. In fact he was interested in graduates’ academic success. Later on Boyatzis (1982) viewed competence from labour market perspective and regarded it as “an underlying characteristic of an individual that is related to effective or superior performance in a job”. He built on McClelland’s research and investigated which characteristics of managers are related to effective performance. It was the transitional phase characterised with the shift from industrial to knowledge economy. Soon the idea got popularity due to heightened international interest in knowledge economy.

Boyatzis defines *competence* broadly as “an underlying characteristic of a person” (p.21). It could be a “motive, trait, skill, aspect of one’s self-image or social role, or a body of knowledge which he or she uses. Boyatzis’ model can be considered “an adaptation of the classical psychological model of behaviour”, i.e. that behaviour is a function of the person and the environment (McClelland, 1971). Both of these authors see *competence* as an “underlying

characteristic causally related to superior performance" (Boyatzis, 1982; McClelalnd, 1973). This approach is also known as the input approach to management competency (Tate, 1995). The UK Government Employment Department defined *competence* more broadly. This approach identifies the outcomes expected from a job when it is performed adequately. Here, the definition of competency is wider than the attributes of jobholders – in fact these attributes are not the prime focus of attention. Instead, the approach identifies the outcomes expected from a job when it is performed adequately. It suggests not only skills and knowledge but also the range of qualities of personal effectiveness to get a job done (Ashworth and Saxton, 1990). It can be seen that two main meanings of the term *competence* have been identified, one preferring to the outputs, or results of the training – that is, competent performance. The other definition refers to the inputs, or the underlying attributes, required of a person to achieve competent performance, an approach which is more behaviourally based.

Developments in the labour market have led to changing job requirements. For example, Hornby and Thomas (1989) defined *competence* as "the ability to perform effectively the functions associated with management in a work situation". Cardona and Chinchilla (1999) identified *competence* in the functional perspective but considered it as behaviour; they included "observable or habitual behaviours that enable a person to succeed in her activity or function. Lee and Beard (1993) painted *competence* on a broader canvass. They thought it to be "a combination of motives, traits, self-concepts, attitudes or values, skills, and abilities that differentiate superior performers from average performers". It depicts more comprehensive picture of the referred concept. "A knowledge, skill, ability or characteristic associated with high performance on a job" constitute *competence*, narrated Mirable (1997). *Competence* is "the ability to perform the tasks and roles required to the expected standard" (Eraut, 1998). KASOC concept was the basis for this definition: "A specific, identifiable, definable, and

measurable knowledge, skill, ability, and/or other employment-related characteristics (e.g. attitude, behaviour, physical ability) which a human resource may possess and which is necessary for, or material to, the performance of an activity within a specific business context". Loo and Semeijn (2004) theorised that competences are the "composites of individual attributes (knowledge, skills, and attitudinal or personal aspects) that represent context-bound productivity".

We quote in the following a few number of competence definitions from the French literature. These are ordered chronologically.

1. Ensembles stabilisés de savoirs et de savoir-faire, de conduites types, de procédures standard, de type de raisonnement que l'on peut mettre en œuvre sans apprentissage nouveau et qui sédimentent et structurent les acquis de l'histoire professionnelle : elle permettent l'anticipation des phénomènes, l'implicite dans les instructions, la variabilité dans la tâche. *(Stabilised sets of knowledge and know-how, of apt reactions, of standard procedures, of the type of reasoning that we can implement without new learning and which form and construct the professional achievement history: that allow the anticipation of phenomena, implicit in the instructions, the variability in the task.)*. (Montmollin, 1986)

2. La compétence est un savoir en usage désignant une totalité complexe et mouvante mais structurée, opératoire, c'est-à-dire ajusté à l'action et à ses différentes occurrences. *(The competence is knowledge used to refer to all complex and moving, but structured procedure, i.e. adjusted for action and its various occurrences)*. (Malglaive, 1990)

3. Le système de connaissance qui permet d'engendrer l'activité répondant aux exigences des tâches d'une certaine classe. *(The system of knowledge that can generate activity that meets the requirements of the tasks of a certain class)*. (Leplat, 1991)

4. La compétence est un savoir validé et exercé. *(The competence is a validated and exercised knowledge)*. (Aubert *et al*, 1993)

5. La compétence est un système de connaissance, déclarative (le quoi) ainsi que conditionnelles (le quand et le pourquoi) et procédurales (le comment), organisées en schémas opératoires et qui permettent, à l'intérieur d'une famille de situation, non seulement l'indentification de problèmes, mais également leur résolution efficace. *(The competence is a system of knowledge, declarative (what) and conditional (when and why) and procedural (how), organized and operating in schemes that permit, within plethora of situation, not only the identification of problems, but also their effective resolution.)*. (Tardif, 1994)

6. La compétence est un savoir-agir reconnu. *(The competence is a recognized knowledge dealing with how to act)*. (Le Boterf, 1994)

7. La compétence est la capacité de sélectionner et de fédérer en un tout applicable à une situation, des savoirs, des habiletés et des attitudes. *(The competence is the ability to select and unite knowledge, skills and attitudes in a whole applicable to a situation.)*. (Taupin, 1995)

8. Les compétences sont des répertoires de comportements que certaines personnes maîtrisent mieux que d'autres, ce qui les rend efficaces dans une situation donnée. *(The competences are the directories of behaviours that some people have mastered better than others, making them effective in a given situation.)*. (Levy-Leboyer, 1996)

9. La compétence est un ensemble de connaissances, de capacité durable et d'habiletés acquises par l'assimilation de connaissance pertinentes et d'expériences qui sont reliées entre elle dans un domaine déterminé. *(The competence is a combination (or set) of awareness (i.e. knowledge), sustainable capacity (i.e. ability) and acquired skills by the assimilation of relevant knowledge and experience which are interconnected in a specific area.)*. (de Ketele *et al*. Cited by Baudin, 1996)

10. La compétence correspond à la mobilisation dans l'action d'un certain nombre de savoirs combinés de façon spécifique en fonction du cadre de perception que se construit l'acteur (individu ou collectif) de la situation. *(The competence is the mobilization of the action of a number of combined knowledge in a specific manner depending on context of perception that actor (individual or collective) builds of the situation.)*. (Wittorski, 1997)

While defining the concept, one may find high similarities in the ideas of the experts (with special reference to the experts from two different linguistic backgrounds). They have used full liberty to use terminology of their choice. It added to conceptual fuzziness of *competence* and its synonyms. There is need to resolve this fuzziness. In the ensuing paragraphs we aim to clarify this confusion making quotations from the existing literature on competence. We remained selective while doing this to avoid prolixity.

1.6. Competence and Synonyms

After a microscopic review of the aforementioned definitions we noticed subtle characteristics attributed to *competence* and its synonyms which may perplex the reader. Although it seems irrelevant to investigate into the plethora of *competence* synonyms, for it drags the centre of gravity, however apparently, towards *linguistics*, yet there is some reason to go deeper into the linguistic world of *competence*. It needs to pay heed to this issue first. Following discourse, in brief, may serve as evidence in itself. However, for more curious readers we have included a glossary of synonyms at the end of the chapter. They are invited to go there for more detailed account.

1.6.1. Competence and Skill

Bennett *et al* (2000) took the term *skill* based on the idea of human capital theory, and said that all productivity that people possess can be defined as *skill*[4]. They stated that from a psychological perspective, skills encompass competences.[5] However, this assumption, they themselves counter argue, is not always welcomed by the policy makers. For example, the Employment Department (Training Agency 1989) claimed the opposite – that competence is a concept, 'which embodies the ability to transfer skills and knowledge to new situations within the occupational area', a definition that has been used for the notion of 'generic' competence (Jessup 1991). This adds nothing except conceptual fuzziness to the scenario. According to Bennett *et al* there have been done only a few attempts to clarify the fuzziness of skills and competences. Cheetham and Chivers (1996) make one such attempt in developing, what they

[4] See for example Becker (1980); McNabb (1987).

[5] Because psychologists' definition of skills includes the notion of practised ability, covering any organised sequence of behaviour that becomes fast, accurate and efficient through practice. On the other hand, they

call a holistic model of professional competence. This draws on both the British occupational standards model (which they criticise as being largely untested, ignoring personal and behavioural competences, and as representing a static and atomized view of competence) as well as the reflective practitioner model of Schön (1987).

McCroskey (1982) defines communicative *skill* as: "the ability of an individual to perform appropriate communicative behavior in a given situation" favouring the Larson et al (1978) definition of communicative *competence*: "the ability of an individual to demonstrate knowledge of appropriate communicative behavior in a given situation". McCroskey further adds "The question is whether the person *can* do it, not whether they always *do* do it[6]".

The Oxford English Dictionary (1961) defines skill as "capability of accomplishing something with precision and certainty; practical knowledge in combination with ability". The definition of skill in BBC English Dictionary (1992) is "knowledge and ability that enables you to do something well. BBC English Dictionary (1992) further stated that "a skill is a type of work or craft which requires special training and knowledge.

Basford & Slevin (2003) included skill as a component in the totality of competence. They put forward an example that a nurse may develop the skill component of the competence without having the knowledge and understanding, and then total competence is not achieved

forwarded the performance- or outcome-based notions of competence: 'A competence is a description of something which a person who works in a given occupational area should be able to do'.

6 McCroskey's remarks: Our judgments of either competence or skill must be based on observations of overt behaviour. Such judgments should be based on carefully controlled situations in which the person to be judged is aware that his/her competence/skill is to be observed and evaluated, and in circumstances in which the person is motivated to be perceived as competent or skilled. The typical classroom may provide such a setting. Under such circumstances it is possible to determine whether the person *can* engage in the competent or skilled behaviour. It is not possible, however, to judge whether the person *will* engage in such behaviour in later life. Both competence and skill are abilities which are mediated by motivations in everyday life and cannot be expected to be universally manifested in behaviour under all circumstances.

at all. Thus we infer that *competence* is a wider concept than skill. It encompasses skill as an important component.

1.6.2. Competence and Attributes

The Association of Graduate Recruiters (AGR 1995) identify attributes – vaguely defined as a mixture of knowledge, skills, understanding and attitudes – which graduates will need in the light of the changes taking place in graduate careers. The report identifies 12 such attributes. The Association of Graduate Recruiters (AGR 1995) and Harvey *et al* (1997) both used an almost identical definition for attributes.[7] This movement of vocabulary towards the use of the term *attributes* has only served to exacerbate the conceptual confusion.

According to BBC English Dictionary (1992) an attribute is a quality or feature. The Oxford English Dictionary (1961) affirms that it is "a quality or character considered to belong to or be inherent in a person or thing". It is not at par with the very idea of *competence* which is more than a quality or character. However, we can maintain that the concept of *competence* encompasses attributes.

1.6.3. Competence and Performance

Linguistically *competence* refers to knowing while *performance* to doing. Since knowing is not equal to doing hence *competence* and *performance* are not the same thing. McCosrkey (1982) stressed that neither is a necessary condition for the existence of the other. "Equating competence and performance has been found to be a barrier to the advancement of both research and pedagogy …" warns McCoskey.

[7] See for detailed discourse Bennett *et al*. (2000).

Eraut (1998) reproduced Messick's (1994) differentiation of *competence* and *performance*:

> "Competence refers to what a person knows and can do under ideal circumstances, whereas performance refers to what is actually done under existing circumstances. Competences embraces the structure of knowledge and abilities, whereas performance subsumes as well the processes of accessing and utilising those structures and a host of affective, motivational, attentional and stylistic factors that influence the ultimate responses. Thus, a student's competence might not be validly revealed in either classroom performance or test performance because of personal or circumstantial factors that affect behaviour."

McCroskey (1982) explains this difference in a catchy way. It is persuasive and convincing enough.

> "Some of the greatest scholars in public address are pitiful public speakers. Similarly, some of our leaders in interpersonal communication theory and research are almost totally ineffectual in their own interpersonal relations. Needless to say, some of the greatest experts in teaching are terrible teachers. In contrast, many nine-year-olds can stand before a class and speak like an "old pro," communicating so well interpersonally that they wrap their teachers and parents around their little fingers. Clearly, knowing how does not always result in

appropriate behavior and appropriate behavior is not always tied to understanding of that behavior."

Chomsky's views on *competence* and *performance* would be useful to relate here.

1.6.4. Competence and Qualification

The confusion may arise from a general observation or belief that qualified men are thought to be competent, and they should be. We try to resolve the dilemma in the following lines. There exist two interpretations of qualification:

1. It may refer to the certificates and examinations. It is the act of passing examinations that you need to pass in order to work in a particular profession (BBC English Dictionary, 1992).

2. It may also be defined as:

   - ✯ The qualities and skills that you need in order to do a particular activity or task. (BBC English Dictionary, 1992)

   - ✯ The determining or distinctive quality of a person or thing. (The Oxford English Dictionary, 1961)

Eraut (1998) advances, "The British Government's introduction of occupational standards and a system of 'competence-based' National Vocational Qualifications … have opened up for

debate the relationship between academic qualifications, professional qualifications and concept of competence … such a system … creates an inevitable gap between being qualified and being competent".

In the literature there are clear indications for the differentiation of the two. There is no confusion at all when qualification refers to certificates (or the act of passing examinations); but the other meaning may be misleading due to its definitional resemblance. This gives birth to confusion between *competence* and qualification. "Usage in Britain appears to have moved towards the more literal 'certificated' meaning of qualification, while in France it has retained its original, rather broader meaning", Eraut (1998) confirms. Hence, it is concluded that this is no more matter of confusion for English readers. One may keep on developing and adding to *competence* repertoire even after being qualified i. e. the certification; for *competence* is attributed to lifelong learning.

1.6.5. Competence and Capability

Capability is referred to power or ability (whether physical or mental) in general (The Oxford English Dictionary, 1961). If you have the capability to do something, you are able to do it (BBC English Dictionary, 1992). In a simple sense of the term it is the ability. We consider it an element of *competence*. Eraut (1998) observed supporting relationships between the conceptions of *competence* and capability.

1.6.6. Competence and Emotional Intelligence

The idea of emotional intelligence is considered as the source for *competence* conception. Boyatzis *et al* (2000) quoted that Salovy and mayer (1990) first used the expression

‘emotional intelligence’ and described it in terms of four domains: knowing and handling one’s own and other’s emotions. This term is referred to the intelligent use of emotions and making them out effective at work. They integrated the work of Goleman (1995 and 1998) and Boyatzis (1982) and offered the following descriptive definition: “emotional intelligence is observed when a person demonstrates the competencies that constitute self-awareness, self-management, social-awareness, and social skills at appropriate times and ways in sufficient frequency to be effective in the situation.”

Preceding text, we expect, will be helpful, if not sufficient, to provide some ground for better differentiation of *competence* from its synonyms; and to some extant help the reader understand the complicated concept of *competence*. We move to the crux of the discourse.

1.7. Concept of Competence

Oxford Advanced Learner’s Dictionary (2007) defines *competence* as the *ability to do something well*, or *a skill that you need in a particular job or for a particular task*. The concept of *competence* is used extensively in the context of ‘human resources’. This, generally, refers to what determines the worth of people in their working environment (in the use of relevant knowledge with respect to this issue). It involves the total spectrum of human behaviour and its determinants. The emphasis of human resource stakeholders is to make full use of *competences* to optimise overall productivity of an individual; they also intend to address *competence* shortcomings.

Theories of mind have generally suffered from the fundamental mistake of focusing explanation primarily on either the organism or the environment as the primary source of

knowledge or intelligence (Fischer et al, 1984)[8]. Similar is the case with the theories of *competence*. These have been fundamentally flawed by their locus on the organism and their failure to recognize the contributions of context to *competence*[9]. We propose here a unique approach that fabricates competence in three aspects i. e. *person, situation* and *institution,* starting with the assumption that all behaviour arises from the mutual collaboration of the three. The dynamics of changes in *competence* should be explained by the analysis of these three aspects.

1.7.1. Three Dimensional Space of Competence

Competence develops through mutual interaction of *person, situation* and *institution*. Competence changes when at least one of them is subjected to any change. *Person* is particularly important in this interaction, moulding the context to support particular kinds of actions and thoughts in those they interact with. The effects of this sort of social support are dramatic, producing sharp shifts in individual's *competence* level. It rises abruptly with the provision of support and drops dramatically when the support is removed.

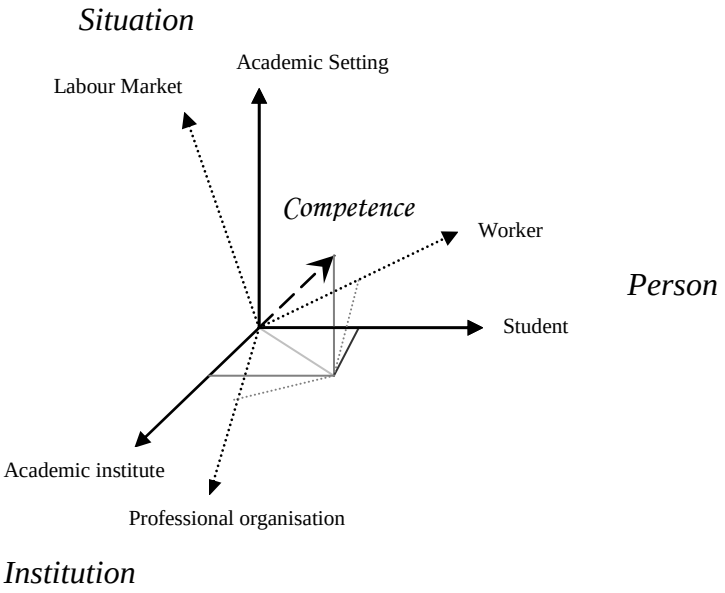
Ellström (1998) mentions three views on competences: They can be considered attributes of individuals, job requirements or an interaction between the individual and the job ('competence-in-use').

Bi-level depiction of three dimensional (3D) space of *competence* vector is shown in figure 2. At level 1 *person* is identified as the *Student*; *situation* is the *Academic Setting*, and *institution* is the *Academic Institute*. Whereas at level 2, *person* is identified as the *Worker, situation* is

[8] Wozniak (Ed) et al (1993)
[9] Wozniak (Ed) et al (1993)

the *Labour Market*, and *institution* is the professional organisation. *Person* being more important is denoted along x-axis. Then there comes *situation* which is taken along y-axis; and finally, the *institution* represented along z-axis. Here, although, *person* appears to be central; yet the other two are necessary and sufficient for the complementarity of 3D space of *competence vector*. It is interesting to note that *x* component of this vector has remained more in focus and, yes, there is some reason for its being in focus. It is easily observable in persons. It is all agreed upon that at the moment it is almost impossible to include all three, simultaneously, under examination. However, it is ideal to include them all for a global and more comprehensive picture. One cannot deny intricate complexities involved in the process of development and use of *competence* at any moment as well as level.

Figure 2: Three dimensional space of competence



This idea, as far as the applicability is concerned, is workable at both levels of social success i.e. academic as well as professional. It works as good during the educational career as it does in the professional career. Level 1 qualifies for academic career and level 2 refers to

professional career. In social continuum there could also be a period of time where the two levels overlap each other. This is the period of higher education. During and soon after higher education is the time when two periods appear to be superimposing. Carrying studies parallel to work, pre-job-training and on-job-training may explain the possibilities of overlapping. The most recent trend of *lifelong learning* is sufficient to reaffirm its likelihood. In *lifelong learning* the two levels are supposed to absolutely overlap each other, but only after a certain period of initial education and training.

The concept of *competence* exists not only in its totality but also as a single unit in its each of three dimensions. To us, although, at the moment it is inexplicable because three dimensions are inseparable (for us), yet we believe that it is a vector; and its rate of change, either increasing or decreasing, could also be observed in both positive as well as negative directions provided with certain conditions affecting its magnitude as well as direction. However, on account of practical hurdles we will remain focussed to only one dimension of this vector i. e. person. For this we refer that competence is individually bound and can be developed (Klarus et al, 1999; quoted by Loo and Semeijn, 2004).

1.7.2. Competence Elements

Different experts have expressed the term in their own way. Close examination of various definitions evidenced that some considered it as traits, characteristics, motives, behaviour, self-concept; and still some others viewed it as attitude (or value), ability, skill and knowledge. It has also been treated as standard procedures, type of reasoning, know-what, know-why, know-when and know-how. In recent literature, the concept of *competence* is defined as integrated knowledge, skills and attitudes that can be used at work to perform,

which means producing output that support organizational goals. For the sake of ease and clarity we take these three elements as basic, namely, knowledge, skill and attitude, which are conspicuously manifested in the literature regarding the definition of the term.

We intend to refer here Bloom's Taxonomy of Educational Objectives. One may trace a surprising similarity between these three elements and the taxonomy of educational objectives. It should be admitted that Bloom surpassed in his investigation into *competence*. The struggle to have better citizens for the future society[10] could be the strongest possible reason of this similarity. Bloom, an American educational psychologist, made his distinguished contribution to the classification of educational objectives. He revolutionised the educational process by presenting his taxonomy of educational objectives in 1956. His taxonomy divides educational objectives into three domains:

- Cognitive: mental abilities ($Knowledge$)
- Affective: growth in feelings or emotional areas ($Attitude$)
- Psychomotor: manual or physical capabilities ($Skills$)

It is hierarchical in nature. All three domains are further divided into their subcategories. He presented it in favour of his *Mastery Learning*[11] – a new instructional method. It was aimed to facilitate the teachers to help learners be more competent and skilled. This induced a continued interest among the actors of education which culminated into the urge for competences at all levels from education to the sustained employability. To demonstrate we

[10] which is known to us as information society

[11] Mastery Learning is an instructional method that presumes all children can learn if they are provided with the appropriate learning conditions. Specifically, it is a method whereby students are not advanced to a subsequent learning objective until they demonstrate proficiency with the current one.

mention here the stages through which individual (of information society) has to pass through i.e. from education to the world of work.

a. during education

b. from education to employment

c. sustained employability

d. progress in (professional) career

It is necessary to include the fifth phase, which is parallel and rather broader, comprises all life situations before, during and after education (formal schooling) as well as work/job. Exactly speaking, (higher) education is being promulgated internationally with a clear focal point i. e. to develop individuals for sustainable learning society. For example, Australian Government Department of Employment, Education and Training (1987) defined "the major function of education […] to increase the individuals' capacity to learn, to provide them with a framework with which to analyse problems and to increase their capacity to deal with new information"; and Dearing report (1997) agrees on that that the aim of higher education should be to sustain a learning society. We may correlate that this heightened human resource interest is in fact extension of international educational interest.

The competences are crucial not only in professional career but are considered important for global citizens in all situations of their life. Büchel (2002) reflected that competent workers are more productive and they have more potential to remain employed. Enormous pace of technological change demands highly competent graduates for sustained economy. Hartog (2000), for example, says that competences are the key elements for sustainable economic growth and development in the globalised economy. In this age of information and

technology human capital is weighed in terms of competences. “Higher education workers are preferred” (van de Werfhorst, 2002) in the knowledge economy (or information society).

1.7.3. Characteristics of Competence

Following characteristics, though not overtly marked, have been noticed after scrutinising the literature on *competence*. It may add to help understand the concept of *competence*.

- **Competences are attributes of a human resource:** Recent practices explain the real worth of competences in human resource.

- **Competences are determinants of professional success:** Classical parameters like educational qualifications are no more sufficient for professional success. Competences are being viewed as to determine professional success. Employers have heightened interest in the competent professionals for a number of reasons.

- **Competencies are functional:** These are related to performing an activity. Competencies can be thought of as a level of ability or characteristic useful or necessary to performing an activity.

- **Competences are measurable:** The competences schema is intended to capture information about measurable characteristics. Some competences may be measurable, but nevertheless difficult to quantify. In some cases, the measure may be simply whether the

characteristics exists or does not exist. Some competences can be objectively measured, whereas others may only be subjectively recognized[12].

- **Competences are compound in nature:** These are compendium of several elements such as knowledge, skills etc. Competence can be recursive. A competence may include other competences. One competence might be decomposed into several component competences, each of which might be separately measurable.

- **Competences are complementary:** Competences are complementary to one another. One competence complements to as well as complemented by the other competences.

- **Competences are able to vary:** There could be observed variations in competence due to various factors, for example motivation, fatigue etc., affecting it. It is subjected to variations under the effect of certain factors.

- **Productivity:** This is basic to the very idea of competence. Productivity is considered in terms of academic achievement, skill dexterity, practical implication of knowledge in live situations and better outputs in work atmosphere.

- **High performance:** Competence is valued for high performance of whom (or which) it is attributed to.

[12] In the context of HR-XML's competency schema, education would be considered a competency when it can be quantified or when it is used a measure for a given business purpose. An educational degree may be evidence of a competency. Descriptive information about an educational degree – e. g., the location of the school or institution granting the degree – is not a competency.

- **Differentiation:** Competences can differentiate between high performers and low (or middle) performers.

- **Usability:** Each competence is useful to its possessor while interacting with the practical situation in order to cope with in a better way.

- **Transferability:** This characteristic becomes comprehensible when competence is viewed in three dimensional space i.e. person, situation and institution. Competences are transferable from one person (situation or institution) to another. There is also mutual transferability among the three, for example, person to situation and institution.

- **Complexity:** World of competence is intricately complex and yet has not been fully analysed.

- **Method in competence:** However competences are structured in a complex whole; yet there is some method and order in its intricacy.

- **Validity:** Degree to which a competence supports to gain the intended outcomes is referred to its validity. It is marked with the extant of ease (in use and application) and volume of output.

- **Practicability:** Competences are hot slogans because of their practical importance in work situations. These are vital for the professionals of knowledge economy.

- **Diagnostic nature:** Competences are not only for the solution of problems encountered but they can also diagnose the problems as well as the ways to improve the institution,

situation and person for their total betterment in future. These are not only diagnostic but suggestive, too; because they may prescribe the ways to resolve the problem as well.

- **Selection ability:** Competences help in self-selection. They may help select the relevant (and the most suitable) among the whole set of them according to the demand of the situation. One should not confuse it with *metacompetences*, which refers to the knowledge of *competence* repertoire one possessed. This is something more, and hence different than *metacompetences*.

- **Effectiveness:** This characteristic is quite general but important in the whole set of competence as well as a subset of the whole. In fact it is ideal to have the whole set of it.

- **Competences are flexible:** This is one of the most important characteristics of competence. A competence should be flexible enough to be used in a number of contexts and situations equally well. Generally, generic competences are characterised with flexibility. It is also demanded for those competences which are termed as specific competences. There is a kind of generality in their specificity, no matter how limited it is.

- **Specificity:** Competences correspond to the problems but with specificity i.e. every competence is not for every problem. Only a subset of the subset is employed by different persons and in different situations as well as institutions.

- **Generality:** One competence is more or less applicable to other similar situations and remains useful to addresses similar problems. Some are more general whereas some others are less general in their scope. One may also observe this characteristic among those competences which are specific in nature.

- ✯ **Competences are relative:** It is critical to express, observe, implement and measure a competence relative to other persons, situations or institutions. For competences are viewed always in a specific context. For example, job settings; and more specifically interacting in a demanding situation.

1.8. Classification of Competence

By asking questions about competences as representing context-bound productivity, a distinction can be made between competences that are relevant in just one (type of) job and competences that are relevant for all jobs or work in general. This is the distinction between specific competences and generic competences, which is a well-known classifying principle in the literature on competences (see e.g. Nordhaug, 1993; Stasz, 1997). In the following lines we present a brief sketch of some of the classifications proposed so far. Bunk (1994) made the following four groups in order to classify the competence. Like Becker he also believed in specificity of the competences. Following is his classification:

1. specialised
2. methodological
3. participative
4. socio-individual

Heijke et al (2002) used the parameters of institution and acquisition of competences. Their classification is:

1. competences acquired in schools which are of direct use in later work
2. competences acquired in schools which facilitate acquiring new competences after graduation from school

3. competences acquired mainly in a working context

Garcia-Aracil et al (2004), however, proposed grouped concept of competences:

1. participative
2. methodological
3. specialised
4. organisational
5. applying rules
6. generic
7. physical
8. socio-emotional

Based on Becker's (1993) ideas we may deduce one such classification which is about the generality versus specificity of the competences.

1. general competences
2. firm specific competences

1.8.1. Specific Competences

Specific competences are those competences which are context bound. Such competences are characterised with their specificity. They might be discipline-specific, job-specific or situation-specific. Particularity is the distinctive feature of this broader division of competences. For example, a physicist must possess abilities (and skills) to be regarded as a physicist; a student must have provided with the qualities (and ethics) of learning, and a teacher should be equipped with what is necessary (and sufficient) to be a teacher. As for as

concept of specific competences is concerned these refer to the ability to do the job and are sometimes called 'hard skills'. They might include such things as[13]:

- technical ability
- knowledge
- qualifications

Specific competences have their own value in the world of work. They are of critical importance in certain fields e.g. in surgery, medicine, space sciences, vocational skills etc. The idea of specialisation comes from this. It is highly demanded for the utmost productivity. Perhaps this was the reason that Adam Smith (1776) was convinced to strongly favour the *division of labour*. He believed labour was paramount, and that a division of labour would affect a great increase in production. One example he used was the making of pins.

Example: One worker could probably make only twenty pins per day. But if ten people divided up the eighteen steps required making a pin, they could make a combined amount of 48,000 pins in one day. "*Practice makes man perfect*" permeates through and strengthens the notion of *division of labour*.

Garcia-Aracil et al (2004) quoted that Kang and Bishop (1989) found that vocational and academic education for high school graduates are complements rather than substitute. Campbell and Laughlin[14] (1991) strengthened this by finding stronger positive effects of vocational course work on labour market outcomes. Brown (1989), and Acemoglu and Pischke (1998), studied the impact of on-job training on productivity and wages because

[13] Source: http://www.usq.edu.au/beyondeducation/employability/skills.htm
[14] See for detailed account: Meng, 2005; Heijke, et al 2003a and Heijke et al 2003b; Altonji, 1995; Mane, 1998

Becker (1964) and Mincer (1974) had emphasised the on-job training for improving competences. They found positive contributory effects of the former on the later.

Specific competences are further classified. One such classification given by Nordhaug (1993) is mentioned here:

1. specific to firms (firm specificity)
2. specific to tasks (tasks specificity)
3. specific to economic sector (industry specificity)

We may present another classification based on our 3D concept of competence.

1. specific to person (student or professional)
2. specific to situation (educational setting or world of work)
3. specific to institution (educational institute or professional organisation)

1.8.2. Generic Competences

Meng and Heijke[15] (2005) observed a recent shift (for researchers interested in labour market) from discipline specific to generic competences. Generic competences are those competences which are not context bound but context free. Such competences are characterised with their generality. Public relation officers, for example, are supposed to be possessed of good number

[15] see also: Bowden and Marton, 1998; Teichler, 1999

as well as good level of such type of competences. Bowen (1977) underlined the importance of generic skills (competences).

Bennett *et al* (2000) presented Hyland's (1994) analysis of the term competence which revealed that the rich and ever-expanding metaphysical universe of competence is made almost complete with the introduction of 'generic' competences (which are meant to ensure the transferability of occupational skills) and by the identification of 'meta-competence' (that work on other competences).

The Mayer Committee[16] (1992) defined key competencies with respect to employability. To them these are the "… competencies essential for effective participation in the emerging patterns of work and work organisation. They focus on the capacity to apply knowledge and skills in an integrated way in work situations. Key competencies are generic in that they apply to work generally rather than being specific to work in particular occupations or industries. This characteristic means that the key competencies are not only essential for participation in work, but are also essential for effective participation in further education and in adult life more generally.

Generic competences are also considered an added benefit, beside the specific one, of schooling. These are the competences one learns independent of formal system of education and these work equally well in different life situations. These are mutually dependant in their acquisition as well as application.

[16] Source: Australian Education Council, Mayer Committee 1992)

Table 1: Terms used in various geopolitical locations for generic competences

Geopolitical locations	Generic competences
United Kingdom	Core skills, key skills, common skills
New Zealand	Essential skills
Australia	Key competencies, employability skills, generic skills
Canada	Employability skills
United States	Basic skills, necessary skills, workplace know-how
Singapore	Critical enabling skills
France	Transferable skills
Germany	Key qualifications
Switzerland	Trans-disciplinary goals
Denmark	Process independent qualifications

(Source: Australian National Training Authority (2003) referred by Meng (2005))

Down (2000) identified that generic skills were rarely applied in isolation but are applied in association with other generic skills. Despite widespread agreement that generic competences are important, it is hard to find some absolute definition of them. Principally debate centres on just how *generic* 'generic competences' really are. Taken literally, a generic competence would be discipline-neutral. That is, the generic competences of science graduates and those of arts graduates would be indistinguishable. Yet this is unlikely to be the case for many of the skills that we consider 'generic'. Written communication is a good example. The style of writing that is valued in science is quite different to the 'creative voice' that characterises writing in many of the arts disciplines. For this reason, *transferable* is often preferred to *generic* - competences developed in one arena serve as a basis for further development and adaptation when transferred to another arena. Generic competences are also known by a number of terms overseas. In some countries they are specifically employment related, while

in others greater emphasis has been placed on their social relevance. Table 1 outlines the different labels being used for generic skills in various countries.

Current attention is focussed on those generic skills which are related to employability. The Mayer Committee (1992) articulated principles that these should:

- be essential to preparation for employment
- be generic to the kinds of work and work organisation emerging in the range of occupations at entry levels within industry rather than occupation- or industry-specific
- equip individuals to participate effectively in a wide range of social settings, including workplaces and adult life more generally
- involve the application of knowledge and skill
- be able to be learned
- be amenable to credible assessment

1.9. Generic versus Specific Competences

The assumption is sometimes made that discipline specific skills are more important than the generic ones. It is believed that general skills are to develop specific skills. However, in a world where knowledge (discipline specific) rapidly becomes obsolete the ability to identify, access, network and communicate new information (generic) is vital for career success. Robinson (1999) declared that many specific skills now have a very short 'half life' due to high developments in knowledge and technology. According to Teichler (1999), discipline

specific knowledge is rendered obsolete at an increasing rate by the pace of technological progress.

From the above scenario it appears that specific competences have lost the ground and soon will no more be in use. It is not wise to believe in. Specific competences have their own merits and they are irreplaceable as a whole. We take them as pre-requisite for the graduates no matter they (the graduates) are to work in a field entirely different from what they studied for. After all specific competences have their own value and interest and they can't be eliminated due to high interest in the generic competences. We are optimist in this regard. The only reason for the heightened interest in the generic competences is because of their flexibility and universal applicability.

Our intended study is expected to explore the generic competences but it does not mean that the specific competences have been replaced at all, and have become a forlorn part of the past. They are important as important as they were in past. The only difference which has made generic competences hot slogan of the day is that they have been less frequent and remained under-explored as compared to their counterpart.

1.10. Higher Education and Generic Competences

Education providers are also interested in generic skills because (NCVER, 2003a) they encourage learners to be more reflective and self-directed[17]. The Australian Council of Educational Research (ACER) review (2001) identified a range of descriptors for the characteristics learners are expected to acquire. These are included in the table 2 below.

[17] See also: Hager, Holland & Beckett (2002)

Table 2: Descriptors for the learners' characters

Descriptor	Definition
Skills	*Skills* are commonly understood to refer to an ability to perform a specific task.
Competencies	*Competency* is used to refer to an observable behaviour performed to a specified level and therefore provides a basis for the assessment of performance.
Attributes, qualities and Characteristics	These refer to those capabilities of an individual in most instances although "*characteristics"* is sometimes used to describe a workplace/job-specific requirement.

Garcia-Aracil et al[18] (2004) kept the idea of generation (and/or promotion) of the competences through higher education system. Higher education is confronted with increasing demand of generic competences (Meng, 2005). Hager et al (2002) suggest that assessment is a key issue and challenge the assumption that these skills will be developed through the higher education experience without explicit attention: A common theme for teaching and learning of generic competences is that success depends crucially on them being made explicit for students. Leaving them implicit, as they are in many traditional courses, does little to encourage learning and development.

The generic competences typically associated with university education include high level competence in:

- Written communication
- Oral communication
- Critical and analytical thinking
- Problem-solving
- Teamwork

[18] See also: Belfield, Bullock and Fielding, 1999; Dolton and Makepeace, 1990; Leckey and Mcguiga, 1997; Pike, 1995

- Independent learning
- Information literacy

Many other skills and attributes could be added to this list, and often are. For example, to 'think and reason logically', to 'be open to new ideas and possibilities', and to 'be responsible and effective citizens', are some of the phrases that appear in university lists of generic competences.

Table 3: Illustrative example of desired attributes of university graduates

Operates effectively with and upon a body of knowledge of sufficient depth to begin professional practice
Prepares for lifelong learning in pursuit of personal development and excellence in professional practice
Solves problems effectively, and is capable of applying logical, critical, and creative thinking to a range of problems
Works both autonomously and collaboratively as a professional
Commits to ethical action and social responsibility as a professional and citizen
Communicates effectively in professional practice and as a member of the community
Demonstrates international perspectives as a professional and as a citizen

Source: University of South Australia

Many universities have begun to pay particular attention to articulating sets of generic competences as desirable characteristics of their graduates. Best practice examples for developing generic competences among university students have been published in the April 2003 edition of the *B-Hert News* (Business/Higher Education Round Table 2003). Articles demonstrate that generic competences are being addressed seriously and that a variety of initiatives involving these competences is being pursued.

The higher education sector and business community are showing an interest in generic competences. Hager et al (2002) note that "… the term 'generic skills' [generic competences] is used widely to refer to a range of qualities and capacities that are increasingly viewed as important in higher education. These include thinking skills such as logical and analytical

reasoning, problem solving and intellectual curiosity; effective communication skills, teamwork skills and capacities to identify, access and manage knowledge and information, personal attributes such as imagination, creativity and intellectual rigour and values such as ethical practice, persistence, integrity and tolerance. However, as Garcia-Aracil et al (2004) maintained, "in this age of technological change some competences are less relevant and some are more relevant".

1.11. Employability as a Fruit of Generic Competences

Garcia-Aracil et al (2004) summarising the results of their study mention that monitory reward depends more on capability to manage complex situations than to specific knowledge needed in the jobs(this signifies generic competences). They discovered that attitude towards work (instead of knowledge) is the most rewarded characteristic in the labour market for young graduates. Proficiency in the broad range of generic skills has become the main requirement for the modern worker (Australian Chamber of Commerce and Industry & Business Council of Australia 2002). Heijke[19] et al (2003a, 2003b) had also emphasised that generic competences are more important in labour market. They[20] found 'lower costs of learning for higher educated' individuals.

The OECD and a range of countries, such as Canada, the United Kingdom, New Zealand, Singapore, the Netherlands, France, Germany and the United States of America, all agree to consider these competences to be most important for graduates' entry into and the continued employment in their workforces (Curtis and McKenzie 2001, NCVER 2003a, Curtis 2004a). NCVER (2003b) stressed on the proficiency in the broad range of generic skills which has

[19] See also: Stasz, 1993; Duncan, 1968; Bowen, 1977
[20] see also: Smoorenburg and van der Velden (2000)

become the main requirement for the modern worker (Australian Chamber of Commerce and Industry & Business Council of Australia 2002). Researchers[21] are interested in the identification of more relevant competences for professional success; and to investigate new concerns about the accuracy of match between higher education and employment in Europe[22].

Generic competences when applied to labour market are sometimes termed as *Employability skills* (*competences*). These are the competences required not only to gain employment, but also to progress within an enterprise so as to achieve one's potential and contribute successfully to enterprise strategic directions. The report (of ACCI & BCA, 2002) defined employability skills as '… skills required not only to gain employment, but also to progress within an enterprise so as to achieve one's potential and contribute successfully to enterprise strategic directions. Employability skills are also sometimes referred to as generic skills, capabilities or key competencies". (Australian Chamber of Commerce and Industry & Business Council of Australia 2002)

1.12. Conclusion

In conclusion we may say that the concept of competence is not as simple as it appears to be. It demands a great care while defining it. It is important to trace the origin of the word in French and then its subsequent appearance in the English literature. Three dimensional interpretation of competence vector is not yet well worked. The objective of this chapter was to present the concept of competence. We honestly tried to achieve this objective.

[21] For example: Garcia-Aracil et al, 2004; Busat et al, 2000; Heijke, Meng and Ramaekers, 2002
[22] see for example: Garcia-Aracil et al, 2004; Heijke, Meng and Ramaekers, 2002; Teichler and Kehm, 1995; Witte and Kalleberg, 1995

Next chapter offers some basic information regarding international interest in competence. This chapter is simple in its construction as it presents some common interests about competence almost all over the globe.

CHAPTER 2

COMPETENCE IN INTERNATIONAL CONTEXT

SUMMARY

This chapter was aimed at to propose a list of generic competences of the graduates in international perspective. We used comparison technique for this. Different lists of competences were provided from different geopolitical locations. Originally, these lists were developed on quite different parameters independent of each other. This deficiency (in having some common foundations) added to the desired internationalised objective of this review. First version of the list of competences was prepared by comparing different competence lists from various geopolitical locations. Then this version was compared to a list of competences used in an international project i.e. Reflex project. It was interesting to note that many competences were common between the two. We may say that the data set we will be using for the analyses presented in Part II of the dissertation, is internationalised in its disposition.

2.1. Introduction

"In recent years, the internationalisation of economic life is being reflected more and more in the internationalisation of education", said Heijke and Meng (2006). However knowledge and wealth (in monitory sense of the term i.e. economic capital) had long been considered the rivals in social life of human beings (both have had their deep impressions in the history of the civilizations) yet there existed another (rather mature) approach which took the two as the two shoulders of the highway of human activity. The later approach takes them as complementary to each other in the multifarious world of intricate relationships.

Loo and Semeijn (2001) have strengthen this point of view by saying that the classical approach of economic development, which was based on the industry, trade and commerce, has been replaced by rather new one as the knowledge economy. This very idea of *knowledge economy* is believed to be promoting better social life all over the globe. That is why more developed countries of the *information age* (present era) are showing more interest in it than ever before. (Source: www.roa.unimaas.nl/. Accessed on 04-12-2006)

Profiting from the human capital revolution which started in 1960s (Alstadsaeter, 2003), the *Knowledge economists* have successfully employed education and learning (i.e. knowledge) in the service of economic development. To Becker (1964) the long pay-off period to education "increases the advantages of education that is useful in many kinds of economic environment", quoted Meng and Heijke (2005). This phenomenon lent greater responsibility to the education in general and higher education in particular. Schultz (1961) regarded education as an investment in man whereas to Becker (1993) education represents more than an investment in human capital (Garcia-Aracil *et al*, 2004.).

Dearing Report (1997) defines the aim of higher education by saying that it should be to sustain learning society. One could present the CHEERS (Careers after Higher Education: a European Research Study) survey (1998-2000) as a best fit example in this regard. "The major function of education is […] to increase the individuals' capacity to learn, to provide them with a framework with which to analyse problems and to increase their capacity to deal with new information" maintained Australian Government Department of Employability, Education and Training (1987). One may trace the evidence of complementarity between education and on-job training (Barron et al, 1989; Brunello, 2001) because higher education lowers the cast for learning (van Smoorenburg and van der Velden, 2000). Consequently, responsibility rests with higher educated workers (van de Werfhorst, 2002) in *knowledge economy*.

For successful functioning and development, Anderson and Marshall (1994) and Nijhof (1994) regarded the labour market relevant knowledge and skills as well as a set of personal competences as crucial. A good number of researchers (see for example: Bishop, 1995; Bishop and Kang, 1989; Campbell and Laughlin, 1991; Altonji, 1995; and Mane, 1998) are inclined to merit specific competences more than the generic competences for employability in the labour market. Teichler (1999) appears to be strict in his conviction that discipline specific knowledge is rendered obsolete at an increasing rate by the pace of technological progress; hence the generic competences are more important in the world of work (Duncan, 1968; and Bowen, 1977; Stasz, 1993). Amidst these (apparently) antithetic point-of-views (although these are based on empirical findings) regressive opinion characterises the flexible graduates to be equipped of necessary and sufficient specific competences along with the repertoire of generic competences.

Demand for competent graduates has transformed from its classical conviction to the flexible graduates. Although specialised knowledge and professional expertise are valued in the labour market yet the *information age*, Sternberg (2003) reflects, urges for the generation of experts whose expertise will extend well beyond technical knowledge. Heijke et al (2003) discovered that generic competences (having indirect monetary value rather than the direct one) are used by on-the-job training to adjust the required level of specific competences; and these are influential in the graduates' placement in the labour market out of their educational domain confirming that these are not context bound and can be applied in a wide range of occupations. Graduates are supposed to be necessarily possessed of specific competences; for the universities are esteemed for their being high seats of learning. Classical indicators like educational grade and the title of the degree had remained helpful to the graduates (as well as the employers) in their placement in the world of work.

Researchers, at present, are interested more in the chemistry of (more specifically, generic) competences. This was the brief context for the present study. The internationalisation of economic life and the internationalisation of the education moved the researcher to study the physiology of the competences in the internationalised context. In particular, this study urges to present an internationalised list of competences for the graduates. In order to achieve our objective we chose to compare the lists of generic competences of various countries from different geopolitical locations all over the globe.

2.2. Competences at Various Geopolitical Locations

In the following lines we have included the various lists of the competences which were developed and used (independently) at different geopolitical location all over the globe. Heterogeneity is the startling characteristic of this chapter.

Table 4 : Geopolitical locations

S. No.	Geopolitical Location
1.	Australia
2.	New Zealand
3.	Hong Kong
4.	Singapore
5.	United Kingdom
6.	Canada
7.	United States of America
8.	Europe

2.2.1. Australia

Australia has achieved his position among the great economies of the world through a period of fifteen years of economic growth (with a strong focus on productivity improvement) under the effect of globalisation. Its interest in the generic competences first began in the 1980s and was re-invigorated in the late 1990s due to industry-led initiatives. A review of young people's post-compulsory education and training in Australia by Finn (Australian Education Council Review Committee 1991) recognised the importance of young people developing key competences. At Finn's recommendation, the Mayer Committee (Australian Education Council, Mayer Committee 1992) developed a set of key competences essential to preparing young people for employment. The Mayer Committee report (Australian Education Council, Mayer Committee 1992) is a major milestone in the establishment of generic skills in Australia.

Although the committee was urged to include cultural understanding as an eighth key competence, it stated that 'both the principles and characteristics the Committee has used to construct the set of key competencies preclude the inclusion of values and attitudes (Australian Education Council, Mayer Committee, 1992).

Table 5: Mayer key competences

S. No.	Key Competences	Description
1.	Collecting, analysing and organising information	The capacity to locate information, sift and sort information in order to select what is required and to present it in a useful way, and evaluate both the information itself and the sources and methods used to collect it.
2.	Communicating ideas and information	The capacity to communicate effectively with others using the range of spoken, written, graphic and other non-verbal means of expression.
3.	Planning and organising activities	The capacity to plan and organise one's own work activities, including making good use of time and resources, sorting out priorities and monitoring one's own performance
4.	Working with others and in teams	The capacity to interact effectively with other people both on a one-to-one basis and in groups, including understanding and responding to the needs of a client and working effectively as a member of a team to achieve a shared goal
5.	Using mathematical ideas and techniques	The capacity to use mathematical ideas, such as number and space, and techniques such as estimation and approximation, for practical purposes
6.	Solving problems	The capacity to apply problem solving strategies in purposeful ways both in situations where the problem and the solution are clearly evident and in situations requiring creative thinking and a creative approach to achieve an outcome
7.	Using technology	The capacity to apply technology, combining the physical and sensory skills needed to operate equipment with the understanding of scientific and technological principles needed to explore and adapt systems.

Source: Australian Education Council, Mayer Committee 1992

The Mayer Key Competences have provided both Australian industry and the Australian education and training system with a useful starting point and tool for understanding applying the concept of generic competences. Australian chamber of commerce and industry (ACCI), and Business council of Australia (BCA) undertook a comprehensive study of skills (competences) in 2002 and expanded the *Mayer Key Competences* renaming it as *Employability Skills*.

Table 6: Employability skills of Australia

S. No.	Key Competences	Description
1.	Communication Skills	Skills that contribute to productive and harmonious relations between employees and customers
2.	Team work Skills	Skills that contribute to productive working relationships and outcome
3.	Problem-solving Skills	Skills that contribute to productive outcome
4.	Initiative and enterprise Skills	skills that contribute to innovative outcome
5.	Planning and organising Skills	skills that contribute to long-term and short-term strategic planning
6.	Self-management Skills	skills that contribute to employee satisfaction and growth
7.	Learning Skills	skills that contribute to ongoing improvement and expansion in employee and company operations and outcome
8.	Technology Skills	skills that contribute to effective execution of tasks

Source: Australian chamber of commerce and industry (ACCI), and Business council of Australia (BCA)

Following is the comparative picture of Mayer Key Competences (1992) and Employability Skills (2002) being developed for Australian labour market.

Table 7: Australian employability skills compared with Mayer key competencies

Employability skills		Mayer key competencies
Communication skills	that contribute to productive and harmonious relations between employees and customers	Communicating ideas and information Using mathematical ideas and techniques
Teamwork skills	that contribute to productive working relationships and outcomes	Working with others and in teams
Problem-solving skills	that contribute to productive outcomes	Solving problems
Initiative and enterprise skills	that contribute to innovative outcomes	
Planning and organising skills	that contribute to long-term and short-term strategic planning	Planning and organising activities Collecting, analysing and organising information
Self-management skills	that contribute to employee satisfaction and growth	
Learning skills	that contribute to ongoing improvement and expansion in employee and company operations and outcomes	
Technology skills	that contribute to effective execution of tasks	Using technology

Source: Australian Chamber of Commerce and Industry (ACCI) and Business Council of Australia (BCA) 2002

Table 8: Australian desired personal attributes

S. No.	Personal attributes
1.	Loyalty
2.	Commitment
3.	Honesty and integrity
4.	Enthusiasm
5.	Reliability
6.	Balanced attitude to work and home life
7.	Motivation
8.	Personal presentation
9.	Common sense
10.	Positive self-esteem
11.	Sense of humour
12.	Ability to deal with pressure
13.	Adaptability

Source: Australian Chamber of Commerce and Industry (ACCI) and Business Council of Australia (BCA) 2002

2.2.2. Essential Skills in New Zealand

In New Zealand, "Essential Skills" has formed part of the national curriculum and the National Qualification Framework. They include:

Table 9 : New Zealand's essential skills

S. No.	Competences
1.	Information Skills
2.	Communication Skills
3.	Self-Management Skills
4.	Work and Study Skills
5.	Social Skills
6.	Numeracy Skills
7.	Problem-Solving and Decision-Making Skills

Source: Workplace Essential Skills: Resources Related to the SCANS Competencies and Foundation Skills (2002)

2.2.3. Key Job Competencies in Hong Kong

Dorinda Fung *et al* (2006) created the Self-Assessment of All-Round Development (SAARD) Questionnaire as a new measure of generic competences in Hong Kong. It includes fourteen key job competencies. Since the early 1990s, generic competencies have been capturing growing attention all over the world. Fast changes in technology and global competition

prompt employers alike to look for all round employees who demonstrate teamwork, problem-solving, flexibility, initiative, and the capacity to undertake many different tasks and information (NCVER, 2003).

According to the researchers the SAARD Questionnaire is designed for producing general profiles of all-round development of university students along various areas of key job competencies at the individual, programme/faculty/departmental, and institutional levels. The SAARD could be administered annually to students during their entry and exit points so as to monitor their all-round development whilst studying at their universities.

Table 10: Key job competencies in Hong Kong

S. No.	Competences
1.	Communication
2.	Creative Thinking
3.	Critical Thinking
4.	Cultural Appreciation
5.	Emotional Intelligence and Psychological Wellness
6.	Entrepreneurship
7.	Global Outlook
8.	Healthy Lifestyle
9.	Interpersonal Effectiveness
10.	Leadership
11.	Life-long Learning
12.	Problem Solving
13.	Social and National Responsibility
14.	Teamwork

We included the list of key job competencies from this questionnaire for some reasons, though it had operated on a small scale study which was restricted to the Hong Kong Polytechnic University. Firstly, the researchers declared it to be reasonably reliable, valid and useful instrument and worthy of additional use and testing. Secondly, it was the only instrument we could find to have the list of key job competencies. Thirdly, it is designed for the graduates. Fourthly, it is prepared and applied for key job competencies. Lastly, we intended to extend our study to different geopolitical locations.

The writers said that despite the fact that the results of this study are encouraging, more work is required to further examine the construct validity of the SAARD by correlating its scores with, for instance, scores achieved in standardised tests with similar content or scores achieved along relevant performance indicators used in the job setting after graduation. The SAARD Questionnaire asks students to rate their abilities and behaviours along a 7-point scale with respect to the following 14 areas of key job competencies:

2.2.4. Singapore

The Singapore Workforce Development Agency (WDA) is a statutory agency of the government of Singapore. It seeks to enhance the competitiveness and employability of employees and jobseekers, thereby building a workforce that meets the changing needs of Singapore's economy. Working with industry, unions, employers, economic agencies, professional associations and training organisations, the agency's efforts are targeted at supporting industry growth by building a pipeline of workers through training and skills upgrading, and raising industry standards through enhancing manpower capabilities. The Singapore Workforce Skills Qualifications (WSQ) is a robust and integrated continuing education and training system (of qualification) ranging from Certificate to Graduate Diploma. It is designed to build industry competencies. It is founded on best international practices and validated by industries and employers. It differs from the pre-employment training system delivered by national schools and post-secondary education institutions. The Singapore Employability Skills System (ESS) is a type of the Singapore Workforce Skills Qualification. It comprises a set of generic employability skills to raise a worker's effectiveness and improve his work abilities. These foundational skills, portable across all industries, enable workers of all levels to better adapt to new job demands, work challenges

and changing work environments. As such, these skills complement other specific industry and occupational skills which are specialised or technical by nature.

Table 11: Employability skills in Singapore

S. No.	Competences
1.	Workplace Literacy & Numeracy
2.	Information & Communications Technology
3.	Problem Solving & Decision Making
4.	Initiative & Enterprise
5.	Communication & Relationship Management
6.	Lifelong Learning
7.	Global Mindset
8.	Self-management
9.	Workplace-related Life Skills
10.	Health & Workplace Safety

(Source: http://wsq.wda.gov.sg/ (18.09.2007)

The ESS was introduced by the Singapore Workforce Development Agency in November 2004 and piloted from November 2004 to 31 March 2005. The comprehensive phase was rolled out on 1 April 2005 with more than 14,500 people benefiting from the programme. It is now recognised by more than 20 training institutions and companies as an alternative to formal academic qualifications like the 'O' levels, which are currently used as entry criteria into occupations and training programmes. WDA established the Centre for Employability Skills (CES) to support the appraisal and certification of ESS Training. Following are the employability skills (ES) in Singapore. To develop the ES programme, WDA identified a set of competency units for each of these ten employability skills. These are grouped into three separate series of competencies and corresponding modules.

2.2.5. United Kingdom

Key developments in defining generic skills in the United Kingdom have been similar to those in Australia. Initially, they were called ‘core skills’ and, following their revision, ‘key

skills'. Employers have since added other skills and referred to them as 'employability skills'. In the United Kingdom, key skills are defined as those relevant to a person's learning, career and to personal life, with a strong emphasis on their application to employability. They comprise a list of skills similar to Australia's key competencies, and are divided into a core set of three basic skills and three wider key skills. The three basic skills, which comprise a national Key Skills Qualification, include:

- communication
- numeracy or the application of numbers
- use of information technology

The three wider key skills are:

- working with others
- improving own learning and performance
- problem-solving

Each of the six key skills is defined at five levels (foundation, craft, technician/supervisor, higher technician/junior manager and professional/managerial). Progression is in terms of:

- degree of responsibility of the learning for using the skills
- more complex and demanding tasks, problems and situations.

The United Kingdom Confederation of British Industry has since developed the key skills scheme even further. The confederation defined employability as: 'the possession by an

individual of the qualities and competencies required to meet the changing needs of employers and customers and thereby help to realise his or her aspirations and potential at work' (Confederation of British Industry 1998, p.6). It identified employability skills as the six key skills, plus basic literacy and numeracy skills. It also included the following attitudes:

- adaptability
- career management
- commitment to lifelong learning.

Table 12: Employability skills in United Kingdom

S. No.	Competences
1.	communication
2.	numeracy or the application of numbers
3.	use of information technology
4.	working with others
5.	improving own learning and performance
6.	problem-solving
7.	Adaptability
8.	career management
9.	commitment to lifelong learning

2.2.6. Canada

Canada has also had generic skills programs since the 1970s and, like many countries the early program produced a set of essential skills similar to the United Kingdom's key skills and Australia's key competencies. In the 1990s, employers became more involved and The Conference Board of Canada, a peak industry body, took initiative for an alternative more extensive scheme and introduced the term employability skills. Members of The Conference Board of Canada's Employability Skills Forum and the Business and Education Forum on Science, Technology and Mathematics (in May 2000) successfully developed The Employability Skills 2000+.

They claim the application and usage of these skills beyond the workplace (too) in a range of daily activities. The recently revised Employability Skills 2000+ Scheme includes:

- fundamental skills (communicate, manage information, use numbers, think/solve problems)
- personal management skills (demonstrate positive attitudes and behaviours, be responsible, be adaptable, learn continuously, work safely)
- teamwork skills (work with others, participate in projects and tasks)
- an orientation to values and attitudes with references to self-esteem, integrity, responsibility. (Conference Board of Canada 2000)

Table 13 – A: Employability skills 2000+ of Canada

Fundamental skills The skills needed as a base for further development	**Personal management skills** The personal skills, attitudes and behaviours that drive one's potential for growth	**Teamwork skills** The skills and attributes needed to contribute productively
You will be better prepared to progress in the world of work when you can: **Communicate** • read and understand information presented in a variety of forms (e.g., words, graphs, charts, diagrams) • write and speak so others pay attention and understand • listen and ask questions to understand and appreciate the points of view of others • share information using a range of information and communications technologies (e.g., voice, e-mail, computers) • use relevant scientific, technological and mathematical knowledge and skills to explain or clarify ideas **Manage Information** • locate, gather and organize information using appropriate technology and information systems • access, analyze and apply knowledge and skills from various disciplines (e.g., the arts, languages, science, technology, mathematics, social sciences, and the humanities)	You will be able to offer yourself greater possibilities for achievement when you can: **Demonstrate Positive Attitudes & Behaviours** • feel good about yourself and be confident • deal with people, problems and situations with honesty, integrity and personal ethics • recognize your own and other people's good efforts • take care of your personal health • show interest, initiative and effort **Be Responsible** • set goals and priorities balancing work and personal life • plan and manage time, money and other resources to achieve goals • assess, weigh and manage risk • be accountable for your actions and the actions of your group • be socially responsible and contribute to your community	You will be better prepared to add value to the outcomes of a task, project or team when you can: **Work with Others** • understand and work within the dynamics of a group • ensure that a team's purpose and objectives are clear • be flexible: respect, be open to and supportive of the thoughts, opinions and contributions of others in a group • recognize and respect people's diversity, individual differences and perspectives • accept and provide feedback in a constructive and considerate manner • contribute to a team by sharing information and expertise • lead or support when appropriate, motivating a group for high performance • understand the role of conflict in a group to reach solutions • manage and resolve conflict when appropriate

Continued on next page

Source: The Conference Board of Canada, May 2000 (*Internet*: www.conferenceboard.ca/education; 19.09.2007)

Table 14 – B: Employability skills 2000+ of Canada

Fundamental skills The skills needed as a base for further development	**Personal management skills** The personal skills, attitudes and behaviours that drive one's potential for growth	**Teamwork skills** The skills and attributes needed to contribute productively
Use Numbers • decide what needs to be measured or calculated • observe and record data using appropriate methods, tools and technology • make estimates and verify calculations **Think & Solve Problems** • assess situations and identify problems • seek different points of view and evaluate them based on facts • recognize the human, interpersonal, technical, scientific and mathematical dimensions of a problem • identify the root cause of a problem • be creative and innovative in exploring possible solutions • readily use science, technology and mathematics as ways to think, gain and share knowledge, solve problems and make decisions • evaluate solutions to make recommendations or decisions • implement solutions • check to see if a solution works, and act on opportunities for improvement	**Be Adaptable** • work independently or as a part of a team • carry out multiple tasks or projects • be innovative and resourceful: identify and suggest alternative ways to achieve goals and get the job done • be open and respond constructively to change • learn from your mistakes and accept feedback • cope with uncertainty **Learn Continuously** • be willing to continuously learn and grow • assess personal strengths and areas for development • set your own learning goals • identify and access learning sources and opportunities • plan for and achieve your learning goals **Work Safely** • be aware of personal and group health and safety practices and procedures, and act in accordance with these	**Participate in Projects & Tasks** • plan, design or carry out a project or task from start to finish with well-defined objectives and outcomes • develop a plan, seek feedback, test, revise and implement • work to agreed quality standards and specifications • select and use appropriate tools and technology for a task or project • adapt to changing requirements and information • continuously monitor the success of a project or task and identify ways to improve

Source: The Conference Board of Canada, May 2000 (*Internet*: www.conferenceboard.ca/education; 19.09.2007)

2.2.7. United States

In the United States (US), the Secretary's Commission on Achieving Necessary Skills (SCANS) Project was the major generic skills scheme of the early 1990s. The SCANS was appointed by the Secretary of the U.S. Department of Labor to determine the skills American young people need to succeed in the world of work. The Commission's fundamental purpose was to encourage a high-performance economy characterized by high-skill, high-wage employment. In 1991, the commission issued their initial report known as "*What Work Requires of Schools: A SCANS Report for America 2000*".

Table 15: SCANS skills in United States

Workplace Competencies	**Foundation Skills**
Resources	**Basic Skills**
Allocates Time	Reading, Writing
Allocates Money	Arithmetic, Mathematics
Allocates Materials and Facility Resources	Listening
Allocates Human Resources	Speaking
Information	**Thinking Skills**
Acquires and Evaluates Information	Creative Thinking
Organizes and Maintains Information	Decision Making
Interprets and Communicates Information	Problem Solving
Uses Computers to Process Information	Seeing Things in the Mind's Eye
	Knowing How to Learn
	Reasoning
Interpersonal	**Personal Qualities**
Participates as a Member of a Team	Responsibility
Teaches Others	Self-Esteem
Serves Clients/Customers	Social
Exercises Leadership	Self-Management
Negotiates to Arrive at a Decision	Integrity/Honesty
Works with Cultural Diversity	
Systems	
Understands Systems	
Monitors and Corrects Performance	
Improves and Designs Systems	
Technology	
Selects Technology	
Applies Technology to Task	
Maintains and Troubleshoots Technology	

Source: *What Work Requires of Schools: A SCANS Report for America 2000*.

What Work Requires of Schools was the initial report from Secretary's Commission on Achieving Necessary Skills (SCANS). This report defined the five workplace competencies and three-part foundation skills that constitute the SCANS skills. US Department of Labor, Employment and Training Administration, and the US Department of Education, National Center for Education Statistics collaborated for the publication of the report in August 2000, Workplace Essential Skills: Resources Related to the SCANS Competencies and Foundation Skills. SCANS skills which identified what skills are important and needed, served as a foundation for this report. In this report one may have a comprehensive overview of identifying, defining, measuring, and analyzing essential workplace skills.

2.3. Reflex Project (European Perspective)

The flexible professional in the knowledge society: new demands on higher education in Europe (see http://www.reflexproject.org). From autumn 1998 to 2000, about 3,000 graduates each from nine countries in the European Union (Austria, Finland, France, Germany, Italy, the Netherlands, Spain, Sweden, and United Kingdom), one EFTA country (Norway), one of the central and eastern European countries in transition (the Czech Republic) and one economically advanced country outside Europe (Japan) provided through a written questionnaire on the relationship between higher education and employment three to four years after graduation. In total, over 40,000 graduates from higher education institutions answered questions on their socio-biographical background, study paths, transition from higher education to employment, early career, links between study and employment, job satisfaction and their retrospective view on higher education.

We have included various lists in the previous chapter. All of them were prepared independently in different geopolitical locations with different objectives/interests. Some of them were prepared to meet the researchers' interests whereas some others were designed for the fulfilment of the government/state agenda. Such an unmatched comparison has its own merit. We intended to draw a list of international interest. The common elements in those lists (that were based upon different parameters) will add to the intended international acceptability to our proposed list. First we present DeSeCo (Definition and Selection of Competencies) an international project.

Table 16: Competences used in the Reflex project

S. No.	Competences
1.	Analytical thinking
2.	Ability to rapidly acquire new knowledge
3.	Ability to negotiate effectively
4.	Ability to perform well under pressure
5.	Alertness to new opportunities
6.	Ability to coordinate activities
7.	Ability to use time efficiently
8.	Ability to work productively with others
9.	Ability to mobilize the capacities of others
10.	Ability to make your meaning clear to others
11.	Ability to assert your authority
12.	Ability to use computers and the internet
13.	Ability to come up with new ideas and solutions
14.	Willingness to question your own and others' ideas
15.	Ability to present products, ideas or reports to an audience
16.	Ability to write reports, memos or documents
17.	Ability to write and speak in a foreign language

Source: http://www.reflexproject.org

2.4. DeSeCo – An International Project

The OECD sponsored DeSeCo (Definition and Selection of Competencies) project (Haste 1999, cited in Curtis 2004) was undertaken in response to the increasing interest in education outcomes and their effects. DeSeCo developed a common, overarching conceptual frame of reference for identifying and assessing key competences. Key competences are individually

based competences considered necessary or desirable for effective participation in democratic societies and for coping with global demands, particularly those related to the so-called knowledge economy or information society. DeSeCo was initiated in the OECD context at the end of 1997 and carried out under the leadership of the Swiss Federal Statistical Office. It is embedded in OECD's long-term programme on education indicators (INES) which aims to provide measures on the functioning, development and impact of education. The work of DeSeCo was designed to complement past and current international empirical studies, in particular the International Adult Literacy Survey (IALS), the Programme for International Student Assessment (PISA) and the Adult Literacy and Life Skills (ALL) survey. The analysis and reflection in DeSeCo is not restricted to what can be learned and taught in schools or to what is currently or readily measurable in large-scale assessments. DeSeCo has not addressed its task by an inductive method, starting from factual situations, but rather by starting at a more general level, laying out conceptual and theoretical considerations.

The DeSeCo Project, supported by the OECD (Rychen & Salganik 2001), takes a very different approach to defining generic skills. Past individual approaches have been based on the opinions of informed community leaders. The DeSeCo Project aimed to establish a theoretical and conceptual basis by involving academics, and commissioning papers from philosophical, anthropological, economic, psychological and sociological perspectives. The DeSeCo Project concluded that there are three very broad competencies, each of which can be broken down to provide a more extensive list of generic skills. These three competencies are:

Table 17: DeSeCo's broader domains of competences

S. No.	Competences
1.	acting autonomously and reflectively
2.	using tools interactively
3.	joining and functioning in socially heterogeneous groups

The DeSeCo Project also identified four conceptual elements of key competencies:

- *Key competencies are multi-functional*—they meet a range of different and important demands of daily and professional life.They are needed to achieve different goals and to solve multiple problems in a variety of contexts.

- *Key competencies are relevant across many social fields* and are therefore relevant for effective participation in school and the labour market. They also play an important role in the political process, social networks and interpersonal relationships (including family life), and in developing a sense of well-being.

- *Key competencies refer to a high order of mental complexity*—they encourage a mental autonomy which involves an active and reflective approach to life.

- *Key competencies are multi-dimensional*—they are composed of 'know-how', analytical, cultural and communication skills and common sense.

Common elements of various listings in DeSeCo are summarised in the following table:

Table 18: Common elements of various listings of generic skills

Basic/fundamental skills—such as literacy, using numbers, using technology
People-related skills—such as communication, interpersonal, teamwork, customer-service skills
Conceptual/thinking skills—such as collecting and organising information, problem-solving, planning and organising, learning-to-learn skills, thinking innovatively and creatively, systems thinking
Personal skills and attributes—such as being responsible, resourceful, flexible, able to manage own time, having self-esteem
Skills related to the business world—such as innovation skills, enterprise skills
Skills related to the community—such as civic or citizenship knowledge and skills

2.5. International Comparison of Skills in Australia

The literature review also provided an international overview highlighting the similarities in both the need for employability skills in a range of developed economies and the range of skills governments and enterprises see as a priority. The table below is taken from the Australian Council for Educational Research (ACER) review (2001). This provides an international comparison of the skill frameworks in place.

Table 19: Comparative table of generic employability skills by country

Australian key competencies (Mayer Key Competencies)	**United Kingdom (NCVQ) core skills**	**Canada employability skills profile**	**United States (SCANS) workplace know-how**
Collecting, analysing and organising information	Communication	Thinking skills	Information Foundation skills: basic Skills
Communicating ideas and information	Communication Personal skills: improving own performance and learning	Communication skills	Information Foundation skills: basic Skills
Planning and organising activities	Personal skills: improving own performance and learning	Responsibility skills Thinking skills	Resources Foundation skills: personal qualities
Working with others and in teams	Personal skills: working with others	Positive attitudes and behaviour Work with others Adaptability	Interpersonal skills
Using mathematical ideas and techniques	Numeracy: application of number	Understand and solve problems using mathematics	Foundation skills: basic Skills
Solving problems	Problem solving	Problem-solving and decision-making skills Learning skills	Foundation skills: Thinking
Using technology	Information Technology	Use technology Communication skills	Technology Systems
Post-Mayer additions: Cultural Understandings	Modern foreign Language	Manage information Use numbers Work safely Participate in projects and tasks	

Source: Adapted from Werner 1995

The Employability Skills Framework identified through this research project includes a number of similarities to the overseas frameworks.

2.6. Comparison of Generic Competences of the Graduates

We compared various lists of the generic competences from the countries in different geopolitical locations and draw the following table. Meng (2005) developed cluster of generic competences (see also: Heijke et al, 2003a, Heijke et al, 2003b) by using hierarchical clustering technique. Almost all the skills in his generic cluster could be found in Table 19.

Table 20: Comparison of generic competences of the graduates – I

S. No.	Competence title
1.	Communication competence
2.	Team work competence
3.	Problem solving competence
4.	Career management competence
5.	Time management competence
6.	Information management competence
7.	Self-management competence
8.	Lifelong learning competence
9.	Technology competence
10.	Analytical thinking competence
11.	Cultural appreciation competence
12.	Leadership competence
13.	Decision making competence
14.	Adaptability competence
15.	Taking initiative competence

This table has been developed through the comparative review of the generic competences lists from Australia, New Zealand, Hong Kong, Singapore, United Kingdom, Canada, and United States of America. In order to lend more international acceptability to our proposed list of generic competences we made it compared with that of the generic competences used in an international project (i.e. Reflex project, 2007). Here we met a problem. Our list carried competences titles (in brief) whereas in the Reflex project the concept of each competence was described in comprehensive phrases. In order to bridge the gap we translated our list (see

Table 19) on a pattern similar to that of the Reflex project. Table 20 has been translated from the above table for a justified comparison of these competences with that of the used in the Reflex Project (2007).

Table 21: Comparison of Generic competences of the graduates – II

S. No.	Competence title	Competence description
1.	Communication competence	Ability to make your meaning clear to others
2.	Team work competence	Ability to work with others
3.	Problem solving competence	Ability to find solutions to a problem
4.	Career management competence	Ability to be more productive in your work
5.	Time management competence	Ability to use time efficiently
6.	Information management competence	Ability to organise and manipulate information
7.	Self-management competence	Ability to organise yourself for work and leisure
8.	Lifelong learning competence	Ability to acquire new knowledge consistently
9.	Technology competence	Ability to make effective use of technology
10.	Analytical thinking competence	Ability to question your own and other's ideas
11.	Cultural appreciation competence	Ability to react positively to the cultures strange to you
12.	Leadership competence	Ability to exercise your authority
13.	Decision making competence	Ability to make apt decisions
14.	Adaptability competence	Ability to learn the situation and act accordingly
15.	Taking initiative competence	Ability to introduce new schemes and projects

We mention again the list of generic competences included in the reflex project (2007) so that the comparison could be made more observable.

Table 22: Competences used in the Reflex project

S. No.	Competence description
1.	Analytical thinking
2.	Ability to rapidly acquire new knowledge
3.	Ability to negotiate effectively
4.	Ability to perform well under pressure
5.	Alertness to new opportunities
6.	Ability to coordinate activities
7.	Ability to use time efficiently
8.	Ability to work productively with others
9.	Ability to mobilize the capacities of others
10.	Ability to make your meaning clear to others
11.	Ability to assert your authority
12.	Ability to use computers and the internet
13.	Ability to come up with new ideas and solutions
14.	Willingness to question your own and others' ideas
15.	Ability to present products, ideas or reports to an audience
16.	Ability to write reports, memos or documents
17.	Ability to write and speak in a foreign language

We compared the competences description manifested in the Table 20 and the Table 21 and came across the following rather internationalised list of competence descriptions.

Table 23: Competences of the graduates – international approach I

S. No.	Competence description
1.	Ability to make your meaning clear to others
2.	Ability to negotiate effectively
3.	Ability to work productively with others
4.	Ability to find solutions to a problem
5.	Ability to be more productive in your work
6.	Ability to use time efficiently
7.	Ability to organise and manipulate information
8.	Ability to organise yourself for work and leisure
9.	Ability to acquire new knowledge consistently
10.	Ability to make effective use of technology
11.	Ability to think analytically
12.	Ability to question your own and other's ideas
13.	Ability to react positively to the cultures strange to you
14.	Ability to write and speak in a foreign language
15.	Ability to exercise your authority
16.	Ability to make apt decisions
17.	Ability to learn new situations and act accordingly
18.	Ability to address to new opportunities
19.	Ability to introduce new schemes and projects

We recoded these descriptions into their respective titles. In the following table our final list of competences titles along with competences description is recorded.

This is the proposed list of international generic competences for the graduates.

Table 24: Competences of the graduates – international approach II

S. No.	Competence title	Competence description
1.	Communication competence	Ability to make your meaning clear to others
2.	Negotiation competence	Ability to negotiate effectively
3.	Team work competence	Ability to work productively with others
4.	Problem solving competence	Ability to find solutions to a problem
5.	Productivity competence	Ability to be more productive in your work
6.	Time management competence	Ability to use time efficiently
7.	Information management competence	Ability to organise and manipulate information
8.	Self-management competence	Ability to organise yourself for work and leisure
9.	Lifelong learning competence	Ability to acquire new knowledge consistently
10.	Technology competence	Ability to make effective use of technology
11.	Analytical thinking competence	Ability to think analytically
12.	Questioning competence	Ability to question your own and other's ideas
13.	Foreign language competence	Ability to write and speak in a foreign language
14.	Cultural appreciation competence	Ability to react positively to the cultures strange to you
15.	Leadership competence	Ability to exercise your authority
16.	Decision making competence	Ability to make apt decisions
17.	Adaptability competence	Ability to learn the situation and act accordingly
18.	Taking initiative competence	Ability to introduce new schemes and projects
19.	Risk taking competence	Ability to address to new opportunities

2.7. Conclusion

We conclude this chapter by proposing an internationalised list of competences. This is only a proposed one. This is not more than this. One may question its validity and reliability. Of course it lacks empirical justification; because this list has never been subjected through any experimentation. Although the source lists included in this chapter had been subjected through some experimentation independent of one another and, surely, these were prepared for a specific purpose and limited community and also they had their peculiar objectives.

Next chapter concisely reviews measurement methodology, especially, those concerning self assessment of competences. This chapter offers a very brief description over this subject. It provides basic information necessary to understand the analyses we are going to present in the next part of the dissertation.

CHAPTER 3

AN OVERVIEW SELF ASSESSMENT OF COMPETENCE

SUMMARY

This chapter offers an overview of competence assessment with a special focus upon self assessment. Advantages and disadvantages of the method have also been discussed along with possible correction techniques.

3.1. Introduction

Although testing and evaluation are not new terms in the literature on education, especially higher education, however, a greater than before interest in competence assessment has emerged out of the concern over 'higher education for economic growth' in recent ideology of global knowledge economy. Objective assessment has been emphasized since ever; nonetheless, we cannot get rid of inevitable subjectivity, predominantly, in social sciences. This necessary evil sometimes befalls blessings. How does it come? We may be seeing in the later stage in this chapter. Very simple answer to this question could be, '*something is better than nothing*'; and we may assure you that this *something* is more than what it appears to be. Previous chapters have seen some insight over the concept of competence and increased international interest in competence as well as competence assessment. This chapter closes first part of this dissertation by presenting a theoretic background; however it is succinct for the quantitative analyses presented in the subsequent chapters on hand in the next part.

3.2. Self Assessment of Competences

Different approaches to competence assessment have been in use so far. For example, Spencer and Spencer (1993) approach for competence assessment is intended to provide the practitioners with instruments that help them in deciding how to match people to jobs and tasks. The notion of competence though much in vogue was, seemingly, lacking major review of the literature until 1989. Baud and Falchikov (1989) say publicly to be the pioneer to provide a critical self assessment literature, analysing 48 quantitative studies addressing self assessment. Ward et al (2002) even enhanced this list to 67 studies in their analysis. Following table presents summary of the competence literature used by Ward et al (2002).

Table 25: Summary of methodologies used in quantitative studies of self assessment*

Field	Correlation	Percentage agreement	Group mean comparisons	Interindividual approach
Health Professions	Antonelli 1997 Arnold 1985 Calhoun 1988 Daniel 1990 Das 1998 Everett 1983 Farnill 1997 Hay 1995 Henbest 1985 Herbert 1990 Johnson 1998 Kaiser 1995 Kolm 1987 Leichner 1980 Linn 1975 MacFadyen 1985 Martin 1998 Morton 1977 Palmer 1985 Plorde 1985 Rezler 1989 Risucci 1989 Stuart 1980 Wooliscroft 1993	Cochran 1980 Coutts 1999 Forehand 1982 Henbest 1985 Kaiser 1995 Mast 1978 Sclabassi 1984	Calhoun 1988 Calhoun 1990 Daniel 1990 Das 1998 Farnill 1997 Geissler 1973 Hay 1995 Henbest 1985 Herbert 1990 Johnson 1998 Morton 1977 Palmer 1985 Risucci 1989 Stuart 1980 Zonia 2000	Fitzgerald 2000 Gruppen 1997 Gruppen 1998 Harrington 1997 Regehr 1996
Subtotal 37 studies	24 (64.9%)	7 (18.9%)	15 (40.5%)	5 (13.5%)
Higher Education	Bergee 1997 Bishop 1971 Boud 1979 Boud 1986 D'Augelli 1973 Doleys 1963 Gaier 1961 Irvine 1983 Israelite 1983 Keefer 1971 LeBlance 1985 Mihal 1984 Murstein 1965 O'Neill 1985 Pease 1975 Pohlmann 1974 Wheeler 1981	Burke 1969 Davis 1980 Falchikov 1986 Filene 1969 Gray 1987 Mueller 1970 Pitishkin-Potanich 1983 Stanton 1978 Stover 1976	Bishop 1971 Boud 1986 Chiu 1975 Doleys 1963 Fuqua 1984 Greenfield 1978 Israelite 1983 Keefer 1971 McGeever 1978 Mihal 1984 O'Neill 1985 Wheeler 1981	
Subtotal 30 studies	17 (56.7%)	9 (30.0%)	12 (40.0%)	–
TOTAL 67 studies	41 studies (66.1%)	16 studies (25.8%)	27 studies (43.5%)	–

(Excluding 'Interindividual')

*Listed by first author only for ease of presentation.

(Source: Ward et al, 2002)

They examined the methodological issues that plague the self assessment of competence, and presented several strategies tackling these methodological problems within the current paradigm.

Economists have classically been measuring competences through proxies like academic titles, earnings etc. Parallel to this there are direct measurement methods as well. These methods may either involve seeking information from the (outside) observers or from the individuals themselves. Former is termed as *peer rating* and the later *self reporting*. Evidently, there are consequences for both assessment methods. Peer rating is also known as *expert rating*. In case of *expert rating*, Ward et al (2002) found evidence of inconsistency among expert ratters. They suggested 'multiple expert ratters' as a remedial measure for expert ratters' inconsistency. However, it is not a workable idea always besides being a costly method. For *self reporting*, Loo and Semeijn (2004) mention two demerits i.e. over estimation and the ordering of question. To accentuate they relate Bergee (1997) who reported mixed inter-ratter reliabilities (coefficient alpha 0.23 to 0.93) for evaluation of applied music performances. Counteractively, quoting from Spenner (1990), they believe that, since it lacks systematic evidence of people reporting their job characteristics, *self reports* are better to rely upon. However, they counsel to provide some rationale to use *self reports* for competence assessment. Ward et al (2002) maintain that despite the theoretical value of self assessment, the traditional measures employed in the literature could lead to the conclusion that self assessment ability is poor. Falchikov and Baud (1989) believe that the more experienced students also tend to underestimate their performance. Nonetheless, they further say, no overall consistent tendency to overestimate or underestimate performance was found. Their view also pointed to the ability level of self assessors as a salient variable, with the "more able students making more accurate self assessments than their less able peers" (p. 543).

3.3. Assessment of Acquired and Required Level of Competences

Self reporting as an assessment method of competence is well known among human capital spheres. It includes assessment of the competences what they have acquired during their academic career, by the individuals themselves. This is referred to as self assessment of acquired competences. Whereas assessment of the competences by the individuals what they think are required in the labour market is called as assessment of required competences. It also comes under the category of *self reporting*. Allen and van der Velden (2005) summarised separately the assessment methods for the acquired level of competences and the required level of competence as below.

Table 26: Methods to assess acquired level of competences

METHOD	LEVEL
Proxy: • By education	 Aggregate of educational groups: level or field
Objective measures: • Assessment • Testing	 Individuals Individuals
Subjective measures: • Supervisor rating • Individual Self Assessment • Testing proxy by required skills	 Individuals Individuals Individuals

(Source: Allen and van der Velden, 2005)

Table 25 and 26 furnish a summary of the methods commonly used to assess competence levels both acquired as well required, respectively. We observe that education has been used as proxy for acquired levels of competence. It is economic to take education as proxy and in addition to this it is a readily available yardstick for competences. We believe that there is a relationship between education and competence level but this is neither always direct nor as well defined as to consider it a standard. Individual's *self reporting*, though it is a subjective method yet surpasses other methods in its merits. We will be discussing its merits a bit later in this chapter. Another method to assess acquired competences is through the use of self

reported competence requirements (Allen and van der Velden, 2005). The main reason why researchers have advocated this method is a conviction that self-reported skill requirements are less prone to response bias than self-assessments of own skills, state Allen and van der Velden (2005, referred to Green, 2004). They believe that these methods are complementary to the methods used for the assessment of required competences given below in Table 26.

Table 27: Methods to assess required level of competences

METHOD	LEVEL
Proxy: • By occupational analyses	 Aggregate of jobs: occupation
Objective measures: • Job Analysys	 Individual jobs
Subjective measures: • Employer survey • Supervisor raring • Worker's Assessment	 Aggregate of jobs: sector or occupation Individual jobs Individual jobs

(Source: Allen and van der Velden, 2005)

Occupation title is used as a proxy for required competences because it offers relatively good measure and is considered as an advance method (Allen and van der Velden, 2005). Analogous to the assessment of acquired competences, workers are asked to assess the competence requirements in their job. We have not discussed previous tables in detail. We refer the interested readers to their original sources for more comprehensive account upon their description. Here, for the sake of brevity, we remain stuck to what is directly relevant to our case of analyses being presented in the next part of the dissertation.

As we are concerned with the reliability of (self) assessment of competences, we would like to stay resolute with this aspect. Researchers have successfully used self reports to assess competences. For instance, Eraut et al. (1998, quoted by Loo and Semeijn, 2004)) use self reports to measure how people have acquired the competences they need in their work. Another occurrence has been noticed some two years later than the work of Eraut and his

coworkers. Borghans et al. (2000, quoted by Loo and Semeijn, 2004) present the findings of a pilot study that focuses on the development of competences in a large company in the insurance industry. The study contains competence measures from a number of different perspectives. There are self-reports and expert (managers) measures that intend to measure potential competences, as well as job analysis components.

3.4. Merits in Self Assessment

In the literature upon assessment of competences, usually, following advantages are mentioned.

Cost effective: self assessment is economic in monetary sense because it does not demand too much material and equipment.

Easy to administer: it is administered very effortlessly.

Applicability: it is applicable in a range of situations. For example, it is applicable in person, through telephone interviews, and by questionnaire. And questionnaire can be distributed through regular mail, email, or via internet. There is a large choice.

Economy of time: it saves time due to its easy administration.

Large scale application: it is quite suitable to large scale application.

Quantifiably: this method provides responses that are quantifiable without difficulty

Analysability: the data, as it is easy to quantify, collected are easily analysable, too.

Direct source of information: self assessment offers a direct source of information as the individuals have access to information about themselves that outside observers may not be aware of.

3.5. Discrepancies of Self Assessment and Suggestions

Greater chance of measurement error

1. Intentional manipulation

2. Unintentional discrepancies

As a result, in practice it may sometimes become difficult to distinguish between intentional and unintentional measurement errors. This could imply that some remedies applied to reduce unintentional errors can also help reduce 'intentional' alteration. Some researchers have therefore proposed the use of self reported skill *requirements* in jobs as indicators of the actual skills of the holder of those jobs (see e.g. Green, 2004, citated by Loo and Semeijn, 2004).

At the closing stage we again refer from Allen and van der Velden (2005). They have made some good practical suggestions at the end of their paper. These are:

1. If possible use a combination of different methods.

2. Assess both the level of possessed *and* required skills.

3. Remove any characteristics that may elicit responses that are socially desirable or manipulated in other ways.

4. Provide clear anchors in the scale, by giving short descriptions that make clear what level is indicated.

5. If this is not possible look at other forms of anchoring, for example anchoring by vignette or anchoring by required level.

6. Avoid items that are composites of several underlying dimensions.

7. Make items as concrete and active as possible.

8. Make wording of questions and answer categories so that any 'legal' response looks normal.

9. As measurement errors are unavoidable, it is important to plan in advance on ways of checking for, and if possible correcting errors.

10. Finally, one needs to be aware at all times when analysing and reporting on the data what the imitations of the data are.

The gist of all this is that researchers must be careful all the times. This is the basic principal they need to know, however which is already known to them.

3.6. Conclusion

Fundamental idea behind this chapter was to present a very concise review of the (self) assessment of (acquired as well required) levels of competence. We tried our level best to remain as specific as we could do. We started this chapter with competence assessment. We confess that we made multi references of Allen and van der Velden (2005) in many places in the text just because this paper we found quite specifically addressing our interest. Loo and Semeijn (2004), and Ward et al (2002) are two other papers which we think helped us a lot in writing this chapter. Of course, like an iceberg, there is always a small part observable upon the surface whereas the large part remains out of sight. Let alone, we moved from assessment of competence to the self assessment of acquired competences and the assessment of required competences. Both of these methods are termed as the self reported assessment of competences. We have also seen that assessment of required competences serves as a proxy for the assessment of acquired competences. We mean to say that these are not very different from each other. In fact they are closely related to each other. Beside this we have mentioned the advantages and discrepancies of self assessment from the literature. Researchers have devised correcting techniques as well. This chapter ends up with some useful suggestions by Allen and van der Velden (2005).

This is also the end of Part I of the dissertation. In this part we theoretically discussed the competence. First chapter talks about the concept and definition of competence. Second chapter presents a view of international interest in competence. We tried to respond the question '*which competences are in focus over the globe?*' It was interesting to learn that competences of international significance were found comparably present in a data set to which we had got accessed for further analyses.

Part II of the dissertation articulates about the question of reliability of (self) assessment of competence. Like preceding part, this part also constitutes three chapters. Chapter 4 responds to the reliability of self assessment of acquired competences. In this chapter we tried to answer the question '*to what extent is the self assessment of acquired competences by the higher education graduates reliable?*' Next chapter replies to a similar question. The question is '*to what extent is the assessment of required competences by the young knowledge workers in labour market reliable?*' The last chapter comes back with same question. This chapter presents a new interpretation of already existing phenomenon for its own purpose; and the purpose is what we have tried to address in the foregoing chapters.

PART II

RELIABILITY OF COMPETENCE ASSESSMENT

(Econometric Analyses)

How reliability of assessment of competence could be explored? How could this assessment be statistically proved reliable? Or, at least, how could it be acceptable to be relied upon? To what extent it is, if it is, reliable? These are the questions we intend to respond in this part of the dissertation.

Part II deals with the statistical analyses of the data. This part contains three chapters. Chapter 4 deals with the reliability of self assessment of acquired competences. Chapter 5 deals with the reliability of assessment of required competences. Chapter 6 also deals with the reliability of competence assessment but with a different perspective. In this chapter we have made use of competence-earning relationship to study self assessment of acquired competences as well as assessment of required competences. In addition, we have also tried to study in chapter 6 the net competence level which we obtained through subtracting required competence levels by acquired competence levels.

Next two chapters highly resemble in the use of methodology. We are treating the data under a common conceptual framework for these two chapters. Obviously, both the chapters differ in their variables and surely, the research questions. We think it logical to mention the conceptual framework here in order to avoid the probable repetition in the course of chapters. In addition, before the chapters get going, it is relevant to explain the source of data (i.e. Reflex project) and the composition of the instrument used for the collection of data.

Birds of a Feather Flock Together

Similarity in characteristics provides strong basis for grouping. Plants in *Botany* and animals in *Zoology* are classified on the basis of similarities in their characteristics. "*Birds of a feather flock together*" is a famous English proverb. Examples could also be multiplied from other disciplines of both scientific as well as literary disposition. There is a notion that similar characteristics draw different individuals to get together to form a group. Characteristics could either be innate or acquired one. Innate ones are attributed as *nature* whereas those acquired ones are termed as *experiences*. Having same (or similar) *experience* is next to having same (or similar) *nature*. We observe both of two, sometimes concurrently and sometimes separately, be operative in various taxonomies. Business firms, professional groups, entrepreneurial networks, and even mafia, are the examples of this (fabricated and/or) autonomic phenomenon. It is all agreed upon that individuals of one group behave, more or less, similarly. Their behaviour, most of the times, is independent of how their fellow group members respond. That is why the (independent) response of one individual, under strict conditions, may be generalised up to whole group. Or, safely speaking, a representative sample of a group may reveal the secrets of the whole group.

Two things have been established so far. Firstly, groups are defined to take in individuals of same, or similar, characteristics (*nature* and/or *experience*). Secondly, their response, independent of their fellow individuals, could tell the story of whole group. In other words, what they tell about themselves could be reliable enough to know about the group which they belong to. In addition to this, if there independent responses are, coherently and consistently, proved similar (if not same), then apparently there is no reason for not to rely upon them. In other words, if independent responses of the individuals of same group are proved to be

similar, then the reliability of their responses, however, to some extent, is proved. Such a criterion could help to prove the reliability of (self) assessment of graduates' competences.

In our data set we have the information provided by the graduates about themselves. Data set could be questionable. We can't overlook the chances of biased (self) assessment. One straight forward response to this is that the respondents are qualified enough with a reasonable exposure to the world of work; moreover, there is no harm to them, apparently–neither academic nor professional–whatever their responses may be. Although, there are some other ways to gather such kind of information, however, the graduates themselves are the most reliable and powerful source of information, we think, for such type of studies. Such objections are further reduced when researchers rationalise their methods and techniques; and try to reduce the bias, objectively. For example, besides asking about their acquired level of competence respondents are asked about their corresponding required level in the labour market; and bias is further reduced if they are questioned about their study programmes characterised with certain set of competences. The responsibility still rests on the shoulders of the researcher that he should manage for these issues while statistically analysing the data, so that the final outcome could be of improved reliability.

Falsifiability Criterion of Popper

We are persuaded to put Popper's characteristic criterion of falsifiability to our present situation. Rationally, it is useful to accept a (well-tested) theory as true until it is falsified because well-tested theories could also be questioned. "No matter how many times the results of experiments agree with some theory, you can never be sure that the next time the result will not contradict the theory", (Hawking, 1988). According to Karl Popper, a theory is scientific

only in so far as it is falsifiable, and should be given up as soon as it is falsified. “The theories are passed on, not as dogmas, but rather with the challenge to discuss them and improve upon them”, says Popper (1963). In our situation, judiciously, it is pragmatic to accept the reliability of self assessment if at least something contradictory does not come out of our analyses. It should be acceptable, in Popperian terms, until it is falsified. In addition to this, the falsifiability of a theory lends her scientific elevation.

Introduction of the Data Source – Reflex Project

We are thankful to Reflex team who provided us the data. Reflex was a research project focused on three broad and interrelated questions:

1. Which competencies are required by higher education graduates in order to function adequately in the knowledge society?

2. What role is played by higher education institutions in helping graduates to develop these competencies?

3. What tensions arise as graduates, higher education institutions, employers and other key players each strive to meet their own objectives, and how can these tensions be resolved?

The REFLEX (The Flexible Professional in the Knowledge Society: New Demands on Higher Education in Europe) project is financed as a Specific Targeted Research Project (STREP) of the European Union’s Sixth Framework Programme. The project involves partners from fifteen countries (Austria, Finland, France, Germany, Italy, the Netherlands, Norway,

Spain and the UK plus Belgium-Flanders, Czech Republic, Portugal, Switzerland, Japan and Estonia that have received funding from national sources).

Reflex which ended in 2006 was a subsequent research study carried out after CHEERS (Careers After Higher Education - a European Research Study) in 1999. CHEERS was conducted from autumn 1998 to spring 2000, about 3,000 graduates each from 9 countries in the European Region, one EFTA country (Norway), one of the Central and Eastern European countries in transition (the Czech Republic) and one economically advanced country outside Europe (Japan) provided information through a written questionnaire on the relationship between higher education and employment four years after graduation (for more details see http://www.uni-kassel.de/incher/cheers/index.ghk). Another Reflex's antecedent study was CATEWE (A Comparative Analysis of Transitions from Education to Work in Europe) is funded by the European Commission under the Targeted Socio-Economic Research (TSER) programme for the period December 1997-December 2000. Participants were from Ireland, Scotland, Germany, the Netherlands, France, Belgium, Portugal, and Sweden. We find following two studies subsequent to Reflex. These studies have used most of the methodology as well as the questionnaire of Reflex project.

1. Proflex: Flexible Professional in the Knowledge Society: New Demands on Higher education in Latin America (www.encuesta-proflex.org).

2. Hegesco: Higher Education as a Generator of Strategic Competences (www.hegesco.org). The following countries were involved in the study: Austria, Belgium (Flanders), Czech Republic, Estonia, Finland, France, Germany, Italy, Japan, the Netherlands, Norway, Spain, Sweden, Switzerland and the United Kingdom.

After having got an eye bird view of Reflex project and its importance in its contribution to research, we come to have very brief description of the questionnaire used in this project.

Reflex Master Questionnaire

Reflex Master Questionnaire was an extensive questionnaire comprising eleven parts. It collected information from the graduates concerning their higher education, transition from study to work, and their employment. Most of the questions in this questionnaire are composite in nature and hence includes comprehensive information. Let us have a short review of the questionnaire. Original questionnaire is given in the *Appendix C* for a quick reference to the readers.

A. Study programme you graduated from in 1999/2000

This part asks information about gradates' study programme. Graduates are required to mention the most important study programme, if they have completed successfully more than one study programmes. It contains ten questions (A1 to A10).

B. Other educational and related experiences

This part enquires about the experiences graduates have got during their higher education. It includes all experiences whether related or unrelated to their field of education. Unrelated experiences may reveal how active and multidimensional they have been during their higher education. This could be considered as a merit rather than a demerit of their academic life. It comprises seven questions (B1 to B7).

C. Transition from study to work

In this part graduates are asked over their transition into the world of work. How they searched their job? When they started searching a job? When and how they did get it? What was the nature and type of job? These are the examples of questions asked in this part. Five questions (C1 to C5) are asked in this part.

D. First job after graduation

This part is concerned with graduates' first job. The graduates have been asked to give the details of their first job (during and after their graduation) including self employment and trainee jobs but excluding the job less than six months soon after graduation. This part also collects information about earnings, contract hours, and the demands of job like education, initial training, etc. etc. It consists of thirteen questions (D1 to D13).

E. Employment history and current situation

This part contains the questions over employment history and current situation of the graduates. For example, how many jobs they have changed? How long and how many times have they been unemployed? It consists of seven questions (E1 to E7).

F. Current work

This part is related with the questions about current situation of the graduates like job title, earnings, working hours etc. This part, like previous, also collects information

about earnings, contract hours, and the demands of job like education, training, etc. It consists of fifteen questions (F1 to F15).

G. Work organisation

The questions about graduates' work organisation construct this part. If they are self employed, these questions apply to themselves or the organization they run. It accommodates 21 questions (G1 to G21).

H. Competencies

This is the most important part of the questionnaire as present study is mainly based on this question. Graduates have been questioned about their acquired level of competences (they had got during higher education) and the required level of competences in their work. They are provided with a list of 19 competences to be rated on a ranking scale of seven from *very low* to *very high*. They have been asked as well to rate the three weak and the three strong competences of their study programme. Only two questions (H1 to H2) have been asked in this part.

I. Evaluation of study programme

This part is all about study programme and contains only two questions (I1 to I2). In fact, this is to know about the worth and importance of the study programme to the graduates.

J. Values and orientations

This part asks to indicate how important the job characteristics are to them personally, and to what extent they actually apply to their current work situation. It has only one question (J1).

K. About yourself

This part contains personal information of the graduates. For example, gender, age, connubial status, living place, work place, parents' and partner's education and date of completion of the questionnaire. We see 12 questions (K1 to K12) in this part.

Graduates have also been asked to give their remarks and/or suggestions. They are required to mention their email address if they would like to receive a summary of the results. For a probable replication of the same study in future they are asked to provide their name and current address. There is no doubt that anonymity has been promised all through this survey.

Next chapter deals with the reliability of self assessment of acquired competences by the higher education graduates. Chapter 5 addresses to the reliability of assessment of required competences in the labour market by the young knowledge workers. The last chapter also concentrate on the reliability of competence assessment but from a different perspective. Sufficiently studied competence-earning relationship provides rationale to investigate the self assessment of acquired competences as well as the assessment of required competences. In addition, we have also tried to study in this chapter the net competence level which we obtained through subtracting required competence levels by acquired competence levels. This chapter, we hope, will be presenting a new portrait of the story.

CHAPTER 4

RELIABILITY OF SELF ASSESSMENT OF ACQUIRED COMPETENCES BY THE HIGHER EDUCATION GRADUATES

Reliability of Self Assessment of Acquired Competences by the Higher Education Graduates

SUMMARY

Our main concern in this chapter is to study the reliability of self assessment of higher education graduates' competences, because self assessment is often questioned for its subjectivity; our research answers in particular 'to what extent self assessment of graduates' competences is reliable, if reliability does exist therein'. We used the data set of Reflex project which was carried out under the 6th framework programme of European Union. We employed ordered probit, OLS regression, parametric and nonparametric analyses of variance with the help of SPSS and Stata. Making use of some objective information along with the subjective one we found nothing contradictory to our reliability hypothesis. We employed the parameters of coherence and consistency to our findings in order to draw conclusions. We feel confident to say that graduates' self assessment of competences is found to be, in Popperian terms, reliable to a modest extent. The fact that the respondents knew, at the time of survey, that they will not be harmed, could be regarded as a limitation to this study. We have explored in this chapter only the acquired level of competences. However, we suggest analysing assessment of required competence level of young knowledge workers in the labour market employing the same methodology (to the permissible extent) in order to delineate a comparative description; and this is what provides substance for Chapter 6.

4.1. Introduction

In this chapter, we are concerned with the reliability of self assessment of acquired competences by the higher education graduates – referred to as graduates from here onward. Various objections have been raised on self assessment method. For example, individuals may have assessed themselves either optimistically or otherwise. Various intrinsic as well as extrinsic factors could be involved, like, personal bias, self expectation effect, observer effect, peer effect, sense of institutional prestige, realisation of social and/or cultural pride, socioeconomic situation. Efforts have been made continuously to respond to the objections raised upon self assessment, for example, Reflex Working Paper 2 (Allen and van der Velden, 2005). Previous chapter (Chapter 3) offers a short review in this regard.

Although self assessment has its drawbacks, the method is popular and widely used. Eraut (1998) described how people have self assessed their acquired competences they need in their work. This method offers a convenient way of quickly obtaining a large amount of usable data. Graduates know about themselves what an outside observer may not be aware of. Self assessment provides only an indirect measure of competence. It is clear that even in the most favourable case self assessments paint a less than perfect picture. In fact, no method of measuring competences is without its flaws; merits of self assessment have almost certainly outweighed its demerits.

Although, previous chapter holds a detailed discourse on various measurement methods where we have discussed the issue of self assessment of competences in qualitative sense of terms, yet, it lacks (however, not necessarily) quantitative justification. This is all about which produces the substance to construct this chapter of the dissertation. We try to address the issue

of self assessment of acquired competence by the graduates rather quantitatively in this chapter. Our main purpose here is to address the reliability of self assessment of competence by the *graduates*. The research question is formulated as under.

To what extant is graduates' self assessment of acquired competence reliable?

4.2. Data Set

We are using the data set of Reflex project. This research project was funded by the European Union under the 6th framework programme and several national funds. This project is coordinated by the *Research Centre for Education and the Labour Market* at Maastricht University, the Netherlands. The flexible professional in the knowledge society: new demands on higher education in Europe (see http://www.reflexproject.org). From autumn 1998 to 2000, about 40,000 graduates in total from fifteen countries (Austria, Belgium, Czech Republic, Estonia, Finland, France, Germany, Italy, Japan, the Netherlands, Norway, Portugal, Spain, Switzerland and the United Kingdom) provided through a written questionnaire on the relationship between higher education and employment three to four years after graduation. At the time of survey in 2005 Graduates were already playing their role actively in the labour market.

4.3. Selecting the Variables

First step in this endeavour is to identify the groups (and/or subcategories) present in the Reflex data set. More precisely speaking, it is to find some common characteristics (*nature* and/or *experience*) in order to assign the graduates to certain groups. The *experience* based

upon their academic background, we think, could be a reasonable criterion to categorise the graduates. We identify three variables directly related to this criterion of *experience*.

These variables are:

1. Field of Education
2. Sublevel of Study Programme
3. Demanding Level of Study Programme

These three variables provide us graduates' categorisation criteria. Field of Education and Training is a group with nine subcategories, Sublevel of Study Programme with two subcategories and Demanding Level of Study Programme with four subcategories. The detail we will discuss in the ensuing paragraphs. We also include *gender* and *country* as control variables in this list.

The variable of main focus is *competence* which is considered as dependent variable. There are 19 competences in the Reflex data set. We have selected 12 competences for our analyses. Graduates were asked to rate their competence level on a rating scale of seven. Next step is to describe all these variables.

4.4. Description of the Variables of Interest

Acquired level of competences as a variable is our major concern in this chapter. This variable has been recorded on a 7-point rating scale ranging from very low (represented by 1) to very high (represented by 7). It is discrete and ordinal. Graduates were inquired to rate their

level of competences what they had acquired at the time of their graduation. It is pertinent to mention that they were inquired a few years after their graduation. This delayed enquiry may have some serious consequences in a sincere effort to know about their real acquired level.

It would be interesting to compare this analyses with that of the required level of competences. We intend to investigate this in the next chapter. We are expecting something remarkable out of this comparison.

Since the selected subset-I (being described in the coming pages) comprising 12 competences showed the declared or believed acquired level of the graduates' competences at the time of their graduation, hence one should believe that these competences may have profound impacts of what the graduates had been studying during the preceding years at universities (or HEIs).

The role of higher education has been viewed as either to impart or to filter the competences. Arrow (1973) was the chief proponent of filter or screening hypothesis. Garcia-Aracil et al (2004) kept the idea of generation (and/or promotion) of the competences through higher education system (see also: Belfield, Bullock and Fielding, 1999; Dolton and Makepeace, 1990; Leckey and Mcguiga, 1997; Pike, 1995). Higher education is confronted with increasing demand of generic competences (Meng, 2005). This is the pretext which makes us believe in the impacts of higher education on the level of acquisition of competences.

4.4.1 Field of Education

The variables, mentioned above, are characteristic to higher education. Field of Education, as a variable, is present in three successive elaborations, namely, *broad* fields, *narrow* fields and *detailed* fields, in our data set. We chose *broad* fields.

This variable has nine subcategories as described in the following.

i. General (Basic/Broad, General Programmes, Literacy and Numeracy)

ii. Education (Teacher Training and Education Science)

iii. Humanities (Religion, Theology, Languages, Cultures, and Fine Arts)

iv. Social (Social Sciences, Business and Law)

v. Science (Physical Sciences, Mathematics, and Computing)

vi. Engineering (Engineering, Manufacturing and Construction)

vii. Agriculture (Agriculture and Veterinary)

viii. Health (Health and Welfare)

ix. Services (Transport Services, Security Services, Environmental Protection)

This variable and the sublevel of study programme are based on the responses of following question. We present here the excerpt from the Reflex Master Questionnaire (see the Annex C).

A1	What was the name of the study programme?	Study Programme *(e.g. Economics, civil engineering)*: ..... Major or specialisation: .....
	What was the type of qualification?	Bachelors *(please specify, BA, BSc Hons)* ..... Masters *(please specify, BA, BSc Hons)* ..... Others *(please specify)* .....

4.4.2 Sublevel of Study Programme

Sublevel of Study Programme has two subcategories.

i. ISCED 5A long programme providing direct access to doctorate
ii. ISCED 5A long programme not providing direct access to doctorate

4.4.3 Demanding Level of Study Programme

Demanding Level of Study Programme is a discrete and ordinal variable with five levels on the rating scale (from not at all to a very high extent). Following is the excerpt from the Reflex Master Questionnaire. Graduates' responses in this part are again adding to the subjectivity.

A6 To what extent did the following description apply to your study programme?

	not at all	1	2	3	4	5	to a very high extent
The programme was generally regarded as demanding		☐	☐	☐	☐	☐	
Employers are familiar with the content of the programme		☐	☐	☐	☐	☐	
There was freedom in composing your own programme		☐	☐	☐	☐	☐	
The programme had a broad focus		☐	☐	☐	☐	☐	
The programme was vocationally oriented		☐	☐	☐	☐	☐	
The programme was academically prestigious		☐	☐	☐	☐	☐	

4.4.4 Generic Competences

In section H1 of Reflex Master Questionnaire, graduates were to rate their competences. Section H2 (questionnaire) asked three strong and weak competences of the study programmes they had graduated in. An excerpt from the questionnaire is given below. This contains two sections namely H1 and H2.

H1 **Below is a list of competencies. Please provide the following information:**

. How do you rate your own level of competence?

. What is the required level of competence in your current work?

If you are not currently employed, only fill in column A

		A Own level							**B Required level in current work**						
		Very low						very high	Very low						very high
		1	2	3	4	5	6	7	1	2	3	4	5	6	7
A	Mastery of your own field or discipline	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
B	Knowledge of other fields or disciplines	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
C	Analytical thinking	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
D	Ability to rapidly acquire new knowledge	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
e	Ability to negotiate effectively	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
f	Ability to perform well under pressure	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
g	Alertness to new opportunities	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
h	Ability to coordinate activities	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
i	Ability to use time efficiently	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
j	Ability to work productively with others	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
k	Ability to mobilize the capacities of others	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
l	Ability to make your meaning clear to others	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
m	Ability to assert your authority	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
n	Ability to use computers and the internet	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
o	Ability to come up with new ideas and solutions	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
p	Willingness to question your own and others' ideas	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
q	Ability to present products, ideas or reports to an audience	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
r	Ability to write reports, memos or documents	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
s	Ability to write and speak in a foreign language	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

H2 **Name a maximum of 3 competencies from the list above that you regard as *strong* points and a maximum of three competencies that you regard as *weak* points of your study programme.**

- fill in letters corresponding to the relevant competencies

Strong points: 1 |___| 2 |___| 3 |___|

Weak points: 1 |___| 2 |___| 3 |___|

4.4.5 Gender

Following is the question about gender in the Reflex Master questionnaire.

K1	Gender	☐ male ☐ female

4.4.6 Country

We have graduates from 15 countries in the data set we are using here. Next section describes the basic statistics concerning these variables.

4.5. Basic Statistics

The variable "Field of Education" contains nine subcategories. We have excluded the subcategory 'general programme' for its very low frequency. 'Demanding Level of Study Programme' was initially on five point rating scale; we excluded the observations with the response 'not at all' thus leaving only four sublevels with us. The variable "Sublevel of Study Programme" contains two main streams. International Standard Classification on Education (ISCED) has been followed for this variable. One is 5A long programme providing direct access to doctorate. Second is 5A long programme not providing direct access to doctorate. Both "Sublevel Study Programme" and "Field of Education" reveal the facts about the academic training of a graduate. Whereas the third variable "Demanding Level of Study Programme" is relevant to their actual need while they are confronting in the labour market. Total number of valid observations for each variable mentioned here are around twenty seven thousand and half.

Table 27 includes number of observations and corresponding percentages of above explained variables. About twenty seven thousand and half graduates participated from 15 countries. Behold, these numbers are showing only the valid cases. We have excluded not responded and irrelevant observations.

Table 28: Percentage participation for variables of interest

S. No.	Variable	*n*	Percentage
	Country		
1.	Austria	1127	4.07
2.	Belgium	1040	3.76
3.	Czech Republic	4555	16.46
4.	Estonia	686	2.48
5.	Finland	1774	6.41
6.	France	1027	3.71
7.	Germany	1191	4.30
8.	Italy	1345	4.86
9.	Japan	1731	6.26
10.	Netherlands	2355	8.51
11.	Norway	1648	5.96
12.	Portugal	487	1.76
13.	Spain	2707	9.78
14.	Switzerland	4882	17.64
15.	United Kingdom	1115	4.03
	Total	**27670**	**100**
	Field of Education		
1.	Education	2694	9.74
2.	Humanities	2981	10.77
3.	Social	8625	31.17
4.	Science	2808	10.15
5.	Engineering	5209	18.83
6.	Agriculture	844	3.05
7.	Health	3902	14.10
8.	Services	607	2.19
	Total	**27670**	**100**
	Demanding Level of Study Programme		
1.	Very Lowly Demanding	3086	11.17
2.	Lowly Demanding	9512	34.44
3.	Highly demanding	10751	38.93
4.	Very Highly demanding	4268	15.45
	Total	**27617**	**100**
	Sublevel of Study Programme		
1.	Direct access to PhD	16007	57.85
2.	No direct access to PhD	11663	42.15
	Total	**27670**	**100**
	Gender		
1.	Male	12365	44.90
2.	Female	15175	55.10
	Total	**27540**	**100**

Next table holds mean values and standard deviations along with the number of observations. We see mean value more than three for "Demanding Level of Study Programme" which indicates that the study programmes (of higher education) are generally demanded. Other statistics are in the table below.

Table 29: Basic statistics for variables of interest

S. No.	Variable	n	$\bar{x}$	σ
1.	Country	27670	8.663	4.780
2.	Field of Education	27670	3.941	1.883
3.	Demanding Level of Study Programme	27617	3.587	0.880
4.	Sublevel of Study Programme	27670	2.422	0.494
5.	Gender	27540	1.551	0.497

On the bases of graduates' responses we calculated the mean values of competences for whole data. This table keeps mean values of all nineteen competences in descending order.

Table 30: Acquired level of competences (basic statistics)

S. No.	COMPETENCES (rearranged in descending $\bar{x}$ values)	n	$\bar{x}$	σ
1.	**Ability to use computers and the internet**	**26221**	**5.861**	**1.175**
2.	**Ability to rapidly acquire new knowledge**	**26226**	**5.652**	**1.064**
3.	**Ability to work productively with others**	**26220**	**5.601**	**1.095**
4.	**Ability to coordinate activities**	**26221**	**5.458**	**1.176**
5.	**Ability to perform well under pressure**	**26226**	**5.424**	**1.240**
6.	**Ability to write reports, memos or documents**	**26216**	**5.401**	**1.264**
7.	**Willingness to question your own and others' ideas**	**26218**	**5.390**	**1.161**
8.	**Ability to use time efficiently**	**26221**	**5.374**	**1.192**
9.	**Analytical thinking**	**26223**	**5.346**	**1.198**
10.	**Ability to make your meaning clear to others**	**26214**	**5.331**	**1.149**
11.	**Ability to come up with new ideas and solutions**	**26212**	**5.319**	**1.149**
12.	**Mastery of your own field or discipline**	**26236**	**5.302**	**1.063**
13.	Alertness to new opportunities	26196	4.894	1.309
14.	Ability to mobilize the capacities of others	26213	4.833	1.274
15.	Ability to present products, ideas or reports to an audience	26210	4.831	1.468
16.	Ability to negotiate effectively	26223	4.647	1.429
17.	Ability to assert your authority	26220	4.626	1.358
18.	Knowledge of other fields or disciplines	26220	4.470	1.172
19.	Ability to write and speak in a foreign language	26226	4.416	1.848

We observe a cut point of five in the means' order in this table which is dividing the whole set of 19 competences into two subsets. One subset has its means more than the cut point and the other less than the cut point of five. We select first 12 competences with their mean values above the cut point and name this as Subset-I. The other one is named as the Subset-II. We

will be using the subset-I for further analyses. The graduates have shown higher acquired levels of competences. This might be an indication that they have optimistically self assessed their competences. If true, this is what usually be expected. However we cannot infer any valid conclusion at this stage. This is what we are going to study in this chapter as well as in the ensuing chapters.

4.6. Research Hypothesis

The null hypothesis states that there is no statistically significant difference of acquired competence level among the graduates of different subcategories and that all the graduates within their respective subcategories, are similar to one another in their acquired levels of competences. Null hypothesis is given here.

> *H_0: Graduates of different subcategories do not differ in their self assessment of acquired competence level*

Whereas the alternative hypothesis states that

> *H_A: Graduates of different subcategories do differ in their self assessment of acquired competence level*

We assume that the graduates are homogeneously distributed within their respective subcategories. All the graduates of a subcategory (e.g. Health Sciences) have similar academic experience. We expect that the graduates of the same subcategory will also reflect homogeneity in their acquired competence level. In other words, similarity in academic experience corresponds to similarity in acquired competence level. If this coherence in their academic experience and their acquired competence level is consistently reflected in their self

assessment of the acquired competence levels, then on the bases of this mutual coherence as well as internal consistency it could be stated that their self assessment is reliable.

4.7. Methodology

Methodology is like a blueprint of a construction structure. Whole structure is constructed virtually in the mind of researcher before it comes to enactment. Beauty of the final outcome depends upon how sophisticatedly the methodology has been built. Of course, this is not an easy go. Let us see how successful we have proved ourselves in doing so.

Difference in academic experience may lead to the development of a distinct subset of competences with relatively homogenous level of acquisition. We identified three variables characteristic to the academic experience of graduates. The details of these variables will be presented later in the following paragraphs. As an example, Economics graduates should have acquired a distinct subset of competences with relatively homogenous level of acquisition and this group of graduates must differ with Health graduates in this regard. We put our analyses to Popperian criterion of falsifiability. Mutual coherence and internal consistency are two parameters we will be relying on throughout our analyses in the dissertation.

We are going to analyse statistically the independent responses of graduates' self assessment of acquired competences. By virtue of logic it is (pre)supposed that the graduates are homogeneous within their respective subcategories on the basis of certain criteria, i.e. *academic experience*. Each subcategory comprises graduates with similar *academic experience*. Thus the subcategory is, logically, supposed to be homogeneous regarding this similarity in *academic experience*. Similar *academic experience* may ensure similar acquired competences. There is coherence between *academic experience* and acquired competence.

We are, in fact, interested in knowing to what extent self assessment of acquired competences is reliable. These homogeneous graduates (on the basis of similarity in *academic experience*) are, conceptually, expected to have acquired similar level of competences. In other words, these predefined subcategories, which are homogeneous in *experience*, should have acquired the same set of competences and the same level of acquisition for each individual competence; they should also be homogenous in the acquisition of competences. In a nutshell, graduates, homogeneous in *academic experience*, should be homogeneous in their acquired competences. If this homogeneity in competence acquisition is observed in their self assessment, we can say that the graduates have judiciously assessed their acquired (level of) competences. On the basis of their coherence in theory and consistence in practice, responses one may say that the self assessment is reliable.

We have developed a two stage methodology. We would like to describe the variables and their selection just after methodology before giving their basic statics. At first instance, we run ordered probit and OLS regression at the same time in order to have another look at the coefficient estimates of competences for both. We understand that ordered probit is the suitable method in present case as our dependent variable i.e. acquired competences levels, is in ordinal and discrete in nature. But this does not speak about the explained variances in the independent variables. For this purpose we use OLS regression, however, this technique is not suitable to the type of variable we are going to deal with. We made a comparison of coefficient estimates of the ordered probit and OLS regression. It reflects surprising similarity in its degrees of significance. For the sake of increased lucidity we have defined four levels of significance. These are excellent, good, fair, and marginal.

This similarity encourages us to proceed to ANOVA, in second phase, in order to see the explained variances of dependent variable by the independent variables. As we know that ANOVA is not a suitable technique in present case, we prefer to calculate Kruskal-Wallis test which is a non parametric counterpart of ANOVA. It is recommended to use this test in lieu of ANOVA when normality condition is not met and when the dependent variable is ordinal. Stata and SPSS have been used during the statistical analyses of the data.

4.8. Choice of Model

We recall that graduates' own level (what they had acquired at the time of their graduation) of the competences had been recorded on a rating scale of seven. This variable is thus ordinal in nature. When the responses are clearly ordered, as a matter of fact, the variable (acquired level of competences) is both discrete and ordinal. Higher values of graduates' responses are associated with the greater level of acquisition of respective competences. However, this ordinal nature of graduates' competence response has no implication for differences in the strength of their responses; that is to say that the response associated with 2 on this rating scale is not twice as strong as that associated with 1. The response 2 shows higher acquired level than 1, but we don't know to which degree it is higher. Furthermore, the difference of 1 to 2 is not comparable to the difference of any other two intervals on the scale, say 2 to 3 or 6 to 7. In fact, the numbers are only a ranking and have no cardinal significance in ordered (dependent) variable.

Linear regression takes the cardinal significance of (these) numbers into account and treats the difference between a 1 and a 2 at par to the difference between a 2 and a 3 (or between a 6 and a 7). *On the other hand, to estimate an econometric relation with an ordinal dependant*

variable using the methods of multinomial logit (Borooah, 2001) *would mean that the information conveyed by the ordered nature of the data was being discarded*. However, multinomial logit is recommended when the critical slop assumption (a critical assumption for ordered probit and ordered logit) is not met.

The variable "own or acquired level of competence" is clearly ordered and discrete. The best and most commonly used method is ordered probit (as well as ordered logit) when it is certain that the variable is both ordered and discrete. In this case we think that ordered probit (or ordered logit) is the most appropriate method for estimating the model we are going to construct in the ensuing paragraphs. Ordered logit differs from ordered probit in the (assumed) distribution of the error term. If the error term is assumed to be distributed logistically then the resulting model is called logistic model; and if it is assumed to be normally distributed, the resulting model is known as ordered probit model. According to Greene (2000), "*it is difficult to justify the choice of one distribution over the other on theoretical grounds ... in most applications, it seems not to make much difference*" (p. 815). We prefer to use ordered probit for its normal distribution.

We run ordered probit and OLS regression with same set of variables. In fact, we are interested in the explained variance of dependent variable by the independent variables. Unfortunately, the suitable estimation model, i.e. ordered probit model, is mute to tell us the required information. Juxtaposition of outputs of the two, we think, may better help us to decide which direction we should move in. We find surprising similarity between the outputs of ordered probit and OLS regression. We are least concerned with the interpretation of the coefficient estimates of the later model; however, a resemblance of highest degree regarding the levels of significance (of coefficient estimates of the two models) is remarkable.

Logically, it permits us to rely upon the output given by OLS regression as well, which is not advised to rely upon under usual circumstances with a set of variables we are dealing with. Hence, the specificity of our case is proved and established statistically. This finding encourages us to advance in the direction of calculating variance analyses; and, apparently, there is no harm at all in doing so. Some deeper insight is required to compare coefficient estimates of OLS and oprobit regressions. This is not our main concern here. This could be of interest for statisticians and econometricians. Any contribution in this regard will be appreciated highly and could be valuable, we think. We leave this for other adventurous researchers for the moment.

Our variable of interest is *competence*. We have selected earlier a set of 12 competences on the basis of graduates' responses recorded on a rating scale of seven (1 to 7) i.e. from very low to very high. Further selection is made for those responses in which the graduates have declared these competences as the strong points of their study programme. We take *competence* as a dependant variable whereas Country, Field of Education, Sublevel of study programme, Demanding Level of Study Programme and Gender are independent variables. Now we proceed towards the development of econometric model.

We have N graduates (indexed $i = 1, ..., N$) and each graduate's "degree of competence" may be represented by the value of a variable C_{pi} (where subscript $p = 1, ..., 12$ represents a competence in a set of 12), such that higher values of C_{pi} represent higher degrees of competence. The value assumed by this index for a particular person depends upon a variety of factors pertaining to that person. We are going to see the effect of three factors (mentioned above) along with country and gender as control variables. We suppose that C_{pi} is a linear

function of these five factors (determining variables) whose values for graduate *i* are X_{ik}, k=1, ... ,5. We can formulate this as

$$C_{pi} = \sum_{k=1}^{5} \beta_k X_{ik} + \varepsilon_i = Z_i + \varepsilon_i \qquad (4.1)$$

Where β_k is the coefficient associated with k^{th} variable (k = 1, ..., 5) and $Z_i = \sum_{k=1}^{5} \beta_k X_{ik}$. An increase in the value of the k^{th} factor for a particular graduate will his competence index to rise if $\beta_k > 0$ and fall if $\beta_k < 0$. The error term is included to represent all the relevant factors left out of the equation and/or inaccurate measurements. The competence index C_{pi} is a *latent variable*, which is difficult, if not impossible, to observe. The Equation 1.1 is a *latent regression*, which as it stands cannot be estimated. However what can be observed is graduates' competence level and a variable Y_i can be associated with these competence levels. A seven point rating scale has been used to record these levels. Variable Y_i is an ordinal and discrete one, as we have discussed before. The categorisation of the graduates in the sample in terms of these competence levels is *implicitly* based upon the values of the latent variable Y_i, in conjunction with "threshold" values δ_l (where l = 1, …, 6), such that

$$\begin{aligned}
&Y_i = 1, \text{ if } C_{pi} \le \delta_1 \\
&Y_i = 2, \text{ if } \delta_1 \le C_{pi} \le \delta_2 \\
&Y_i = 3, \text{ if } \delta_2 \le C_{pi} \le \delta_3 \\
&Y_i = 4, \text{ if } \delta_3 \le C_{pi} \le \delta_4 \\
&Y_i = 5, \text{ if } \delta_4 \le C_{pi} \le \delta_5 \\
&Y_i = 6, \text{ if } \delta_5 \le C_{pi} \le \delta_6 \\
&Y_i = 7, \text{ if } C_{pi} \ge \delta_6
\end{aligned} \qquad (4.2)$$

The threshold values $\delta_l > 0$ of Equation 1.2 are unknown parameters to be estimated along with β_k of Equation of 1.1. A graduate's classification in terms of competence level depends

upon whether or not his competence index, C_{pi}, crosses a threshold. The probabilities of *Yi* taking values 1, 2, ..., 7 are given by

$$
\begin{aligned}
&P_r(Y_i=1)=P_r(C_{pi}\le\delta_1)=P_r(Z_i+\varepsilon_i\le\delta_1)=P_r(\varepsilon_i\le\delta_1-Z_i)\\
&P_r(Y_i=2)=P_r(\delta_1\le C_{pi}\le\delta_2)=P_r(\delta_1\le Z_i+\varepsilon_i\le\delta_2)=P_r(\delta_1-Z_i\le\varepsilon_i\le\delta_2-Z_i)\\
&P_r(Y_i=3)=P_r(\delta_2\le C_{pi}\le\delta_3)=P_r(\delta_2\le Z_i+\varepsilon_i\le\delta_3)=P_r(\delta_2-Z_i\le\varepsilon_i\le\delta_3-Z_i)\\
&P_r(Y_i=4)=P_r(\delta_3\le C_{pi}\le\delta_4)=P_r(\delta_3\le Z_i+\varepsilon_i\le\delta_4)=P_r(\delta_3-Z_i\le\varepsilon_i\le\delta_4-Z_i)\\
&P_r(Y_i=5)=P_r(\delta_4\le C_{pi}\le\delta_5)=P_r(\delta_4\le Z_i+\varepsilon_i\le\delta_5)=P_r(\delta_4-Z_i\le\varepsilon_i\le\delta_5-Z_i)\\
&P_r(Y_i=6)=P_r(\delta_5\le C_{pi}\le\delta_6)=P_r(\delta_5\le Z_i+\varepsilon_i\le\delta_6)=P_r(\delta_5-Z_i\le\varepsilon_i\le\delta_6-Z_i)\\
&P_r(Y_i=7)=P_r(C_{pi}\ge\delta_6)=P_r(Z_i+\varepsilon_i\ge\delta_6)=P_r(\varepsilon_i\ge\delta_6-Z_i)
\end{aligned}
\qquad (4.3)
$$

Each of the N observations is treated as a single draw for a multinomial distribution, and in this case the multinomial distribution has seven outcomes, from *very low* to *very high*. Thence we suppose from N_1 for *very low* to N_7 for *very high* (i. e. $N = N_1 + N_2 + N_3 + N_4 + N_5 + N_6 + N_7$). Then the likelihood of observing the sample, which is simply the product of the probability of the individual observation, is

$$
\begin{aligned}
L&=\left[P_r(Y_i=t)\right]^{N_t}\qquad\therefore\ t=1,2,...,7\\
&=\left[P_r(Y_i=1)\right]^{N_1}\left[P_r(Y_i=2)\right]^{N_2}\left[P_r(Y_i=3)\right]^{N_3}\\
&\quad\left[P_r(Y_i=4)\right]^{N_4}\left[P_r(Y_i=5)\right]^{N_5}\left[P_r(Y_i=6)\right]^{N_6}\left[P_r(Y_i=7)\right]^{N_7}\\
&=\left[F(\delta_1-Z_i)\right]^{N_1}\left[F\{(\delta_2-Z_i)-(\delta_1-Z_i)\}\right]^{N_2}\\
&\quad\left[F\{(\delta_3-Z_i)-(\delta_2-Z_i)\}\right]^{N_3}\left[F\{(\delta_4-Z_i)-(\delta_3-Z_i)\}\right]^{N_4}\\
&\quad\left[F\{(\delta_5-Z_i)-(\delta_4-Z_i)\}\right]^{N_5}\left[F\{(\delta_6-Z_i)-(\delta_5-Z_i)\}\right]^{N_6}\left[1-F(\delta_6-Z_i)\right]^{N_7}
\end{aligned}
\qquad (4.4)
$$

Where $F(x)=\Pr(\varepsilon_i>x)$ is the cumulative probability distribution of the error terms. If we knew the probability distribution of the error terms – that is, if we knew what *F(x)* was – then we could chose as our estimates of β_k, and δ_l those values which maximized the likelihood of observing the sample observations (that is why the estimates are termed as maximum likelihood estimates). In the absence of such knowledge, we could assume that the error terms

followed a particular probability distribution. We have assumed that the error terms followed normal distribution in our case.

Using the estimated values of $\hat{\beta}_k$ of the coefficients β_k allows an estimated value $\hat{Z}_i = \sum_{k=1}^{5} \hat{\beta}_k X_{ik}$ to be computed for each graduate in the sample. Using $\hat{Z}_i$ in conjunction with $\hat{\delta}_l$, which are the cutoff parameters δ_l, allows the probabilities of being at different levels of competence to be estimated for every graduate in the sample. These estimates – denoted p_{it} (where t = 1, 2, ..., 7) – are computed as

$$
\begin{aligned}
\hat{p}_{i1} &= P_r\,(\varepsilon_i \le \hat{\delta}_1 - \hat{Z}_i) = F\left(\hat{\delta}_1 - \hat{Z}_i\right) \\
\hat{p}_{i2} &= P_r\,(\hat{\delta}_1 - \hat{Z}_i \le \varepsilon_i \le \hat{\delta}_2 - \hat{Z}_i) = F\left\{\left(\hat{\delta}_2 - \hat{Z}_i\right) - \left(\hat{\delta}_1 - \hat{Z}_i\right)\right\} \\
\hat{p}_{i3} &= P_r\,(\hat{\delta}_2 - \hat{Z}_i \le \varepsilon_i \le \hat{\delta}_3 - \hat{Z}_i) = F\left\{\left(\hat{\delta}_3 - \hat{Z}_i\right) - \left(\hat{\delta}_2 - \hat{Z}_i\right)\right\} \\
\hat{p}_{i4} &= P_r\,(\hat{\delta}_3 - \hat{Z}_i \le \varepsilon_i \le \hat{\delta}_4 - \hat{Z}_i) = F\left\{\left(\hat{\delta}_4 - \hat{Z}_i\right) - \left(\hat{\delta}_3 - \hat{Z}_i\right)\right\} \\
\hat{p}_{i5} &= P_r\,(\hat{\delta}_4 - \hat{Z}_i \le \varepsilon_i \le \hat{\delta}_5 - \hat{Z}_i) = F\left\{\left(\hat{\delta}_5 - \hat{Z}_i\right) - \left(\hat{\delta}_4 - \hat{Z}_i\right)\right\} \\
\hat{p}_{i6} &= P_r\,(\hat{\delta}_5 - \hat{Z}_i \le \varepsilon_i \le \hat{\delta}_6 - \hat{Z}_i) = F\left\{\left(\hat{\delta}_6 - \hat{Z}_i\right) - \left(\hat{\delta}_5 - \hat{Z}_i\right)\right\} \\
\hat{p}_{i7} &= P_r\,(\varepsilon_i \ge \hat{\delta}_6 - \hat{Z}_i) = 1 - F\left(\hat{\delta}_6 - \hat{Z}_i\right)
\end{aligned}
\qquad (4.5)
$$

Where $\sum_{t=1}^{3} \hat{p}_{it} = 1$ for all i = 1, 2, ..., N.

The cumulative distribution of a standard normal variate X is

$$\Pr(X < x) = \Phi(x) = \int_0^x (1/2\pi) \exp(-X^2/2) dX \qquad (4.6)$$

If error terms are assumed to follow this distribution

$$
\begin{aligned}
&P_r\,(Y_i=1)=\Phi\,(\delta_1-Z_i)\\
&P_r\,(Y_i=2)=\Phi\,\{(\delta_2-Z_i)-(\delta_1-Z_i)\}\\
&P_r\,(Y_i=3)=\Phi\,\{(\delta_3-Z_i)-(\delta_2-Z_i)\}\\
&P_r\,(Y_i=4)=\Phi\,\{(\delta_4-Z_i)-(\delta_3-Z_i)\}\\
&P_r\,(Y_i=5)=\Phi\,\{(\delta_5-Z_i)-(\delta_4-Z_i)\}\\
&P_r\,(Y_i=6)=\Phi\,\{(\delta_6-Z_i)-(\delta_5-Z_i)\}\\
&P_r\,(Y_i=7)=1-\Phi\,(\delta_6-Z_i)
\end{aligned}
\qquad (4.7)
$$

The estimates of the β_k, and δ_l are obtained by maximizing the likelihood function (Equation 4.4), using the normal distribution function $\Phi(.)$ in place of F (.).

4.9. Data Analyses

Ordered probit is run 12 times for each competence separately with same independent variables. Parallel to this OLS regression is employed for the same set of variables. Before we proceed to present the results of the analyses we like to mention here some basic information in more detail.

Competence 1– Ability to use computers and the internet

Competence 2– Ability to rapidly acquire new knowledge

Competence 3– Ability to work productively with others

Competence 4– Ability to coordinate activities

Competence 5– Willingness to question your own and others' ideas

Competence 6– Ability to write reports, memos or documents

Competence 7– Ability to perform well under pressure

Competence 8– Ability to use time efficiently

Competence 9– Ability to make your meaning clear to others

Competence 10– Analytical thinking

Competence 11– Ability to come up with new ideas and solutions

Competence 12– Mastery of your own field or discipline

Reference categories:

'The Netherlands' for "countries"

'Social sciences' for "*fields of education*"

'not providing direct access to PhD' for "*sublevel study programme*"

'highly demanding' for "*to what extent study programme was demanding*", and

'female' for "*gender*".

The outputs of the two analyses (ordered probit and OLS regression) are presented in the following tables.

Table 31: Coefficient estimates of *ordered probit* and OLS regression

	Competence 1		Competence 2		Competence 3		Competence 4		Competence 5		Competence 6	
	$\beta_{oprobit}$	β_{OLS}	$\beta_{oprobit}$	β_{OLS}	$\beta_{oprobit}$	β_{OLS}	$\beta_{oprobit}$	β_{OLS}	$\beta_{oprobit}$	β_{OLS}	$\beta_{oprobit}$	β_{OLS}
Austria	0.699††	0.431††	0.263††	0.173††	0.597††	0.421††	0.451††	0.318†	0.275**	0.204**	0.363††	0.234††
Belgium	**0.119**	**0.085**	- 0.124*	**- 0.088**	**0.087**	**0.072**	**0.052**	**0.035**	**0.202**	**0.168**	- 0.148*	- 0.136*
Czech Republic	0.588††	0.373††	0.098*	**0.066**	0.318††	0.218††	**0.016**	**- 0.018**	0.416††	0.328††	0.192††	0.128**
Estonia	0.190*	**0.123**	**- 0.122**	**- 0.107**	0.241**	0.181**	**- 0.104**	**- 0.092**	**0.056**	**0.044**	- 0.238**	- 0.265†
Finland	**0.088**	**0.060**	- 0.302††	- 0.251††	- 0.154**	- 0.128**	**- 0.047**	**- 0.060**	**- 0.102**	**- 0.090**	- 0.253††	- 0.269††
France	0.186*	**0.126**	- 0.217†	- 0.173†	**- 0.125**	**- 0.118**	- 0.447††	- 0.420††	**- 0.100**	**- 0.105**	- 0.208†	- 0.208†
Germany	0.528††	0.340††	0.115*	**0.077**	0.200†	0.155**	**0.144**	**0.125**	**0.086**	**0.066**	**0.060**	**0.031**
Italy	**0.136**	**0.059**	**- 0.070**	**- 0.075**	**- 0.021**	**- 0.083**	**0.012**	**- 0.028**	**0.059**	**- 0.009**	**0.019**	**- 0.047**
Japan	- 0.926††	- 0.960††	- 1.258††	- 1.254††	- 0.957††	- 0.969††	- 1.066††	- 1.136††	- 0.976††	- 1.068††	- 0.928††	- 1.022††
Norway	**0.077**	**0.053**	- 0.262††	- 0.214††	- 0.202††	- 0.183††	- 0.389††	- 0.374††	**- 0.079**	**- 0.084**	**- 0.026**	**- 0.055**
Portugal	0.389†	0.279†	**- 0.094**	**- 0.078**	**0.050**	**0.008**	**- 0.068**	**- 0.060**	**0.090**	**0.064**	**- 0.156**	- 0.194*
Spain	**- 0.116**	- 0.117*	- 0.176†	- 0.150††	0.241††	0.144††	- 0.244†	- 0.237††	**- 0.008**	**- 0.024**	**- 0.057**	**- 0.086**
Switzerland	0.374††	0.251††	**- 0.065**	**- 0.061**	**0.082**	**0.055**	**- 0.034**	**- 0.045**	**- 0.043**	**- 0.056**	**- 0.073**	**- 0.087**
United Kingdom	0.484††	0.306††	**- 0.049**	**- 0.037**	0.519††	0.366††	0.403††	0.304††	0.392††	0.300††	0.316††	0.253††
Education	**- 0.024**	**- 0.008**	- 0.080*	- 0.067*	**0.043**	**0.018**	**0.091**	**0.084**	0.189†	0.175†	- 0.104**	- 0.084*
Humanities	**0.009**	**0.000**	0.122†	0.091†	**0.067**	**0.031**	**0.051**	**0.039**	**0.079**	**0.060**	0.078**	0.059*
Science	0.291††	0.172††	0.077**	0.057*	**- 0.072**	**- 0.056**	**0.013**	**0.012**	**0.115**	**0.083**	- 0.167††	- 0.150††
Engineering	**0.038**	**0.041**	**- 0.031**	**- 0.022**	**- 0.013**	**- 0.010**	**0.055**	**0.056**	**0.058**	**0.044**	- 0.165††	- 0.149††
Agriculture	- 0.147*	**- 0.099**	- 0.258††	- 0.203††	**- 0.055**	**- 0.047**	**- 0.093**	**- 0.080**	**0.170**	**0.174**	**- 0.022**	**- 0.015**
Health	- 0.295††	- 0.230††	- 0.301††	- 0.234††	**0.031**	**0.026**	**- 0.033**	**0.002**	**- 0.077**	**- 0.063**	- 0.103**	- 0.080*
Services	**0.029**	**0.022**	**- 0.014**	**- 0.005**	**- 0.037**	**- 0.051**	**0.178**	0.182**	**- 0.027**	**- 0.005**	**- 0.004**	**0.005**
Direct access to PhD	- 0.077**	- 0.051*	**0.044**	0.044*	**- 0.005**	**0.003**	**0.042**	**0.038**	**0.034**	**0.030**	0.167††	0.162††
Very Lowly Demanding	- 0.209††	- 0.170††	- 0.078*	- 0.071**	- 0.130†	- 0.118†	**- 0.015**	**- 0.035**	**- 0.023**	**- 0.027**	- 0.151††	- 0.172††
Lowly Demanding	- 0.124††	- 0.080†	- 0.107††	- 0.085††	- 0.077**	- 0.058**	**- 0.055**	**- 0.051**	**- 0.070**	**- 0.065**	- 0.077†	- 0.076†
Very Highly Demanding	0.176††	0.080**	0.247††	0.170††	0.215††	0.141††	0.121*	**0.087**	0.193†	0.164†	0.259††	0.200††
Male	0.206††	0.132††	- 0.084††	- 0.060†	- 0.109††	- 0.087††	- 0.116†	- 0.091**	0.083*	0.079**	- 0.050*	**- 0.039**
n	5754	5754	9766	9766	6362	6362	3134	3134	3014	3014	7493	7493
(Pseudo) R^2	0.0828	0.1947	0.0329	0.0874	0.0368	0.0924	0.0292	0.0808	0.0365	0.1027	0.0443	0.1236
$LR\chi^2(26)/F$	1087.68††	53.25††	805.38††	35.89††	591.59††	24.80††	235.11††	10.50††	301.84††	13.15††	916.49††	40.50††

Values in bold – $(p>0.100)$ – No; * – $(p\leq 0.100)$ – Marginal; ** – $(p\leq 0.050)$ – Fair; † – $(p\leq 0.010)$ – Good; †† – $(p\leq 0.001)$ – Excellent

Table 32: Coefficient estimates of *ordered probit* and OLS regression

	Competence 7		Competence 8		Competence 9		Competence 10		Competence 11		Competence 12	
	$\beta_{oprobit}$	β_{OLS}	$\beta_{oprobit}$	β_{OLS}	$\beta_{oprobit}$	β_{OLS}	$\beta_{oprobit}$	β_{OLS}	$\beta_{oprobit}$	β_{OLS}	$\beta_{oprobit}$	β_{OLS}
Austria	0.375††	0.255††	0.420††	0.338††	**- 0.030**	**- 0.077**	0.238††	0.141†	0.398††	0.252†	0.567††	0.431††
Belgium	**- 0.084**	**- 0.076**	**0.099**	**0.073**	- 0.288**	- 0.294**	- 0.293††	- 0.241††	- 0.234**	- 0.220†	- 0.122**	- 0.106*
Czech Republic	- 0.175†	- 0.182†	0.175**	0.147**	0.316††	0.225†	- 0.105**	- 0.103†	**0.016**	**- 0.008**	0.252††	0.188††
Estonia	**0.049**	**0.007**	**- 0.012**	**- 0.016**	**- 0.001**	**- 0.010**	- 0.266††	- 0.219††	**- 0.012**	**- 0.009**	- 0.310††	- 0.265††
Finland	- 0.185**	- 0.169**	**0.000**	**- 0.010**	- 0.315†	- 0.287†	- 0.497††	- 0.431††	- 0.296††	- 0.275††	- 0.316††	- 0.282††
France	**- 0.037**	**- 0.072**	**- 0.053**	**- 0.054**	**0.018**	**- 0.017**	- 0.427††	- 0.359††	**- 0.068**	**- 0.060**	- 0.211††	- 0.182††
Germany	0.221†	0.161**	**0.108**	**0.075**	**0.002**	**- 0.056**	**- 0.020**	**- 0.034**	**0.107**	**0.062**	0.394††	0.305††
Italy	- 0.259††	- 0.303††	**- 0.135**	- 0.179**	**- 0.179**	- 0.193*	- 0.300††	- 0.282††	- 0.179*	- 0.209†	**- 0.070**	- 0.098**
Japan	- 1.040††	- 1.133††	- 0.701††	- 0.772††	- 0.978††	- 1.034††	- 1.194††	-1.146††	- 1.061††	- 1.045††	- 1.367††	- 1.405††
Norway	**- 0.007**	**- 0.015**	**- 0.127**	**- 0.126**	**0.109**	**0.076**	- 0.456††	- 0.389††	- 0.281†	- 0.247†	- 0.109**	- 0.092**
Portugal	**- 0.011**	**- 0.062**	**0.127**	**0.085**	0.348†	0.224*	- 0.297††	- 0.262††	0.260*	**0.176**	0.236†	0.175†
Spain	**- 0.060**	**- 0.087**	**- 0.033**	**- 0.042**	**- 0.062**	**- 0.083**	- 0.635††	- 0.556††	- 0.289††	- 0.261††	- 0.228††	- 0.211††
Switzerland	**0.022**	**- 0.003**	**0.037**	**0.023**	**- 0.071**	**- 0.087**	- 0.084	- 0.081**	- 0.151**	- 0.138**	**0.047**	**0.035**
United Kingdom	0.292††	0.219†	0.353††	0.261††	0.623††	0.437††	- 0.220††	- 0.191††	**0.159**	**0.081**	**- 0.096**	**- 0.091**
Education	**0.006**	**- 0.021**	0.121*	0.103*	0.181†	0.136**	- 0.160††	- 0.150††	0.164**	0.132**	0.294††	0.253††
Humanities	**0.021**	**0.000**	0.110*	0.099*	**0.067**	**0.053**	**0.000**	**- 0.009**	0.143**	0.128**	0.280††	0.230††
Science	- 0.144**	- 0.132†	**0.061**	**0.054**	**- 0.049**	**- 0.053**	0.127††	0.097††	**0.039**	**0.044**	0.063*	**0.048**
Engineering	**- 0.056**	**- 0.040**	**- 0.043**	**- 0.025**	**0.010**	**0.001**	**- 0.005**	**0.003**	**0.069**	**0.073**	- 0.080†	- 0.064**
Agriculture	**- 0.137**	- 0.131*	**0.005**	**0.028**	**- 0.058**	**- 0.081**	**- 0.097**	**- 0.073**	**- 0.077**	**- 0.022**	**- 0.050**	**- 0.029**
Health	- 0.163††	- 0.144††	- 0.102*	**- 0.080**	**0.062**	**0.058**	- 0.227††	- 0.184††	**- 0.081**	**- 0.062**	**- 0.003**	**0.010**
Services	**0.055**	**0.053**	**- 0.056**	**- 0.004**	**- 0.100**	**- 0.065**	**0.083**	**0.067**	**- 0.070**	**- 0.041**	**0.084**	**0.076**
Direct access to PhD	**0.017**	**0.020**	**0.032**	**0.023**	**0.072**	**0.063**	0.136††	0.122††	**- 0.016**	**- 0.006**	- 0.054**	- 0.036*
Very Lowly Demanding	**- 0.079**	**- 0.071**	- 0.109*	- 0.129**	**- 0.093**	- 0.100*	- 0.097†	- 0.095†	- 0.123**	- 0.104*	- 0.217††	- 0.210††
Lowly Demanding	- 0.079**	- 0.058*	**- 0.056**	**- 0.047**	**- 0.059**	**- 0.051**	- 0.121††	- 0.104††	- 0.110**	- 0.092**	- 0.172††	- 0.151††
Very Highly Demanding	0.133††	0.100†	0.255††	0.199††	0.205†	0.140**	0.317††	0.236††	0.308††	0.237††	0.189††	0.139††
Male	**0.039**	0.046*	- 0.262††	- 0.235††	**0.022**	**0.024**	0.102††	0.088††	0.184††	0.155††	0.117††	0.107††
n	5850	5850	4186	4186	2962	2962	12035	12035	3656	3656	13741	13741
(Pseudo) R^2	0.0197	0.0539	0.0297	0.0789	0.0451	0.1201	0.0507	0.1321	0.0382	0.0988	0.0665	0.1924
$LR\chi^2(26)/F$	297.31††	12.76††	334.18††	13.70††	361.69††	15.41††	1620.76††	70.31††	365.35††	15.30††	2542.35††	125.63††

Values in bold – $(p>0.100)$ – No; * – $(p\leq 0.100)$ – Marginal; ** – $(p\leq 0.050)$ – Fair; † – $(p\leq 0.010)$ – Good; †† – $(p\leq 0.001)$ – Excellent

The signs of the coefficient estimates allow the direction of change in the probabilities of the extreme outcomes only. Probabilities are relative to corresponding reference category.

We are taking two categories just for example. Firstly, the graduates of Science, ceteris paribus, have higher probability of having acquired and a lower probability of not having acquired greater level of *Ability to use computers and the internet* (competence 1) and *Analytical Thinking* (Competence 10) than that of their counterparts from the Social Sciences (the reference category). Secondly, Health graduates show lesser probability of having acquired and higher probability of not having acquired greater level of *Ability to use computers and the internet* (competence 1), *Ability to rapidly acquire new knowledge* (Competence 2), *Ability to perform well under pressure* (Competence 7), and *Analytical Thinking* (Competence 10) as compared to their counterparts from Social Sciences.

We observe a hierarchy in different categories of graduates on the basis of field of education. In rather simple words, we may say that health professionals fall next to social scientists which in turn are next to mathematicians and computer scientists in a hierarchical order regarding the acquired level of *Ability to use computers and the internet* (competence 1) and *Analytical Thinking* (Competence 10). It is necessary to remember that this ranking is relative only.

Graduates who followed study programme providing direct access to doctorate, ceteris paribus, have higher probability of having acquired and a lower probability of not having acquired greater level of *Ability to write reports, memos or documents* (Competence 6) and *Analytical Thinking* (Competence 10). It appears logical. Graduates continuing to doctorate should have possessed of relatively higher level in these competences for better

accomplishment of their future chores. Writing a dissertation is both a science as well an art. It is a science in the sense that it urges to rationalise what is observed or could be perceived. It demands apt observation, logical perception, rationalistic approach, critical thinking etc. etc. It is an art to present what you have accomplished. It is an art how to question, how to answer, how to write and how to juxtapose various entities of different colours in order to produce something different in tinge and texture.

These observations are articulating what it is in theory as well as practice. We can say that veracity of these observations could be reliable as these are found consistent to what is expected theoretically and what is observed practically. These results ceteris paribus are coherent to what we know already and what we observe in real situations.

Demanding level of study programme is an ordinal variable. It is subjective in the sense that the graduates (themselves) are to rate their study programme to what extent it was regarded as demanding. We select *highly demanding category* as a reference. The graduates who rated their study programme (very) lowly demanding, ceteris paribus, have lower probability of having acquired and a higher probability of not having acquired greater level of almost all 12 competences; whereas, the graduates who rated their study programme very highly demanding, ceteris paribus, have higher probability of having acquired and a lower probability of not having acquired greater level of almost all 12 competences.

In case of demanding level of study programme we observe rather regular patterns in competence acquisition level; however, this is pregnant with subjectivity. They are the graduates who rated their study programmes; and again, they are the graduates who self assessed their competences. In the face of this multiplied subjectivity graduates' assessment may become more suspicious. There is another side of the picture. Coherence could be

marked easily in graduates' assessment at two different points of enquiry. This marked coherence lends reliability to graduates' responses all through the process of enquiry. If we take this subjective opinion reliable, it is interesting, however, that the graduates who followed more demanding study programmes have acquired higher level of certain competences. Truthfulness of this finding is favoured by virtue and convention.

Although a good discussion can be provoked regarding the interpretation of country and gender estimates mentioned in the tables, but we leave this for they are included in the model as control variables. Reader may look into them for their interest.

The pseudo R^2 (often referred to as McFadden (1973) pseudo R^2) varies between 0 and 1. According to many authors (for example Greene, 2008) there is not natural interpretation of this statistic. However it is observed to be increasing as the fit of the model improves (Borooah, 2001). The χ^2 value, with excellent significant difference, helps us to reject the null hypothesis that our model does not have greater explanatory power than an "intercept only" model. We have not mentioned the cutoff points simply because here we do not intend to discuss them for our own reason. We just overlooked this and come to compare ordered probit and OLS regression.

Most of the cases in the tables above are evident that corresponding coefficient estimates of ordered probit and OLS regression resemble each other to a high extent. They do differ sometimes, but this difference is restricted to their immediate significance levels. We have defined four levels of significance, if it is there, just to elucidate the situation. Prime difference between ordered probit and OLS regression is that of ordinal and cardinal values of numbers. Former considers the ordinal values of the numbers whereas the later takes their

cardinal values into consideration in their operations. Although, we have discussed this in some earlier paragraphs of this section prior to discuss the results; however, some deeper insight could be more fruitful.

We, as rational beings, are convinced to believe (or at least, consider) more in exactitude; and are attracted towards numbers' cardinal value. In addition to this, as we know that their cardinal value includes the ordinal (too), we are, intrinsically, dragged more to believe in this property of numbers. Since the set of graduates we are investigating in this study does belong to same population of rational beings, therefore, has no exception. As a researcher we believe (we have observed in our analyses) that despite self imposed restriction to consider only the ordinal value of numbers we appear helpless to elope ourselves from considering their cardinal value. Thus graduates' ordinal consideration of numbers may have a tinge of cardinality. This could be the possible reason of startling resemblance in the significance levels of estimates of two different analyses mentioned above in tables. This subconscious shift of graduates towards exactitude (ordinal cardinality of numbers) may have some positive conviction to what we intend to investigate (i.e. to what extent graduates' self assessment is reliable?).

In fact we run two different models, namely, OLS and ordered probit regression, retaining same variables to see the explained variance by the independent variables. Unfortunately, the suitable estimation model, i.e. ordered probit model, according to the nature of the data, is mute to tell us the required information. Juxtaposition of the two outputs better help us to decide which direction we should move in. We find surprising similarity between the outputs of oprobit regression and OLS regression. We are least concerned with the interpretation of the coefficient estimates of the later model; however, a resemblance of highest degree

regarding the levels of significance (of coefficient estimates in the two models) is remarkable. Logically, it permits us to rely upon the outputs given by OLS regression as well, which is not advised to rely upon under usual circumstances with the type and set of variables we are dealing with. Hence, the uniqueness of our case is statistically proved and established.

This surprising similarity between the levels of significance of two analyses encourages us to rely upon the results of OLS regression with relatively greater confidence. We can proceed to calculate ANOVA; and we think, apparently, there is no harm at all in doing so.

4.10. Statistical Comparison of OLS Regression and Ordered Probit

Two different coefficient estimates have been found to resemble in their levels of significance. Some deeper insight is required to compare the coefficient estimates of ordered probit and OLS regression. We are not concerned with this as this beyond the scope of this study. Nevertheless, this could be of interest for statisticians and econometricians. Any contribution in this regard might be interesting, we think; and could be valuable as well. We leave this venture to the courage of adventurous researchers for the moment.

4.11. ANOVA, Mann-Whitney Test and Kruskal-Wallis Test

We are going to investigate into the variances i.e. *between-groups mean square variance* (a measure of effect) and *within-groups mean square variance* (a measure of noise). Inter-groups variance is synonymous to *between-groups mean square variance* (a measure of effect) and intra-groups variance is synonymous to *within-groups mean square variance* (a measure of noise). Between-groups variance is the variance of the set of group means from the overall

mean of all observations. Within-groups variance is a function of the variances of the observations in each group weighted for group size. Our hypothesis is that inter-groups variance is greater than the intra-groups variance.

F is the ratio of the two variances i.e. *between-groups variance* (a measure of effect) divided by *within-groups variance* (a measure of noise). Larger F statistic[23] signifies that the null hypothesis is less likely to be true. If it is around 1, differences in group means are only random variations. If it is (significantly) greater than 1, then there is more variation between groups than within groups; hence the grouping variable does make a difference. Small significant difference is not surprising as our sample is large enough. Statistically Significant difference observed in F statistic is due to larger measure of effect i.e. *between-groups mean square variance,* than that of the noise i.e. *within-groups mean square variance*. Such F statistics encourage us to reject the null hypothesis in favour of the alternative one i.e. inter-groups variance is greater than the intra-groups variance.

Partial eta-squared describes the percentage of variance explained in the dependent variable by a predictor controlling for the other predictors. It measures the effect size coefficient based on percent of variance explained. Eta-squared is the ratio of the *between-groups sum of squares* (effect[24] of the grouping variable) to the *total sum of squares*. The coefficient is "partial" in the sense that it reflects the effect after controlling for other variables in the model. It is a biased estimate of the variance explained in the population. Partial eta-squared is interpreted as the percent of variance in the dependent variable uniquely attributable to the

[23] If the computed F score is greater than 1, then there is more variation between groups than within groups, from which we infer that the grouping variable does make a difference. If the F score is enough above 1, it will be found to be significant in a table of F values, using df = k – 1 (degrees of freedom for between-groups) and df = N – k – 1 (degrees of freedom for within-groups), where N is sample size and k is the number of groups formed by the factor(s).

[24] the extent to which the means are different between groups.

given effect variable i.e. the independent variable. The following rules of thumb have emerged: small = 0.01; medium = 0.06; large = 0.14. (*Cf*. Kittler, J. E., Menard, W., & Phillips, K., A. (2007). *Weight concerns in individuals with body dysmorphic disorder*. Eating Behaviors, 8, 115-120.)

Our dependent variable is the acquired level of competence. We selected 12 competences out of the list of nineteen. Selection process has been described in the previous section of this discourse. Independent variables are "Field of Education", "Sublevel of Study Programme", "Demanding Level of Study Programme" and "Gender". We have employed GLM (General Linear Model) multivariate analyses in SPSS. We have calculated this for all fifteen countries. We are presenting only F and $\partial\eta^2$ in the following tables. We discuss separately the effect of each independent variable.

4.11.1. Field of Education

We want to see that to what extent this variable explains the variance (after controlling the effect of the other dependent variables) in the dependent variable i.e. competence. This variable has been marked very satisfactory in terms of the values of $\partial\eta^2$ but not for F values. The predictor 'Field of Education' for all fifteen countries is explaining the variance in Competence 1 (Ability to use computers and the internet) with high values of *F* at excellent significant difference level. Greater than 1 value of *F* indicates that there is more variation between groups than within groups.

Null hypothesis is less likely to be true as *F* is found to be large enough; furthermore, the differences in group means are not only random variations since *F* is significantly greater than

1. Values of partial eta squared range from 0.021 to 0.089. This statistic interprets the percent of variance in Competence 1 (Ability to use computers and the internet) uniquely attributable to the effect of the predictor i.e. Field of Education.

Table 33: Analyses of variance (Field of Education)

	Competence 1		Competence 2		Competence 3		Competence 4		Competence 5		Competence 6	
	F	$\partial\eta^2$	F	$\partial\eta^2$	F	$\partial\eta^2$	F	$\partial\eta^2$	F	$\partial\eta^2$	F	$\partial\eta^2$
Austria	16.741††	0.073	3.502††	0.016	**1.128**	0.005	**1.062**	0.005	5.149††	0.024	9.387††	0.042
Belgium	9.537††	0.053	**0.902**	0.005	**0.867**	0.005	**0.669**	0.004	3.203†	0.019	12.416††	0.068
Czech Republic	53.855††	0.061	8.698††	0.010	3.945††	0.005	10.564††	0.013	6.784††	0.008	40.319††	0.046
Estonia	3.848††	0.032	**0.878**	0.007	3.255†	0.027	2.090**	0.017	3.050†	0.025	4.693††	0.038
Finland	13.594††	0.039	3.167†	0.009	**0.610**	0.002	3.285†	0.010	**0.988**	0.003	5.469**	0.016
France	18.967††	0.089	2.865†	0.015	2.135**	0.011	2.628**	0.013	2.875†	0.015	4.700††	0.024
Germany	11.139††	0.049	2.685†	0.012	**1.416**	0.006	1.825*	0.008	2.217**	0.010	2.048**	0.009
Italy	10.595††	0.033	**0.527**	0.002	**0.322**	0.001	**1.373**	0.004	**1.272**	0.004	3.041†	0.010
Japan	7.892††	0.021	**0.274**	0.001	1.899*	0.005	**0.700**	0.002	**1.343**	0.004	**0.851**	0.002
Netherlands	20.702††	0.047	4.422††	0.010	**1.450**	0.003	3.925††	0.009	2.004*	0.005	3.950††	0.009
Norway	17.039††	0.058	5.752††	0.020	2.682†	0.010	3.953††	0.014	2.999†	0.011	2.541**	0.009
Portugal	5.682††	0.066	**1.620**	0.020	2.579**	0.031	**1.350**	0.016	**1.288**	0.016	1,745*	0,021
Spain	14.886††	0.030	**1.405**	0.003	4.597††	0.009	4.498††	0.009	**1.550**	0.003	3.454††	0.007
Switzerland	38.173††	0.058	9.516††	0.015	1.944*	0.003	2.773†	0.004	2.331**	0.004	4.556††	0.007
United Kingdom	8.744††	0.047	**0.697**	0.004	2.929†	0.016	3.021†	0.017	**0.665**	0.004	2.444**	0.014
	Competence 7		**Competence 8**		**Competence 9**		**Competence 10**		**Competence 11**		**Competence 12**	
	F	$\partial\eta^2$	F	$\partial\eta^2$	F	$\partial\eta^2$	F	$\partial\eta^2$	F	$\partial\eta^2$	F	$\partial\eta^2$
Austria	3.109†	0.014	2.796†	0.013	6.175††	0.028	6.162††	0.028	6.846††	0.031	6.944††	0.031
Belgium	3.167†	0.018	**1.555**	0.009	1.986*	0.012	9.208††	0.052	3.629††	0.021	2.955†	0.017
Czech Republic	14.511††	0.017	5.035††	0.006	10.274††	0.012	28.546††	0.033	15.795††	0.019	12.032††	0.014
Estonia	4.396††	0.036	**1.515**	0.013	2.914†	0.024	3.101†	0.026	**0.997**	0.008	**1.468**	0.012
Finland	**1.402**	0.004	2.108**	0.006	2.001*	0.006	2.655†	0.008	5.738††	0.017	9.533††	0.028
France	3.457††	0.018	2.475**	0.013	**0.758**	0.004	2.634†	0.013	**1.285**	0.007	**1.379**	0.007
Germany	3.312†	0.015	2.306**	0.010	3.359††	0.015	10.043††	0.044	4.093††	0.018	4.147††	0.019
Italy	3.368††	0.011	**1.220**	0.004	**0.086**	0.000	**1.222**	0.004	2.206**	0.007	3.396††	0.011
Japan	**1.124**	0.003	**0.946**	0.003	**1.266**	0.003	**0.568**	0.002	**1.343**	0.004	8.528††	0.023
Netherlands	4.080††	0.010	**1.336**	0.003	3.511††	0.008	8.940††	0.021	4.567††	0.011	7.817††	0.018
Norway	**0.611**	0.002	2.354**	0.008	6.586††	0.023	8.651††	0.030	7.115††	0.025	5.104††	0.018
Portugal	**1.190**	0.015	**1.445**	0.018	2.999†	0.036	**0.729**	0.009	**0.344**	0.004	3.434††	0.041
Spain	2.220**	0.005	5.558††	0.011	7.212††	0.015	5.878††	0.012	3.531††	0.007	6.545††	0.013
Switzerland	6.306††	0.010	2.679†	0.004	4.493††	0.007	9.418††	0.015	4.916††	0.008	9.881††	0.016
United Kingdom	3.726††	0.021	**1.592**	0.009	5.737††	0.032	2.509†	0.014	3.637††	0.020	2.549†	0.014

Values in bold – $(p>0.100)$ – No; * – $(p\leq0.100)$ – Marginal; ** – $(p\leq0.050)$ – Fair; † – $(p\leq0.010)$ – Good; †† – $(p\leq0.001)$ – Excellent

Kruskal Wallis Test (H)

Table 34: Kruskal Wallis statisitc (Field of Education)

	COMPETENCE											
COUNTRY	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Austria	151.155††	15.630**	**3.678**	25.312††	26.779††	49.403††	20.837†	31.161††	13.999*	51.917††	40.383††	18.437†
Belgium	91.627††	**4.893**	**5.846**	**2.877**	16.868**	56.015††	20.799†	22.618†	13.312*	82.098††	33.142††	21.634†
Czech Republic	528.178††	33.803††	20.037†	70.628††	31.140††	209.941††	82.769††	66.446††	37.994††	225.977††	80.871††	59.747††
Estonia	43.115††	**6.373**	24.531††	15.647**	20.963†	30.685††	25.573††	13.106*	20.214†	26.747††	**5.864**	**2.473**
Finland	174.825††	22.134†	12.957*	28.606††	45.555††	32.930††	**11.614**	43.414††	13.551*	114.167††	63.113††	49.519††
France	151.950††	24.132††	18.813†	**11.723**	14.425**	39.040††	22.751†	15.308**	**5.289**	31.578††	16.619**	15.455**
Germany	128.417††	23.068†	**7.969**	17.401**	22.035†	24.774††	20.004†	23.866††	14.201**	121.543††	36.464††	17.884**
Italy	83.570††	**7.200**	**4.515**	**9.446**	**8.246**	22.533†	24.599††	**8.007**	**2.518**	17.979**	21.570†	17.273**
Japan	49.600††	**4.471**	14.641**	**10.306**	**8.819**	**10.374**	**10.051**	18.161†	**5.587**	11.932*	20.690†	71.822††
Netherlands	223.134††	58.680††	16.605**	51.646††	21.549†	43.747††	31.316††	27.677††	26.433††	175.402††	57.974††	44.091††
Norway	268.527††	87.933††	30.587††	52.685††	28.086††	31.088††	**6.913**	57.955††	40.761††	234.418††	58.247††	32.235††
Portugal	48.386††	12.698*	19.424†	**7.021**	**5.609**	**10.251**	**10.057**	14.328**	16.882**	**9.879**	**1.139**	22.120†
Spain	156.690††	21.183†	63.000††	26.580††	27.905††	39.194††	32.867††	41.699††	45.373††	131.447††	45.127††	38.614††
Switzerland	389.376††	108.350††	32.456††	41.466††	21.611†	73.618††	33.259††	54.522††	24.524††	129.391††	75.373††	40.639††
United Kingdom	60.401††	**4.352**	38.551††	32.378††	**4.521**	22.701†	26.265††	27.250††	56.595††	31.476††	25.960††	13.697*

Values in bold – $(p > 0.100)$ – No; * – $(p \leq 0.100)$ – Marginal; ** – $(p \leq 0.050)$ – Fair; † – $(p \leq 0.010)$ – Good; †† – $(p \leq 0.001)$ – Excellent

We take Competence 8 (Ability to use time efficiently) as a second example. The predictor 'Field of Education' is explaining the variance in Competence 8 (Ability to use time efficiently) with relatively smaller values of *F* (however large enough to reject the null hypothesis) observed significantly different for only eight countries. Greater than 1 value of *F* indicates that there is more variation between groups than within groups and that the differences in group means are not only random variations. Null hypothesis is less likely to be true as *F* is found to be large enough. Values of partial eta squared range from 0.004 to 0.013. This statistic interprets the percent of variance in Competence 1 (Ability to use computers and the internet) uniquely attributable to the effect of the predictor i.e. Field of Education.

We have interpreted effect of the predictor for two dependent variables i.e. competence 1 and 8. Similar interpretation could be made for the rest of 10 competences. We leave this job for the readers' exercise.

We note partial eat squared values as low as 0.004 and as large as 0.089 for the cases with significant *F* values. One may suspect about the acceptability of lower limit value; yet the predefined pretext of large data set may suffice for the justification. One may say that the percentage of effect is too small. This could be questionable in the absence of any valid justification. In fact there is no criterion for this limit, at least, readily available to us. Researchers like Kittler et al (2007) have defined the small limit as 0.01 without giving any valid justification. It appears as this was the researchers own choice for defining the limit. If this is the case, we may set our own limit as 0.004 (or even lower than this e.g. 0.001). We may provide three grounds for doing so. Firstly, the large data set; secondly, the researcher's own choice; and thirdly, the competences are transversal to the fields of education. The last factor we believe in most in this justification. This variable is found as good as we were

expecting earlier to explain the variances in the dependent variables i.e. competences. We consider it positive while rejecting the null hypothesis in favour of our research hypothesis.

High levels of significance show that the graduates from different subcategories of 'Field of Education' are not same; they do differ in their self assessment of acquired competences as they are expected to be. Mutual differences in their self assessment are coherent to the fact that they belong to different subcategories. In simple words we may say that the graduates with different *academic experiences* possess distinct subset of competences and Kruskal-Wallis test shows that this presumption is coherently observable in their self assessment. Consequently, their self assessment of acquired competences could be said to be reliable, in Popperian terms as there is nothing contradictory to factual situations.

4.11.2. Sublevel of Study Programme

We are interested to look how good this predictor is in explaining the variances in the dependent variables of competences. This variable is found to reflect poorer output than the previous one in terms of F as well as $\partial\eta^2$. We take competence 3 and 6 for example. Competence 3 (Ability to work productively with others) is marked among the competences for which the variances have been very poorly explained. It is found to show marginal significant difference for Czech Republic and Spain; fair significant difference for Austria; excellent significant difference for Finland; and insignificant difference for the rest of 11 countries. The partial eta squared statistic is too small ranging from 0.001 to 0.002 for significantly different *F* statistic cases. For such cases *F* statistic is large enough to reject the null hypothesis in favour of the alternative one. However, partial eta squared statistic range is very small. Competence 6 (Ability to write reports, memos or documents) exhibited

insignificant difference for four countries, namely, Austria, Czech Republic, Estonia and United Kingdom; marginal significant difference for Germany only; faire significant difference for France and Portugal; and excellent significant difference for the rest of seven countries. Partial eta squared statistic (for significant *F* statistic cases) ranges from 0.002 to 0.014. We selected two competences (3 and 6) for example only. Similar interpretation could be made for the rest of 10 competences. We leave this job for the readers' exercise. This variable has not proved itself as good as we imagined to begin with in explaining the variances in the dependent variables i.e. competences. We found it not supportive to accept our research hypothesis and to reject the null hypothesis.

Table of Mann-Whitney (U) statistics in the following shows that the graduates who followed study programmes providing direct access to doctorate are different from their counterparts (who followed study programmes not providing direct access to doctorate) in their self assessment of acquired competences. This is what we expected earlier. As this is coherent and not contradictory so, following the falsifiability criterion of Karl Popper, we may say that the self assessment of the graduates is reliable.

Table 35: Analyses of variance (Sublevel of Study Programme)

	Competence 1		Competence 2		Competence 3		Competence 4		Competence 5		Competence 6	
	F	$\partial\eta^2$	F	$\partial\eta^2$	F	$\partial\eta^2$	F	$\partial\eta^2$	F	$\partial\eta^2$	F	$\partial\eta^2$
Austria	13.856††	0.009	**0.067**	0.000	6.315**	0.004	3.293*	0.002	**0.633**	0.000	**0.334**	0.000
Belgium	**1.112**	0.001	10.913††	0.009	**0.162**	0.000	2.836*	0.002	14.935††	0.012	12.676††	0.011
Czech Republic	**0.007**	0.000	8.331†	0.001	3.410*	0.001	8.052†	0.001	16.490††	0.003	**2.537**	0.000
Estonia	7.879†	0.009	3.433*	0.004	**0.046**	0.000	**0.256**	0.000	**1.091**	0.001	**1.663**	0.002
Finland	31.618††	0.013	**2.590**	0.001	10.620††	0.005	**0.075**	0.000	4.291**	0.002	13.171††	0.006
France	3.196*	0.002	3.750*	0.003	**1.040**	0.001	**0.034**	0.000	**0.313**	0.000	8.982†	0.007
Germany	8.639†	0.006	**0.027**	0.000	**2.367**	0.002	8.787†	0.006	**0.189**	0.000	2.923*	0.002
Italy	**2.434**	0.001	**0.279**	0.000	**0.035**	0.000	**0.011**	0.000	**1.998**	0.001	8.826†	0.004
Japan	**0.296**	0.000	5.323**	0.002	**0.499**	0.000	4.510**	0.002	2.985*	0.001	10.304††	0.005
Netherlands	7.215†	0.002	20.596††	0.007	**0.366**	0.000	**0.001**	0.000	11.264††	0.004	40.731††	0.014
Norway	**0.832**	0.000	**0.315**	0.000	**0.535**	0.000	**1.084**	0.001	**0.040**	0.000	12.878††	0.007
Portugal	**0.564**	0.001	3.388*	0.006	**0.368**	0.001	**0.732**	0.001	3.534*	0.006	6.981†	0.012
Spain	3.472*	0.001	**0.270**	0.000	3.101*	0.001	**0.881**	0.000	5.622**	0.002	25.835††	0.008
Switzerland	6.265**	0.001	25.310††	0.006	**1.263**	0.000	3.729*	0.001	**0.138**	0.000	21.307††	0.005
United Kingdom	**0.351**	0.000	**2.377**	0.002	**1.308**	0.001	**0.058**	0.000	**1.040**	0.001	**1.158**	0.001

	Competence 7		Competence 8		Competence 9		Competence 10		Competence 11		Competence 12	
	F	$\partial\eta^2$	F	$\partial\eta^2$	F	$\partial\eta^2$	F	$\partial\eta^2$	F	$\partial\eta^2$	F	$\partial\eta^2$
Austria	**1.416**	0.001	**1.837**	0.001	**0.120**	0.000	**0.001**	0.000	**0.259**	0.000	**0.289**	0.000
Belgium	**0.915**	0.001	**0.009**	0.000	**1.564**	0.001	11.321††	0.009	3.874	0.003	**0.020**	0.000
Czech Republic	**2.088**	0.000	4.501**	0.001	3.903**	0.001	**0.447**	0.000	4.309**	0.001	9.653†	0.002
Estonia	**0.099**	0.000	**0.429**	0.001	**2.456**	0.003	6.259**	0.008	**0.119**	0.000	5.013**	0.006
Finland	7.304†	0.003	9.629†	0.004	**0.047**	0.000	89.862††	0.037	**0.123**	0.000	**2.328**	0.001
France	3.142*	0.002	**0.009**	0.000	2.789*	0.002	11.824††	0.009	**0.008**	0.000	3.219*	0.002
Germany	3.840**	0.003	6.693†	0.004	**0.001**	0.000	**0.232**	0.000	**1.040**	0.001	**0.969**	0.001
Italy	**0.016**	0.000	**1.723**	0.001	**2.538**	0.001	**0.008**	0.000	**0.113**	0.000	**0.192**	0.000
Japan	6.295**	0.003	4.313**	0.002	4.650**	0.002	3.251*	0.001	7.617†	0.003	12.879††	0.006
Netherlands	**0.719**	0.000	**0.136**	0.000	**0.197**	0.000	107.871††	0.035	**0.007**	0.000	**1.933**	0.001
Norway	**2.590**	0.001	**1.286**	0.001	5.191**	0.003	34.115††	0.017	**1.490**	0.001	**1.080**	0.001
Portugal	**0.005**	0.000	**0.257**	0.000	**2.618**	0.005	7.476†	0.013	**0.395**	0.001	**2.050**	0.004
Spain	7.642†	0.002	**0.001**	0.000	**2.456**	0.001	46.355††	0.013	**0.046**	0.000	**0.775**	0.000
Switzerland	**1.753**	0.000	**1.805**	0.000	**0.431**	0.000	29.257††	0.007	10.810††	0.002	31.720††	0.007
United Kingdom	**0.073**	0.000	**0.148**	0.000	**0.366**	0.000	**2.532**	0.002	**1.462**	0.001	**2.624**	0.002

Values in bold – $(p>0.100)$ – No; * – $(p\leq0.100)$ – Marginal; ** – $(p\leq0.050)$ – Fair; † – $(p\leq0.010)$ – Good; †† – $(p\leq0.001)$ – Excellent

Table 36: Mann-Whitney statistic (Sublevel of Study Programme)

	COMPETENCES											
COUNTRY	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Austria	54456††	**79599**	70746**	**73877**	**74341**	**79909**	**72775**	**79501**	**78998**	**78120**	**76042**	**78590**
Belgium	153034††	157106†	**167204**	**164898**	**162767**	151402††	**172390**	161322*	**168575**	**162212**	**168426**	**163205**
Czech Republic	2737628**	2712813**	**2755149**	2700787**	2742938**	2740728**	**2798602**	2736197*	**2827652**	2724851**	**2782036**	**2789592**
Estonia	40178††	45110**	**50198**	**46885**	**49508**	**48769**	**49102**	**50284**	44502**	44148**	**50117**	44097**
Finland	698682††	734934*	714537†	712133†	684479††	660007††	**748270**	734546*	711563†	530556††	684004††	732483†
France	249542††	254784†	**269196**	**266776**	**265905**	246551††	251685†	**278359**	257392†	237571††	258378**	255139†
Germany	261098††	270997**	**289869**	**282928**	**280695**	259050††	**283095**	**284264**	**278050**	**284812**	**282211**	279331*
Italy	285782†	**318428**	**313702**	**312548**	**300508**	279719†	**303239**	**316527**	**303824**	**302794**	290740	**318651**
Japan	204110†	200682††	**228774**	200539†	197865††	179101††	192642††	**216380**	202902†	195237††	190897††	180250††
Netherlands	**1094417**	957418††	**1108348**	**1083944**	1006599††	917664††	**1096171**	**1110807**	**1087546**	803428††	**1073324**	**1104648**
Norway	401420††	418877††	474167**	474175**	463589†	440091††	**495915**	474388**	**485630**	317348††	456158††	**502159**
Portugal	**35857**	32962**	**36192**	**35628**	**33873**	33279*	**36576**	**36506**	**35360**	29660††	**34907**	30573††
Spain	1567254*	1547296†	1509014††	**1613179**	1526406†	1416989††	1512866††	**1614390**	**1594586**	1329025††	**1613732**	**1642853**
Switzerland	2186675†	1891555††	**2280355**	**2265362**	**2246784**	1964028††	**2255809**	**2269600**	2175103†	2012760††	2131544††	2180888††
United Kingdom	**70844**	70146*	68895*	**76243**	69516*	**71545**	**74870**	**74777**	**76218**	66142†	67461**	67572**

Values in bold – $(p>0.100)$ – No; * – $(p\leq 0.100)$ – Marginal; ** – $(p\leq 0.050)$ – Fair; † – $(p\leq 0.010)$ – Good; †† – $(p\leq 0.001)$ – Excellent

4.11.3. Demanding Level of Study Programme

The variable 'Demanding Level of Study Programme' is observed to better explain the variances in the dependent variables i.e. competences, than the variable 'Sublevel of Study Programme' in terms of both F and $\partial\eta^2$. But this is poorer than the 'Field of Education'.

We are going to interpret, for example, the results of Competence 3 (Ability to work productively with others) and Competence 12 (Mastery of your own filed or discipline).

Competence 3 (Ability to work productively with others) can be ranked among the competences with poorly explained variances. It is found to show good significant difference for Germany and United Kingdom; excellent significant difference for Austria, Czech Republic, Finland, France, Japan, Spain and Switzerland; and insignificant difference for the rest of 6 countries. The partial eta squared statistic is very small ranging from 0.008 to 0.016 for significantly different F statistic cases. Although F statistic is also very small but it is large enough with (either good or excellent) significant difference to reject the null hypothesis and to accept the alternative hypothesis. Nonetheless, partial eta squared statistic range is very small, yet it could reasonably explain the percent of the variance of dependent variables i.e. competences.

We take Competence 12 (Mastery of your own filed or discipline) as a second example. The predictor 'Demanding Level of Study Programme' is explaining successfully the variance in Competence 12 (Mastery of your own filed or discipline) for 14 countries. Estonia is the sole country to express the insignificant difference. Among the rest, we note marginal significant difference for Belgium; good significant difference for the Netherlands and United Kingdom;

excellent significant difference for Austria, Czech Republic, Finland, France, Germany, Italy, Japan, Norway, Portugal, Spain and Switzerland. The range of partial eta squared statistic is 0.005 to 0.029 for the cases for which significant differences have been marked.

This predictor is proved as good as we foresaw earlier in explaining the variances in the dependent variables i.e. competences. We consider it encouraging while rejecting the null hypothesis in favour of our research hypothesis.

Both parameters *F* (because of insignificance in most of the countries) as well as partial eta squared (with maximum value of 0.015) reveal that the variances on the basis of gender in Competences 2, 6, 7 and 9 are very poorly explained.

Elevated levels of significance in the table below show that the graduates from different subcategories on the basis of 'Demanding Level of Study Programme' are not same; as we expected in the beginning, they do differ in their self assessment of acquired competences. Mutual differences in their self assessment of acquired competences are coherent to the fact that they belong to different subcategories and that they do possess different subset of competences distinct from the graduates of other subcategories. This is evidently observable, through Kruskal-Wallis test, in their self assessment of acquired competences. In simple words we may say that the graduates with different *academic experiences* possess distinct subset of competences and Kruskal-Wallis test shows that this presumption is coherently observable in their self assessment. Consequently, their self assessment of acquired competences might be considered reliable, in Popperian terms, as contradiction has been found through this analysis.

Table 37: Analyses of variance (Demanding Level of Study Programme)

	Competence 1		Competence 2		Competence 3		Competence 4		Competence 5		Competence 6	
	F	$\partial\eta^2$	F	$\partial\eta^2$	F	$\partial\eta^2$	F	$\partial\eta^2$	F	$\partial\eta^2$	F	$\partial\eta^2$
Austria	4.654††	0.012	7.415††	0.019	5.279††	0.014	**0.491**	0.001	**1.736**	0.005	**1.127**	0.003
Belgium	3.385†	0.011	**1.554**	0.005	**1.301**	0.004	**0.078**	0.000	**0.602**	0.002	2.169*	0.007
Czech Republic	3.366†	0.002	19.141††	0.013	11.244††	0.008	13.626††	0.009	11.087††	0.008	9.497††	0.006
Estonia	**0.331**	0.002	**1.867**	0.009	**0.958**	0.005	3.059**	0.015	**1.090**	0.005	2.404**	0.012
Finland	3.702†	0.006	17.397††	0.029	7.908††	0.013	3.610†	0.006	7.186††	0.012	5.121††	0.009
France	2.766**	0.008	5.594††	0.016	5.589††	0.016	2.816**	0.008	2.005*	0.006	3.945†	0.011
Germany	8.429††	0.022	4.764††	0.012	3.345†	0.009	**1.872**	0.005	**0.265**	0.001	**1.666**	0.004
Italy	3.598†	0.007	5.967††	0.011	**1.652**	0.003	3.580†	0.007	6.582††	0.012	4.378†	0.008
Japan	11.185††	0.020	8.236††	0.015	6.558††	0.012	4.172†	0.008	7.342††	0.013	12.557††	0.023
Netherlands	**0.739**	0.001	2.041*	0.003	**1.581**	0.002	**0.241**	0.000	2.167*	0.003	**0.673**	0.001
Norway	**1.396**	0.003	5.311††	0.011	**1.862**	0.004	2.076*	0.004	2.911**	0.006	4.444††	0.009
Portugal	**0.924**	0.006	4.133†	0.028	**0.450**	0.003	2.903**	0.020	2.819**	0.020	3.741†	0.026
Spain	7.041††	0.008	11.188††	0.013	8.211††	0.010	8.095††	0.009	4.725††	0.005	4.546††	0.005
Switzerland	9.038††	0.008	13.066††	0.012	8.297††	0.008	**1.668**	0.002	4.076†	0.004	4.166†	0.004
United Kingdom	1.980*	0.006	5.599††	0.016	4.405†	0.012	4.001†	0.011	4.848††	0.014	4.471††	0.013
	Competence 7		**Competence 8**		**Competence 9**		**Competence 10**		**Competence 11**		**Competence 12**	
	F	$\partial\eta^2$	F	$\partial\eta^2$	F	$\partial\eta^2$	F	$\partial\eta^2$	F	$\partial\eta^2$	F	$\partial\eta^2$
Austria	6.247††	0.016	4.922††	0.013	7.880††	0.021	6.047††	0.016	5.798††	0.015	12.045††	0.031
Belgium	**1.744**	0.006	3.110**	0.010	**1.884**	0.006	**1.722**	0.006	**0.497**	0.002	1.964*	0.007
Czech Republic	15.220††	0.010	14.932††	0.010	17.017††	0.012	22.304††	0.015	12.546††	0.009	29.362††	0.020
Estonia	3.285**	0.016	**1.875**	0.009	2.931**	0.014	4.623††	0.022	2.170*	0.010	**1.711**	0.008
Finland	10.000††	0.017	4.838††	0.008	11.845††	0.020	12.424††	0.021	7.980††	0.013	17.693††	0.029
France	6.929††	0.020	3.592†	0.010	6.323††	0.018	4.186†	0.012	3.639†	0.011	6.194††	0.018
Germany	7.767††	0.020	5.570††	0.014	**1.790**	0.005	7.925††	0.020	**1.618**	0.004	13.738††	0.035
Italy	2.534**	0.005	2.089*	0.004	5.643††	0.010	11.404††	0.021	5.297††	0.010	9.303††	0.017
Japan	8.584††	0.016	6.316††	0.011	11.730††	0.021	12.184††	0.022	8.538††	0.015	16.608††	0.030
Netherlands	**1.294**	0.002	3.517†	0.005	**1.408**	0.002	3.436†	0.005	3.740†	0.005	3.499†	0.005
Norway	4.514††	0.009	6.533††	0.013	3.869†	0.008	**1.095**	0.002	1.994*	0.004	6.725††	0.014
Portugal	1.986*	0.014	**0.651**	0.005	2.393**	0.017	5.511††	0.037	3.321**	0.023	8.312††	0.055
Spain	6.021††	0.007	14.793††	0.017	5.332††	0.006	6.854††	0.008	8.830††	0.010	9.336††	0.011
Switzerland	11.682††	0.011	4.698††	0.004	2.973**	0.003	17.665††	0.016	5.557††	0.005	7.894††	0.007
United Kingdom	2.551**	0.007	2.969**	0.008	5.031††	0.014	7.623††	0.021	5.024††	0.014	3.517†	0.010

Values in bold – $(p>0.100)$ – No; * – $(p\leq0.100)$ – Marginal; ** – $(p\leq0.050)$ – Fair; † – $(p\leq0.010)$ – Good; †† – $(p\leq0.001)$ – Excellent

Table 38: Kruskal-Wallis Test (Demanding Level of Study Programme)

	COMPETENCE											
COUNTRY	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Austria	29.615††	23.675††	25.781††	**1.164**	**4.585**	**1.714**	16.222†	**4.448**	22.343††	33.896††	26.562††	31.413††
Belgium	20.905††	10.026**	**6.843**	**0.852**	**1.852**	**2.562**	**3.530**	**4.695**	**4.528**	19.051††	**5.677**	13.774†
Czech Republic	15.335†	54.500††	44.181††	10.458**	31.344††	**2.951**	37.177††	40.583††	36.539††	57.606††	23.076††	77.791††
Estonia	**2.585**	7.885**	**2.799**	**7.416**	**5.057**	7.851*	9.765**	**4.872**	10.619**	18.346††	7.909*	**7.605**
Finland	21.682††	70.742††	21.230††	15.717†	50.159††	40.198††	44.324††	13.813†	45.971††	118.413††	40.824††	56.082††
France	11.584**	31.207††	35.708††	16.682†	8.787*	20.692††	32.367††	25.129††	35.840††	26.795††	17.905††	31.283††
Germany	60.862††	32.537††	**6.525**	**3.109**	**6.356**	**5.513**	28.308††	12.139**	9.961**	83.525††	19.764††	38.270††
Italy	17.120†	22.767††	11.574**	14.427†	31.879††	14.557†	24.445††	12.152**	27.777††	48.438††	28.785††	44.953††
Japan	31.566††	42.237††	31.904††	24.571††	30.620††	40.520††	39.182††	27.213††	50.558††	44.221††	34.214††	77.778††
Netherlands	13.090**	16.910†	12.305**	**3.372**	24.759††	**3.509**	**4.913**	**5.828**	**6.396**	48.367††	32.737††	17.009†
Norway	39.642††	51.614††	**2.801**	**3.744**	22.822††	38.929††	18.740††	19.598††	16.913†	88.605††	12.485**	26.536††
Portugal	**2.440**	14.847†	**3.266**	12.942**	12.914**	13.500†	10.522**	7.904**	8.259*	31.210††	12.975**	33.100††
Spain	65.667††	59.180††	23.110††	27.428††	39.570††	26.805††	48.053††	33.42††7	10.130**	89.108††	49.886††	26.682††
Switzerland	74.728††	63.382††	39.536††	**6.484**	21.104††	22.423††	47.975††	12.318**	10.956**	93.993††	37.438††	24.380††
United Kingdom	9.738**	25.169††	16.141†	11.876**	26.077††	8.740*	12.469**	10.900**	23.805††	38.266††	21.078††	20.227††

Values in bold – $(p>0.100)$ – No; * – $(p\leq 0.100)$ – Marginal; ** – $(p\leq 0.050)$ – Fair; † – $(p\leq 0.010)$ – Good; †† – $(p\leq 0.001)$ – Excellent

This section contains the discussion of above mentioned results followed by the conclusion of the analyses we have done so far.

4.12. Discussion

We are studying the reliability of self assessment. The research question is given in the following:

> Is graduates' self assessment of their acquired level of competences reliable? If yes, to what extant?

Self assessment is often questioned for its subjectivity. We are interested to study its reliability. We looked into the data to find some objective information in order to develop research methodology suitable for our analyses. We come to see competences as it is our main focus of interest. On the basis of their mean values we selected 12 competences out of the set of nineteen included in the data set which we are exploiting in this study. Their selection has been detailed in the data section. We identified three variables which are believed to be operative in the acquisition process of these competences. Graduates' acquired level of competences is the response variables. The three variables which served as predictors are: "Field of Education", "Sublevel of Study Programme", and "Demanding Level of Study Programme". We include country and gender as control variables. All these variables have been discussed in detail in the data section above where we have also given the basic statistics.

We have used the information provided by the graduates about themselves. Data set could be questionable. We can't overlook the chances of biased self assessment. One straight forward response to this is that the respondents are qualified enough with a reasonable exposure to the world of work; moreover, there is no harm to them, apparently–neither academic nor professional–whatever their responses may be. Although, there are some other ways to gather such kind of information, however, the graduates themselves are the most direct source of information, we think, for such type of studies. Such objections are further reduced when researchers rationalise their methods and techniques; and try to reduce the bias, objectively. For example, besides asking about their acquired level of competence respondents are asked about their corresponding required level in the labour market; and bias is further reduced if they are questioned about their study programmes characterised with certain set of competences. The responsibility still rests on the shoulders of the researcher that he should manage for these issues while statistically analysing the data, so that the final outcome could be of improved quality.

We are persuaded to put Popper's characteristic criterion of falsifiability to our present situation. Rationally, it is useful to accept a (well-tested) theory as true until it is falsified because well-tested theories could also be questioned. "No matter how many times the results of experiments agree with some theory, you can never be sure that the next time the result will not contradict the theory", (Stephen Hawking, 1988). According to Karl Popper, a theory is scientific only in so far as it is falsifiable, and should be given up as soon as it is falsified. "The theories are passed on, not as dogmas, but rather with the challenge to discuss them and improve upon them", says Popper (1963). In our situation, judiciously, it is pragmatic to accept the reliability of self assessment if at least something contradictory does not come out

of our analyses. It should be acceptable, in Popperian terms, until it is falsified. In addition to this, the falsifiability of a theory lends her scientific elevation.

We have developed a two stage methodology in order to respond our research question. At first stage ordered probit is run 12 times for 12 competences (separately for each competence) with these three independent variables (along with the control variables) and parallel to this OLS regression is also employed for the same set of variables. Stata as a software for statistical analyses is found suitable for this. The purpose of this double regression technique was to compare their outputs. We leave for curious statisticians and econometricians to investigate the statistical comparison of corresponding coefficient estimates resulted from ordered probit and OLS regression.

We have noticed that corresponding coefficient estimates of ordered probit and OLS regression resemble each other to a high extent in their levels of significance. They do differ sometimes, but this difference is restricted to their immediate significance levels. We have defined four levels of significance, just to elucidate the situation. This resemblance of highest degree is remarkable. Logically, it permits us to rely upon the outputs given by OLS regression as well, which is not advised to rely upon under usual circumstances with the type and set of variables we are dealing with. As a digression we mention that prime difference between ordered probit and OLS regression is that of cardinal and ordinal values of the numbers. Former considers the ordinal values of the numbers whereas the later takes their cardinal values into consideration in their operations. We have previously discussed this in detail in the analyses section.

Startling similarity in the levels of significance of the coefficient estimates produced by ordered probit and OLS regression became the pretext to go for the analyses of variances.

Inter-groups-variances are expected to be larger than intra-groups-variances. This is the research hypothesis of this study. We intend to check our hypothesis through the analyses of variances; but we find it useful to elaborate ordered probit output with an argument of different conceptual orientation. Let us discuss the three predictors in the following. “Field of education” and “Sublevel Study Programme” are objective parameters whereas “Demanding Level of Study Programme” is subjective in its disposition.

We observe a hierarchy in different categories of graduates on the basis of field of education. For example, ceteris paribus, health professionals fall next to social scientists which in turn are next to mathematicians and computer scientists in this hierarchical order regarding the acquired level of *Ability to use computers and the internet* (Competence 1) and *Analytical Thinking* (Competence 10). It is necessary to remember that this ranking is relative only. In simple words, mathematicians and computer scientists have acquired higher ability to use computers and the internet (and analytical thinking) compared to social scientists and social scientists have got higher ability to use computers and the internet (and analytical thinking) compared to the health professionals. This is what one may expect and it is quite acceptable on logical grounds. “Field of education” provides us an objective measure. Graduates’ self assessment appears to be reliable if graduates’ subjective opinion is in accordance with the objective measure of “Field of education”. Narrating otherwise, at least, it is not defective logically.

Graduates who followed a (sublevel) study programme providing direct access to doctorate, ceteris paribus, have higher probability of having acquired and a lower probability of not having acquired greater level of *Ability to write reports, memos or documents* (Competence 6) and *Analytical Thinking* (Competence 10). It appears logical as we have observed in the

"Field of education", previously. Graduates expected to continue to doctorate should have possessed of relatively higher level in these competences for better accomplishment of their future chores. They should know better the science and art of writing the dissertation. We believe that writing a dissertation is both a science as well as an art. It is a science in the sense that it urges to rationalise what is observed or could be perceived. It demands apt observation, logical perception, rationalistic approach, critical thinking etc. etc. It is an art to present what you have accomplished. It is an art how to question, how to answer, how to write and how to juxtapose various entities of different colours in order to produce something different in tinge and texture.

Demanding level of study programme is an ordinal variable. It is subjective in the sense that the graduates (themselves) are to rate their study programme to what extent it was regarded as demanding. If we take this subjective opinion reliable, it is interesting, however, that the graduates who followed more demanding study programmes have acquired higher level of certain competences. Nevertheless, truthfulness of this finding is favoured by virtue and convention. We observe that this predictor gives fairly regular patterns in competence acquisition level; however, this is charged with subjectivity. These are the graduates who rated their study programmes; and again, these are the graduates who self assessed their competences. In the face of this multiplied subjectivity, graduates' assessment may become more suspicious. There is another side of the picture. It is likely that the graduates were not cautious to provide the information regarding these two variables which are apparently unrelated to one another; furthermore, the questions concerning these two variables are isolated in position in the questionnaire. Despite these differences in character and location, these variables have been found coherent to what it is believed and observed in real practical situations. Coherence could be marked easily in graduates' opinion (assessment) at two

different points of enquiry. Both of the two are contributing to make up the same picture from different angles independently. We have not found any contradiction in the information provided by these two different sources. This marked coherence lends greater reliability to graduates' responses all through the process of enquiry.

Although a good discussion can be provoked on the interpretation of country and gender estimates mentioned in the tables above, but we leave this for the moment; for they are included in the model as control variables only. Reader may look into for their interest. For all three predictors it is observed that the findings are in coherence with theory as well as practice. No grave absurdity has been traced in ordered probit analyses which could affirm, in Popperian terms, the reliability of self assessment of the graduates.

The surprising similarity between the levels of significance of two analyses encourages us to rely upon the results of OLS regression with relatively greater confidence. We can proceed to calculate ANOVA; and we think, apparently, there is no harm at all in doing so. Our hypothesis is that the inter-groups variances are greater than the intra-groups variances. We have employed General Linear Model (GLM) for multivariate analyses in SPSS. We have calculated this for all fifteen countries. "Sublevel of Study Programme" and "Demanding Level of Study Programme" are not found as good as we imagined to begin with in explaining the variances in the dependent variables i.e. competences. Although we found them not very much supportive, however, we consider them positive, to accept our research hypothesis and to reject the null hypothesis. "Field of Education" is found as good as we were expecting earlier to explain the variances in the dependent variables i.e. competences. We consider it very encouraging while rejecting the null hypothesis in favour of our research hypothesis.

It is palpable (from F statistic as well as partial eta squared statistic) that the distinct graduates' intra-group homogeneity is retained; and it is reflected in their self assessment of transversal competences. This twofold homogeneity lends reliability, however modestly, to their self assessment. Two competences, namely, 'analytical thinking' and 'ability to use computers and the internet' are found to be significant among the graduates of all fifteen countries.

Kruskal-Wallis (nonparametric ANOVA) statistic reflects more favourable results than conventional ANOVA statistic. We have calculated this for all fifteen countries using the 'Field of Education' and 'Demanding Level of study Programme' as the grouping variables. For 'Sublevel of study Programme' we calculate Mann-Whitney (U) statistic because this variable has only two subcategories. In brief, through all these analyses we come to find the results which are not contradictory to our hypothesis. Accordingly, in Popperian terms, the self assessment of acquired competences by the graduates is said to be reliable.

Summing up the analyses of variance for 12 competences with respect to three variables (gender, as control, was the fourth one), one may say that all the three variables are found useful in explaining the variances in the dependent variables i.e. competences. In rather simple words, these variables reveal that the graduates are homogeneously distributed within their respective subcategories and each subcategory may have retained distinct subset of the graduates. Making use of statistical techniques and including some objective information we feel confident, in Popperian terms, to rely upon graduates' self assessment of competences.

4.13. Conclusion

Our main concern in this discourse is about the reliability of self assessment, if it does exist. Self assessment is often questioned for its subjectivity. We are interested to study its reliability. Whether it is reliable or not? If it is reliable, to what extent it is reliable? We are persuaded to put Popper's characteristic criterion of falsifiability in our study. In a nutshell, rationally, it is useful to accept a (well-tested) theory as true until it is falsified because well-tested theories could also be questioned.

It is presupposed that the graduates are homogeneously distributed within their distinct groups (and subcategories) on the basis of certain criterion i.e. *experience*. It is logical to believe in their intrinsic homogeneity in their respective subcategories. For example, graduates of social sciences are believed to possess a similar acquired level of competences as that of humanities but a different one than that of the graduates of physical sciences. Econometricians differ with managers in their acquired (level of) competences they procure during their education and training. But their mutual difference will always be less than those who got Health education. Similarly, a cardiac surgeon cannot be an alternative to an eye surgeon; however they do resemble more with each other in their acquired level of competences for their education and training, but they resemble to lesser extent with the economists as long as their acquisition level of competences are concerned. Briefly speaking, the graduates are believed to be representative of their respective subcategory, for example, field of education and training, in their acquisition level of competences. There will be intra-group homogeneity and inter-group heterogeneity among them. In other words, intra-group-variance will always be greater than inter-group-variance. Individual differences should not be overlooked in this logical supposition.

Once this intra-group-homogeneity is understood and considered, we go forward to deduce from our results of ordered probit (along with OLS regression) and ANOVA. If self assessment of, for example, physics graduates reflects homogeneity with respect to their acquired level of competences, it could be said that their self assessment is reliable enough. They do not have neither over- nor under-estimated their competences. We should not forget to make some allowance to individual differences of graduates.

Our basic model contains "Acquired Level of Competences" as the response variable along with three predictors: "Field of Education", "Sublevel of Study Programme", and "Demanding Level of Study Programme"; and two control variables: "Country" and "Gender". We run ordered probit and OLS regression in Stata environment. The purpose of this double regression technique was to compare their outputs. We have noticed that corresponding coefficient estimates of ordered probit and OLS regression resemble each other to a high extent in their levels of significance. "Field of education" and "Sublevel Study Programme" are objective parameters whereas "Demanding Level of Study Programme" is subjective in its disposition.

We observe a hierarchy in different categories of graduates on the basis of field of education. For example, ceteris paribus, health professionals fall next to social scientists which in turn are next to mathematicians and computer scientists in this hierarchical order regarding the acquired level of *Ability to use computers and the internet* (Competence 1) and *Analytical Thinking* (Competence 10). In simple words, mathematicians and computer scientists have acquired higher ability to use computers and the internet (and analytical thinking) compared to social scientists and social scientists have got higher ability to use computers and the internet (and analytical thinking) compared to the health professionals. "Field of education"

provides us an objective measure. Graduates' self assessment appears to be reliable if graduates' subjective opinion is in accordance with the objective measure of "Field of education". Graduates expected to continue to doctorate should have possessed of relatively higher level in these competences for better accomplishment of their future chores. It demands apt observation, logical perception, rationalistic approach, critical thinking etc. etc. Demanding level of study programme is an ordinal variable. If we take this subjective opinion reliable, it is interesting, however, that the graduates who followed more demanding study programmes have acquired higher level of certain competences. It is likely that the graduates were not cautious to provide the information regarding these two variables which are apparently unrelated to one another; furthermore, the questions concerning these two variables are isolated in position in the questionnaire. Coherence could be marked easily in graduates' opinion (assessment) at two different points of enquiry. For all three predictors it is observed that the findings are in coherence with theory as well as practice. No grave absurdity has been traced in ordered probit analyses which could affirm, in Popperian terms, the reliability of self assessment of the graduates.

Summing up the analyses of variance for acquired level of competences with respect to three variables (gender, as control, was the fourth one), we may say that all the three variables are found helpful in explaining the variances in the dependent variables i.e. acquired level of competences. In rather simple words, these variables reveal that the graduates are homogeneously distributed within their respective subcategories and each subcategory may have retained distinct subset of the graduates. Making use of statistical techniques and including some objective information we feel confident, in Popperian terms, to rely upon graduates' self assessment of competences.

Through the ordered probit analysis of data we observed that graduates' independent self assessment of competence acquisition level is more identical with that of the graduates of the same subcategory but very different from that of the graduates of the other subcategories. They have sustained their homogeneity predetermined upon certain criterion, for example, field of education and training; and have exhibited their intrinsic homogeneity in their self assessment of competence.

Startling similarity in the levels of significance of the coefficient estimates produced by ordered probit and OLS regression became the pretext to go for the analyses of variances. Inter-groups-variances are expected to be larger than intra-groups-variances. This is the research hypothesis of this study. We have employed General Linear Model (GLM) for multivariate analyses in SPSS. "Sublevel of Study Programme", and "Demanding Level of Study Programme" are not found as good as we imagined to begin with in explaining the variances in the dependent variables i.e. acquired level of competences. We consider it very encouraging while rejecting the null hypothesis in favour of our research hypothesis. It is palpable (from F statistic as well as partial eta squared statistic) that the distinct graduates' intra-group homogeneity is retained; and it is reflected in their self assessment of transversal competences. Question could be raised upon the use of ANOVA on the pretext of its unsuitability in the present case. To answer this we have also calculated Kruskal-Wallis (H) statistic and Mann-Whitney (U) statistic. Nothing was contradictory; rather, more favourable results were noticed through these analyses.

This twofold homogeneity lends reliability, however modestly, to their self assessment. The conclusion drawn on the basis of analysis of variance is in agreement with that of the ordered

probit analysis. Two competences, namely, ‘analytical thinking’ and ‘ability to use computers and the internet’ are found to be significant among the graduates of all fifteen countries.

CHAPTER 5

RELIABILITY OF ASSESSMENT OF REQUIRED COMPETENCES BY THE KNOWLEDGE WORKERS

Reliability of Assessment of Required Competences by the Knowledge Workers

SUMMARY

This chapter, like previous, also deals with the question of reliability of assessment of competences, but this time required competences are under study. Required competences have been assessed by young knowledge workers in the labour market. Question is 'to what extent their assessment of required competences is reliable, if it is reliable'. We used the data set of Reflex project which was carried out under the 6th framework programme of European Union. We employed ordered probit, and OLS regression. Unlike previous chapter we have not calculated parametric and nonparametric analyses of variance because this time the nature of the variables selected for the analyses did not permit us for this. The analyses have been realised in SPSS and Stata. We employed coherence and consistency parameters in order to draw conclusions from our findings. We found nothing contradictory to our reliability hypothesis. We feel confident to say that knowledge workers' assessment of (required) competences is found to be, in Popperian terms, reliable to a modest extent. The fact that the respondents knew, at the time of survey, that they will not be harmed, could be regarded as a limitation to this study. We have explored only the required level of competences in this chapter.

5.1. Introduction

The aim of higher education is to sustain learning society (Dearing Report, 1997) where labour market relevant knowledge and skills as well as a set of personal competences are considered as crucial (Nijhof, 1998). The reason is that workers with sufficient and up-to-date competences are more productive and have more potential to remain employed (Buchel 2002). Labour market oriented competences are highly required and highly remunerated. Recent literature demonstrates heightened interest to study (acquired as well required) competences.

Although strong demand of competence in the labour market has been confirmed (Heijke and Meng, 2006), yet there are some concerns over the assessment of required competences. For a detailed account we would like to invite the inquisitive readers to consult the Reflex Working Paper 2 (Allen and van der Velden, 2005). This document discusses various aspects of acquired as well as required competences' assessment. We find a dual advantage to study the assessment of required competences. First, the main reason to support this method is a conviction that self-reported skill requirements are less prone to response bias than self assessments of own skills (Green, 2004), quote Allen and van der Velden (2005). Second, researchers like Allen and van der Velden (2005) think that it helps studying the self assessment of acquired competences. Some researchers have therefore proposed the use of self reported skill *requirements* in jobs as indicators of the actual skills of the holder of those jobs (see e.g. Green, 2004).

Previous chapter has a discussion over the self assessment of acquired competences by the graduates. This chapter examines the reliability of assessment of required competences by the

young knowledge workers. We would like to mention that the *higher education graduates* and the *young knowledge workers* are the same individuals in our data set. This is only the preferred use of the two expressions. We prefer to call individuals the *higher education graduates* while addressing the problem of self assessment of acquired competences; and the *young knowledge workers* while studying assessment of the required competences. We will be studying the reliability of assessment of required competences by the *young knowledge workers*. Following is the research question:

To what extant is knowledge workers' assessment of required competence reliable?

Reflex data set comprising about 40,000 graduates from fifteen countries is available for the analysis in order to provide the substance of statistical analyses in this part of the dissertation. We have given a short description of the data set of Reflex project earlier in chapter 4.

5.2. Selecting the Variables

First step in this endeavour is to identify the subcategories upon which knowledge workers are distributed. More precisely speaking, it is to find some common characteristics (*nature* and/or *experience*) in order to classify young knowledge workers. The *experience* concerning with their profession, we think, could be a reasonable criterion to categorise the young knowledge workers. We identify three variables directly related to this *experience* criterion. These are:

1. Total Monthly Income (in Euros)

2. Appropriate Education Level for Current Job

3. Time to be Expert in Current Job

These three variables provide us young knowledge workers' categorisation criteria. Total Monthly Income (in Euros) is continuous variable. We categorise this into eight subcategories. Appropriate Education Level for Current Job has four subcategories. Time to be Expert in Current Job had six categories but we merged first three categories (thus making total four subcategories) in order have more clear picture. The detail we will discuss in the ensuing paragraphs. We also include *gender* and *country* as control variables in this list.

The variable of main focus is *competence* which is considered as dependent variable. We have 19 competences in the data set. We select twelve of them. Young knowledge workers were asked to rate their competence level on a rating scale of seven. Next step is to describe all these variables.

5.3. Description of the Variables of Interest

Required level of competences as a variable is our major concern in this chapter. This variable has been recorded on a 7-point rating scale ranging from very low (represented by 1) to very high (represented by 7). It is discrete and ordinal. Young knowledge workers were inquired to rate the level of competences required for their current job. It is pertinent to mention that they were inquired a few years after their graduation. Since the selected subset-I comprising 12 competences showed the required level of competences declared or believed by the young knowledge workers in their current job. The variables mentioned above are characteristic to current job.

5.3.1 Total Monthly Income

Total Monthly Income (in Euros) was continuous variable. We made the following eight subcategories.

i. Monthly Income 1 (up to € 1000.99)

ii. Monthly Income 2 (€ 1001.00 – 1500.99)

iii. Monthly Income 3 (€ 1501.00 – 2000.99)

iv. Monthly Income 4 (€ 2001.00 – 2500.99)

v. Monthly Income 5 (€ 2501.00 – 3000.99)

vi. Monthly Income 6 (€ 3001.00 – 3500.99)

vii. Monthly Income 7 (€ 3501.00 – 4000.99)

viii. Monthly Income 8 (€ 4001.00 – 4500.99)

Following is the excerpt from the Reflex Master Questionnaire asking about monthly income of the individuals.

F7	**What are your gross monthly earnings?**	
	From contract hours in main employment	about |___|___|___|___|___| EURO per month
	From overtime or extras in main employment	about |___|___|___|___|___| EURO per month
	From other work	about |___|___|___|___|___| EURO per month

5.3.2 Appropriate Education Level for Current Job

Appropriate Education Level for Current Job has four subcategories.

i. Higher education level

ii. Same education level

iii. Low education level (lower level of tertiary education)

iv. Lower education level (below tertiary level)

We present here the excerpt from the Reflex Master Questionnaire which is related to this variable.

F8	**What type of education do you feel is most appropriate for this work?**	☐ PhD ☐ other postgraduate qualification ☐ master ☐ bachelor ☐ lower than higher education

5.3.3 Time to be Expert in Current Job

Time to be Expert in Current Job was categorised into following four subcategories. We have merged first three subcategories into one.

i. 2 Years to be expert (up to 2 years of experience)

ii. 5 Years to be expert (up to 5 years of experience)

iii. 10 Years to be expert (up to 10 years of experience)

iv. More Years to be expert (more than 10 years of experience)

Following is the excerpt from the Reflex Master Questionnaire for ‘Time to be Expert in Current Job’.

F10	How much time would it take for an average young knowledge worker with the relevant educational background to become an expert in this kind of work?	☐ 6 months or less ☐ 7 to 12 months ☐ 1 to 2 years ☐ 3 to 5 years ☐ 6 to 10 years ☐ more than 10 years

5.3.4 Gender

Here is the question about gender.

K1	Gender	☐ male ☐ female

5.3.5 Country

We have young knowledge workers from 15 countries in the data set we are using. Next section contains basic statistics concerning these variables.

5.3.6 Competences

Here is the list of 19 competences in section H1 of the Reflex Master Questionnaire (see the excerpt below). We are concerned with the B part of this question where required level in current work has been asked. Find the original excerpt of the questionnaire in the following.

H1 **Below is a list of competencies. Please provide the following information:**

. How do you rate your required level of competence?

. What is the required level of competence in your current work?

If you are not currently employed, only fill in column A

		A Required level	**B Required level in current work**
		Very low ⟷ very high	Very low ⟷ very high
		1 2 3 4 5 6 7	1 2 3 4 5 6 7
a	Mastery of your required field or discipline	☐☐☐☐☐☐☐	☐☐☐☐☐☐☐
b	Knowledge of other fields or disciplines	☐☐☐☐☐☐☐	☐☐☐☐☐☐☐
c	Analytical thinking	☐☐☐☐☐☐☐	☐☐☐☐☐☐☐
d	Ability to rapidly acquire new knowledge	☐☐☐☐☐☐☐	☐☐☐☐☐☐☐
e	Ability to negotiate effectively	☐☐☐☐☐☐☐	☐☐☐☐☐☐☐
f	Ability to perform well under pressure	☐☐☐☐☐☐☐	☐☐☐☐☐☐☐
g	Alertness to new opportunities	☐☐☐☐☐☐☐	☐☐☐☐☐☐☐
h	Ability to coordinate activities	☐☐☐☐☐☐☐	☐☐☐☐☐☐☐
i	Ability to use time efficiently	☐☐☐☐☐☐☐	☐☐☐☐☐☐☐
j	Ability to work productively with others	☐☐☐☐☐☐☐	☐☐☐☐☐☐☐
k	Ability to mobilize the capacities of others	☐☐☐☐☐☐☐	☐☐☐☐☐☐☐
l	Ability to make your meaning clear to others	☐☐☐☐☐☐☐	☐☐☐☐☐☐☐
m	Ability to assert your authority	☐☐☐☐☐☐☐	☐☐☐☐☐☐☐
n	Ability to use computers and the internet	☐☐☐☐☐☐☐	☐☐☐☐☐☐☐
o	Ability to come up with new ideas and solutions	☐☐☐☐☐☐☐	☐☐☐☐☐☐☐
p	Willingness to question your required and others' ideas	☐☐☐☐☐☐☐	☐☐☐☐☐☐☐
q	Ability to present products, ideas or reports to an audience	☐☐☐☐☐☐☐	☐☐☐☐☐☐☐
r	Ability to write reports, memos or documents	☐☐☐☐☐☐☐	☐☐☐☐☐☐☐
s	Ability to write and speak in a foreign language	☐☐☐☐☐☐☐	☐☐☐☐☐☐☐

5.4. Basic Statistics

Above mentioned variables are described here through descriptive statistics.

Table 39: Percentages of variables of interest

S. No.	Variable	*n*	Percentage
	Country		
1.	Austria	1122	3.91
2.	Belgium	1049	3.66
3.	Czech Republic	5141	17.92
4.	Estonia	703	2.45
5.	Finland	1815	6.33
6.	France	1046	3.65
7.	Germany	1132	3.95
8.	Italy	1453	5.06
9.	Japan	1799	6.27
10.	Netherlands	2460	8.57
11.	Norway	1653	5.76
12.	Portugal	501	1.75
13.	Spain	2796	9.75
14.	Switzerland	4882	17.02
15.	United Kingdom	1138	3.97
	Total	**28690**	**100.00**
	Total Monthly Income (in Euros)		
1.	Monthly Income 1	5796	20.81
2.	Monthly Income 2	4140	14.86
3.	Monthly Income 3	3924	14.09
4.	Monthly Income 4	3453	12.40
5.	Monthly Income 5	3028	10.87
6.	Monthly Income 6	2268	8.14
7.	Monthly Income 7	1543	5.54
8.	Monthly Income 8	3699	13.28
	Total	**27851**	**100**
	Appropriate Education Level for Current Job		
1.	Higher education level	2680	9.51
2.	Same education level	20765	73.65
3.	Low education level	2577	9.14
4.	Lower education level	2171	7.70
	Total	**28193**	**100.00**
	Time to be Expert in Current Job		
1.	2 Years to be expert	15713	55.73
2.	5 Years to be expert	9140	32.41
3.	10 Years to be expert	2463	8.73
4.	More Years to be expert	881	3.12
	Total	**28197**	**100.00**
	Gender		
1.	Male	12799	44.81
2.	Female	15761	55.19
	Total	**28560**	**100.00**

These variables are: Country, Total Monthly Income (in Euros), Appropriate Education Level for Current Job, Time to be Expert in Current Job and Gender. Table 38 contains percentage participation of the knowledge workers being included in the analyses. We have excluded invalid observations. Total 28690 *knowledge workers* from all fifteen countries are included in the analyses. Male-female ratio is 45-55 percent respectively. Numbers of observations for rest of variables are about twenty eight thousand.

Table 39 describes the relevant variables through their basic statistics. For example, average income is about two thousand and three hundred Euros with a standard deviation of fifteen hundred Euros and mean time to be expert is observed to be three years with a standard deviation one year.

Table 40: Basic statistics of variables of interest

S. No.	Variable	n	$\bar{x}$	σ
1.	Country	28690	8.774	4.828
2.	Total Monthly Income (in Euros)	27851	2348.418	1552.624
3.	Appropriate Education Level for Current Job	28193	2.150	0.687
4.	Time to be Expert in Current Job	28197	3.180	1.259
5.	Gender	28560	1.552	0.497

Serial numbers in the tables are, in fact, the labels. These are described below:

Competences 1 – Ability to use time efficiently

Competences 2 – Ability to perform well under pressure

Competences 3 – Ability to use computers and the internet

Competences 4 – Ability to work productively with others

Competences 5 – Ability to make your meaning clear to others

Competences 6 – Ability to rapidly acquire new knowledge

Competences 7 – Ability to coordinate activities

Competences 8 – Mastery of your required field or discipline

Competences 9 – Ability to write reports, memos or documents

Competences 10 – Ability to come up with new ideas and solutions

Competences 11 – Analytical thinking

Competences 12 – Willingness to question your required and others' ideas

Appropriate Education Level for Current Job:

Higher education level

Same education level

Low education level (lower level of tertiary education)

Lower education level (below tertiary level)

Time to be Expert in Current Job:

We have merged three basic categories.

2 Years to be expert (up to 2 years of experience)

5 Years to be expert (up to 5 years of experience)

10 Years to be expert (up to 10 years of experience)

More Years to be expert (more than 10 years of experience)

Gender:

Male young knowledge workers

Female young knowledge workers

Reference Categories:

The Netherlands (for countries);

'Monthly Income 1 (up to € 1000.99)' for "*Total Monthly Income (in Euros)*";

‘Same education level’ for “*Appropriate education level for current job*”;

‘2 Years to be expert’ for “*Time to be expert in current job*”; and

‘Female’ young knowledge workers for “*Gender*”

5.5. Required Level of Competences

On the bases of young knowledge workers’ responses we calculated the mean values of competences for whole data. This table keeps mean values of all nineteen competences for total sample in descending order.

Table 41: Decreasing mean values with respect to “Required Level of Competence”

S. No.	Variable	n	$\bar{x}$	σ
1.	**Ability to use time efficiently**	**25846**	**5.578**	**1.326**
2.	**Ability to perform well under pressure**	**25851**	**5.553**	**1.403**
3.	**Ability to use computers and the internet**	**25851**	**5.449**	**1.453**
4.	**Ability to work productively with others**	**25846**	**5.414**	**1.436**
5.	**Ability to make your meaning clear to others**	**25843**	**5.382**	**1.371**
6.	**Ability to rapidly acquire new knowledge**	**25856**	**5.356**	**1.366**
7.	**Ability to coordinate activities**	**25842**	**5.350**	**1.435**
8.	**Mastery of your own field or discipline**	**25862**	**5.312**	**1.461**
9.	**Ability to write reports, memos or documents**	**25846**	**5.167**	**1.588**
10.	**Ability to come up with new ideas and solutions**	**25838**	**5.159**	**1.471**
11.	**Analytical thinking**	**25841**	**5.107**	**1.454**
12.	**Willingness to question your own and others' ideas**	**25843**	**4.942**	**1.474**
13.	Ability to mobilize the capacities of others	25839	4.772	1.626
14.	Ability to negotiate effectively	25850	4.708	1.771
15.	Ability to present products, ideas or reports to an audience	25842	4.692	1.777
16.	Alertness to new opportunities	25817	4.659	1.636
17.	Ability to assert your authority	25845	4.650	1.662
18.	Knowledge of other fields or disciplines	25845	4.231	1.495
19.	Ability to write and speak in a foreign language	25386	3.894	2.132

Mean values for the required level of competences are recorded in the table above. Competences have been rearranged in descending order of their mean values. We observe a cut point of four in the order of mean values in this table which is dividing the whole set of 19 competences into two subsets. One subset has its means more than, and the other less than, the cut point of five. Although there are eleven competences which have their mean values above the cut point but we select first 12 competences and name this as Subset-I. The other

one is named as the Subset-II. It is interesting to mention here that first 12 competences are same for both acquired as well as required competences when rearranged in descending order of their mean values; however, some of these twelve competences have been displaced in their order. In order to retain symmetry in our analyses of this chapter to that of the previous one, we prefer to chose these 12 competences. We believe that beauty lies in symmetry. We will use the Subset-I for further analyses.

5.6. Research Hypothesis

We assume that *young knowledge workers* with similar characteristic (i.e. *knowledge worker experience*) are homogeneously assigned to their respective subcategories. We expect that the *Knowledge workers* of the same subcategory will also reflect homogeneity in their independent individual responses concerning their assessment of required competences. Statistically speaking, their inter-group variances should be larger than that of the intra-group. The null hypothesis states that there is no difference among groups' variances.

> *H_0: Knowledge workers of different subcategories do not differ in their assessment of required competence level*

Whereas the alternative hypothesis states that

> *H_A: Knowledge workers of different subcategories do differ in their assessment of required competence level*

Subcategories of *knowledge workers* are homogeneous in the sense that they are distinct from other subcategories upon certain predefined criteria (i.e. *knowledge worker experience*).

Subcategories do have possessed of *knowledge workers* with similar characteristics within their respective subcategory. *Knowledge workers* of similar *knowledge worker experience* should have declared similar required level of competence. *Knowledge workers* in each subcategory are distinct and if their assessment of required competences is homogeneous within that very subcategory, then we can consider their assessment as a reliable source of information, until it is falsified.

5.7. Analyses

We continue to follow (almost) the same methodology as we did to analyse data for the reliability of self assessment of competences levels in the previous chapter. The variables described above to be used in the analyses in this chapter are of the nature that they do not permit us to go to calculate neither parametric nor nonparametric ANOVA. We will mention here the resulting coefficient estimates of ordered probit in comparison to OLS regression coefficient estimates. We will not be extending our analyses to the analyses of variances.

Ordered probit is run 12 times for each competence separately with same independent variables. Parallel to this OLS regression is employed for the same set of variables. The outputs of the two are presented in the following tables.

Table 42: Coefficient estimates from *ordered probit* and OLS Regression

	Competence 1		Competence 2		Competence 3		Competence 4		Competence 5		Competence 6	
	$\beta_{oprobit}$	β_{OLS}	$\beta_{oprobit}$	β_{OLS}	$\beta_{oprobit}$	β_{OLS}	$\beta_{oprobit}$	β_{OLS}	$\beta_{oprobit}$	β_{OLS}	$\beta_{oprobit}$	β_{OLS}
Austria	0.320††	0.324††	0.560††	0.616††	0.693††	0.842††	0.348††	0.355††	**- 0.021**	- 0.100**	0.557††	0.638††
Belgium	**0.030**	**0.022**	0.071*	**0.065**	0.104†	0.129**	**- 0.021**	**- 0.054**	- 0.147††	- 0.211††	0.115†	0.132†
Czech Republic	0.392††	0.424††	0.530††	0.634††	0.924††	1.141††	0.365††	0.401††	0.259††	0.271††	0.800††	0.960††
Estonia	0.223††	0.227††	0.486††	0.597††	0.589††	0.799††	0.349††	0.407††	0.398††	0.453††	0.457††	0.565††
Finland	0.129††	0.126†	0.171††	0.191††	0.387††	0.501††	**0.020**	**- 0.012**	**- 0.001**	**- 0.026**	0.310††	0.375††
France	0.147††	0.141†	- 0.072*	- 0.198††	0.074*	**0.023**	- 0.093**	- 0.205††	0.255††	0.256††	0.070*	**0.038**
Germany	0.288††	0.301††	0.518††	0.583††	0.359††	0.436††	0.186††	0.180††	**- 0.043**	- 0.112**	0.467††	0.555††
Italy	0.284††	0.271††	0.405††	0.423††	0.526††	0.666††	0.317††	0.324††	- 0.059*	- 0.161††	0.486††	0.558††
Japan	0.229††	0.214††	**0.038**	**- 0.011**	0.301††	0.375††	0.159††	0.141†	0.348††	0.358††	0.406††	0.482††
Norway	- 0.162††	- 0.226††	**- 0.028**	**- 0.053**	**- 0.012**	**- 0.053**	- 0.258††	- 0.428††	0.123††	0.121†	- 0.130††	- 0.182††
Portugal	0.218††	0.233††	0.323††	0.358††	0.612††	0.786††	0.208††	0.245††	0.369††	0.412††	0.337††	0.401††
Spain	0.202††	0.208††	0.206††	0.210††	0.299††	0.388††	0.219††	0.198††	0.367††	0.408††	0.285††	0.343††
Switzerland	- 0.056*	- 0.136††	0.189††	0.195††	0.243††	0.296††	**- 0.031**	- 0.100**	- 0.261††	- 0.394††	0.097††	0.090**
United Kingdom	0.371††	0.395††	0.285††	0.325††	0.374††	0.441††	0.321††	0.347††	0.345††	0.357††	0.124††	0.132†
Monthly Income 2	0.082††	0.104††	0.139††	0.192††	0.077††	0.105††	0.125††	0.176††	0.075††	0.094††	0.065†	0.080†
Monthly Income 3	0.074†	0.103††	0.174††	0.239††	0.112††	0.165††	0.143††	0.207††	0.086††	0.110††	0.063**	0.081†
Monthly Income 4	0.132††	0.184††	0.281††	0.392††	0.193††	0.295††	0.200††	0.295††	0.075†	0.107†	0.138††	0.178††
Monthly Income 5	0.151††	0.210††	0.315††	0.446††	0.226††	0.334††	0.229††	0.335††	0.163††	0.217††	0.162††	0.209††
Monthly Income 6	0.147††	0.199††	0.351††	0.483††	0.240††	0.356††	0.227††	0.335††	0.187††	0.253††	0.194††	0.249††
Monthly Income 7	0.179††	0.238††	0.354††	0.492††	0.322††	0.462††	0.208††	0.307††	0.188††	0.257††	0.240††	0.307††
Monthly Income 8	0.260††	0.345††	0.446††	0.609††	0.371††	0.529††	0.278††	0.416††	0.188††	0.266††	0.274††	0.363††
Higher education level	0.058†	0.050*	**0.020**	**0.020**	0.111††	0.135††	**0.017**	**0.015**	0.072††	0.078†	0.166††	0.194††
Low education level	- 0.131††	- 0.170††	- 0.105††	- 0.160††	- 0.110††	- 0.151††	- 0.142††	- 0.200††	- 0.199††	- 0.257††	- 0.216††	- 0.282††
Lower education level	- 0.349††	- 0.501††	- 0.237††	- 0.366††	- 0.425††	- 0.657††	- 0.275††	- 0.423††	- 0.528††	- 0.750††	- 0.535††	- 0.755††
5 Years to be expert	0.104††	0.132††	0.104††	0.138††	- 0.054††	- 0.065††	0.073††	0.101††	0.144††	0.176††	0.114††	0.147††
10 Years to be expert	0.189††	0.219††	0.195††	0.236††	- 0.134††	- 0.174††	0.144††	0.185††	0.244††	0.286††	0.171††	0.221††
More Years to be expert	0.220††	0.214††	0.251††	0.276††	- 0.205††	- 0.297††	0.203††	0.240††	0.380††	0.418††	0.182††	0.208††
Male	- 0.316††	- 0.372††	- 0.174††	- 0.202††	**0.005**	**0.007**	- 0.231††	- 0.287††	- 0.166††	- 0.188††	- 0.177††	- 0.212††
n	28028	28028	28033	28033	28033	28033	28028	28028	28025	28025	28038	28038
(Pseudo) R^2	0.0158	0.0478	0.0140	0.0437	0.0253	0.0761	0.0116	0.0356	0.0226	0.0720	0.0261	0.0832
$LR\chi^2(26)/F$	1382.26††	50.22††	1249.12††	45.73††	2316.79††	82.39††	1069.67††	36.89††	2054.37††	77.54††	2387.18††	90.77††

Values in bold – $(p>0.100)$ – No; * – $(p\leq 0.100)$ – Marginal; ** – $(p\leq 0.050)$ – Fair; † – $(p\leq 0.010)$ – Good; †† – $(p\leq 0.001)$ – Excellent

Table 43: Coefficient estimates from *ordered probit* and OLS Regression

	Competence 7		Competence 8		Competence 9		Competence 10		Competence 11		Competence 12	
	$\beta_{oprobit}$	β_{OLS}	$\beta_{oprobit}$	β_{OLS}	$\beta_{oprobit}$	β_{OLS}	$\beta_{oprobit}$	β_{OLS}	$\beta_{oprobit}$	β_{OLS}	$\beta_{oprobit}$	β_{OLS}
Austria	0.516††	0.634††	0.583††	0.632††	0.429††	0.583††	0.189††	0.193††	0.401††	0.460††	- 0.087**	- 0.182††
Belgium	**- 0.026**	**- 0.070**	0.097**	0.092*	**0.059**	**0.074**	**- 0.023**	**- 0.056**	**0.039**	**0.025**	- 0.075**	- 0.130**
Czech Republic	0.644††	0.818††	0.596††	0.671††	0.737††	1.042††	0.260††	0.303††	0.566††	0.736††	0.374††	0.468††
Estonia	0.373††	0.469††	0.173††	0.209††	0.331††	0.447††	0.322††	0.392††	0.525††	0.681††	- 0.107**	- 0.187†
Finland	0.150††	0.181††	- 0.157††	- 0.264††	0.067**	**0.067**	0.091†	0.090**	- 0.064**	- 0.112†	- 0.071**	- 0.134†
France	**- 0.041**	- 0.093*	- 0.094**	- 0.183††	**0.007**	**- 0.031**	- 0.219††	- 0.369††	0.198††	0.243††	- 0.204††	- 0.329††
Germany	0.408††	0.500††	0.491††	0.541††	0.397††	0.545††	0.153††	0.151†	0.194††	0.206††	**- 0.054**	- 0.124**
Italy	0.300††	0.325††	0.332††	0.375††	0.458††	0.636††	0.169††	0.157††	0.360††	0.444††	0.150††	0.138†
Japan	0.328††	0.392††	- 0.819††	- 1.315††	0.488††	0.703††	0.304††	0.345††	0.325††	0.400††	0.158††	0.169††
Norway	**- 0.051**	**- 0.068**	- 0.064*	- 0.081*	0.142††	0.219††	- 0.242††	- 0.363††	- 0.487††	- 0.720††	- 0.242††	- 0.358††
Portugal	0.231††	0.277††	0.117**	0.129*	0.312††	0.472††	**0.068**	**0.063**	0.170††	0.221††	**- 0.034**	**- 0.069**
Spain	0.248††	0.307††	0.098††	0.109†	0.423††	0.607††	0.212††	0.263††	0.095†	0.108†	**- 0.025**	**- 0.068**
Switzerland	0.098††	0.104†	0.097††	0.087**	0.262††	0.371††	- 0.050*	- 0.116†	0.119††	0.131††	- 0.146††	- 0.238††
United Kingdom	0.363††	0.432††	**- 0.030**	**- 0.071**	0.278††	0.369††	- 0.097†	- 0.188††	**- 0.015**	**- 0.053**	**- 0.023**	**- 0.075**
Monthly Income 2	0.099††	0.134††	**0.035**	0.056*	0.053**	0.088†	0.069†	0.101††	0.119††	0.160††	0.057**	0.089†
Monthly Income 3	0.120††	0.172††	0.068†	0.116††	0.089††	0.147††	0.080††	0.122††	0.206††	0.274††	0.111††	0.167††
Monthly Income 4	0.191††	0.268††	0.078†	0.146††	0.182††	0.298††	0.104††	0.167††	0.228††	0.316††	0.133††	0.208††
Monthly Income 5	0.238††	0.337††	0.066**	0.135††	0.265††	0.424††	0.161††	0.239††	0.305††	0.424††	0.180††	0.270††
Monthly Income 6	0.287††	0.403††	0.064**	0.122†	0.287††	0.466††	0.203††	0.304††	0.365††	0.520††	0.210††	0.314††
Monthly Income 7	0.283††	0.393††	0.096†	0.165††	0.206††	0.348††	0.200††	0.295††	0.458††	0.636††	0.217††	0.319††
Monthly Income 8	0.348††	0.490††	0.117††	0.192††	0.192††	0.324††	0.160††	0.247††	0.438††	0.620††	0.179††	0.271††
Higher education level	0.045**	**0.047**	0.180††	0.210††	0.187††	0.245††	0.158††	0.203††	0.190††	0.229††	0.149††	0.194††
Low education level	- 0.158††	- 0.228††	- 0.350††	- 0.498††	- 0.278††	- 0.428††	- 0.286††	- 0.400††	- 0.269††	- 0.365††	- 0.269††	- 0.381††
Lower education level	- 0.461††	- 0.700††	- 0.731††	- 1.111††	- 0.740††	- 1.206††	- 0.647††	- 0.980††	- 0.727††	- 1.067††	- 0.622††	- 0.935††
5 Years to be expert	0.103††	0.141††	0.207††	0.263††	0.111††	0.171††	0.106††	0.142††	0.149††	0.202††	0.141††	0.196††
10 Years to be expert	0.139††	0.184††	0.264††	0.331††	0.156††	0.227††	0.122††	0.160††	0.188††	0.250††	0.187††	0.256††
More Years to be expert	0.209††	0.241††	0.390††	0.467††	0.214††	0.278††	0.157††	0.179††	0.200††	0.237††	0.280††	0.360††
Male	- 0.251††	- 0.319††	- 0.140††	- 0.156††	- 0.140††	- 0.172††	- 0.044††	- 0.052†	0.082††	0.122††	- 0.061††	- 0.073††
n	28024	28024	28044	28044	28028	28028	28020	28020	28023	28023	28025	28025
(Pseudo) R^2	0.0187	0.0617	0.0465	0.1627	0.0252	0.0898	0.0171	0.0608	0.0314	0.1106	0.0189	0.0670
$LR\chi^2(26)/F$	1734.66††	65.69††	4336.22††	194.47††	2459.82††	98.65††	1640.77††	64.66††	3008.87††	124.34††	1840.52††	71.80††

Values in bold – $(p>0.100)$ – No; * – $(p\leq 0.100)$ – Marginal; ** – $(p\leq 0.050)$ – Fair; † – $(p\leq 0.010)$ – Good; †† – $(p\leq 0.001)$ – Excellent

The signs of the coefficient estimates allow the direction of change in the probabilities of the extreme outcomes only. Probabilities are relative to corresponding reference category.

Monthly Income has been reconstructed as an ordinal variable; previously it was continuous variable. As it is an objective parameter so we can rely upon this more (compared with the other two variables included in the analysis) for the required level of competences declared by the young knowledge workers. We select a subcategory with lowest income i.e. *Monthly Income 1* as a reference. Young knowledge workers from all the subcategories i.e. from *Monthly Income 2* to *Monthly Income 8*, ceteris paribus, have higher probability of having declared a requisition of and a lower probability of not having declared a requisition of greater level of almost all 12 competences in current job. This is exactly what we were expecting. By and large, monthly income coherently corresponds to the required level of competences. Theoretically, it is believed that higher requirement of competence level is better remunerated. Our results are in agreement to this belief. We have found coherence in theory and practice, which promotes also the suitability of the methodology we have employed. Unexpectedly, required level of competence 8 i.e. Mastery of your own field or discipline, contrary to other competences, reflected uneven coefficient estimates. This could be the case if job demands transversal (generic) competences more than the specific ones; and/or where higher salaries are not necessarily defined on the basis of specific competence (Garcia-Aracil et al, 2004 and Tiechler, 1999).

Highest income (more than four thousand Euros) group reflects that the competence 9 (Ability to write reports, memos or documents), competence 10 (Ability to come up with new ideas and solutions), competence 11 (Analytical thinking), and competence 12 (Willingness to

question your own and others' ideas) are not necessarily required in higher levels as compared to their immediate lower income groups.

We have observed similarity in the levels of significance of the coefficients of ordered probit and OLS regression for "Total Monthly Income (in Euros)".

Variable of "Appropriate Sublevel of Education for Current Job" has four subcategories. We chose "Same Education Level" as the reference category. Highly regular and coherent patterns (in theory and practice) are observed for the variable this variable. Young knowledge workers of subcategory "Higher Education Level", ceteris paribus, have higher probability of having declared a requisition of and a lower probability of not having declared a requisition of greater level of almost all 12 competences in current job. Young knowledge workers of both subcategories "Low Education Level" and "Lower Education Level", ceteris paribus, have lower probability of having declared a requisition of and a higher probability of not having declared a requisition of greater level of almost all 12 competences in their current job. In rather simple words we can say that young knowledge workers, who considered that higher education level (compared with reference category i.e. same education level) was appropriate for their current job, declared higher requirement of competence levels accordingly and vice versa.

"Appropriate Sublevel of Education for Current Job" is subjective in its nature. Because these are the young knowledge workers who are supposed to express what is the appropriate required level of education for their current job. However, young knowledge workers are found consistent in their two assessments at two different places. Their first assessment is about the appropriate education level and the second is the required level of competences.

Nevertheless, this assessment, which seems subdued with subjectivity, backs up their assessment's reliability.

Similarity in the levels of significance of the coefficients of ordered probit and OLS regression is observable for "Appropriate Education Level for Current Job".

We had six subcategories in the variable "Time to be Expert in Current Job". We reduced first three subcategories into one thus making four subcategories. We leave out the subcategory "2 Years to be Expert" for reference. This variable, although it is with subjective impression, is reflected also highly regular and coherent patterns (in theory and practice). Young knowledge workers from subcategory "5 Years to be Expert", ceteris paribus, have higher probability of having declared a requisition of and a lower probability of not having declared a requisition of greater level of almost all 12 competences in current job with respect to the reference category i.e. 2 Years to be Expert. Similar trends are observed for the rest of two subcategories '10 Years to be Expert' and 'More Years to be Expert'.

This variable is also subjective like the previous one. These are the young knowledge workers who are to report the required time to get hold of in their current job. In another section of the questionnaire they are rating the required level of the competences. This assessment is also considered subjective. When scrutinized in isolation, both of these questions could be considered as deprived of reliability on account of biasness likelihood. But the intrinsic subjectivity of their responses is minimised when they are juxtaposed. Their responses are found mutually consistent; and in addition to this their responses are coherent in theory and practice. In other words, novices believe in a fewer requirements of competence level compared with the old hands.

We have observed similarity in the levels of significance of the coefficients of ordered probit and OLS regression for "Time to be Expert in Current Job".

These observations are articulating what is in theory as well as practice. We can say that veracity of these observations could be reliable as these are found consistent to what is expected theoretically and what is observed practically. These results ceteris paribus are coherent to what is expected theoretically and what we observe through our analyses.

Although a good discussion can be provoked regarding the interpretation of country and gender estimates mentioned in the tables, but we leave this for they are included in the model as control variables. Reader may look into them for their interest.

The pseudo R^2 (often referred to as McFadden (1973) pseudo R^2) varies between 0 and 1. According to many authors (for example Greene, 2000) there is not natural interpretation of this statistic. However it is observed to be increasing as the fit of the model improves (Borooah, 2001). The χ^2 value, with excellent significant difference, helps us to reject the null hypothesis that our model does not have greater explanatory power than an "intercept only" model. We have not mentioned the cutoff points simply because here we do not intend to discuss them as we are not interested in them. We just overlooked this and come to compare ordered probit and OLS regression.

Most of the cases in the tables above are evident that corresponding coefficient estimates of ordered probit and OLS regression resemble each other to a high extent. They do differ sometimes, but this difference is restricted to their immediately next significance levels. We have defined four levels of significance just to give more illumination to the scene. Prime difference between ordered probit and OLS regression is that of cardinal and ordinal values of

the numbers which are used to rate the dependent variable. Former considers the ordinal values of the numbers whereas the later takes their cardinal values into consideration in their operations. Although, we have discussed this in some earlier paragraphs of this section prior to discuss the results, however, some deeper insight could be more productive.

We, as rational beings, are convinced to believe (or at least, consider) more in exactitude; and are attracted towards numbers' cardinal value. Moreover, as we know that their cardinal value includes the ordinal (too), we are, intrinsically, dragged more to believe in cardinality of numbers. Since the set of young knowledge workers we are investigating in this study does belong to same population of rational beings, therefore, has no exception. As a researcher we believe (this belief has been intensified through the above analyses) that despite (an imposed) restriction to consider numbers' ordinal value only, we could not help considering their cardinality. Thus young knowledge workers' ordinal consideration of numbers, we suspect, may have a tinge of cardinality. This could be the possible reason of startling resemblance in the significance levels of estimates of two different analyses mentioned above in the tables of ordered probit and OLS regression. This subconscious shift of young knowledge workers towards exactitude (ordinal cardinality of numbers) may have some positive conviction to what we intend to investigate (i.e. to what extent young knowledge workers' assessment is reliable?).

A resemblance of highest degree regarding the levels of significance (in coefficient estimates in the two models) is remarkable. Logically, it permits us to rely upon the outputs given by OLS regression as well, which is not advised to rely upon under customary circumstances i.e. the type and the set of variables we are dealing with. Hence, the uniqueness of our case is statistically proved and established. This surprising similarity in the levels of significance of

the two analyses encourages us to rely upon the results of OLS regression with relatively greater confidence. We can proceed to calculate ANOVA; and we think, apparently, there is no harm at all in doing so. Anyhow, we are looking forward for some insight from experts.

5.8. Statistical Comparison of OLS Regression and Ordered Probit

We think that some deeper insight is required to compare coefficient estimates of ordered probit and OLS regressions. This is not our main concern here. This could be of interest for statisticians and econometricians. Any contribution in this regard will be of high value, we believe. We propose this venture to the adventurous researchers.

5.9. Discussion

Monthly Income has been reconstructed as an ordinal variable; initially, it was continuous variable. As it is an objective parameter so we can rely upon it more confidently (compared with the other two variables included in the analysis) for required level of competences declared by the young knowledge workers. We select a subcategory with lowest income i.e. *Monthly Income 1* as a reference. The signs of the coefficient estimates allow the direction of change in the probabilities of the extreme outcomes only. Probabilities are relative to corresponding reference category. This subcategory contains young knowledge workers with lowest monthly income in our data set. The young knowledge workers who earn more than that of those in the reference category, ceteris paribus, have higher probability of having declared requisition of and a lower probability of not having declared requisition of greater level of almost all 12 competences in current job. By and large, monthly income coherently corresponds to the required level of competences. Theoretically, it is believed that higher

requirement of competence level is better remunerated. Our results are in agreement to this belief. We have found coherence in theory and practice, which promotes also the suitability of the methodology we have employed. Unexpectedly, required level of competence 8 i.e. Mastery of your own field or discipline, contrary to other competences, reflected uneven coefficient estimates. This could be the case if job demands transversal (generic) competences more than the specific ones; and/or where higher salaries are not necessarily defined on the basis of specific competence (Garcia-Aracil et al, 2004 and Tiechler, 1999).

Highest income (more than four thousand Euros) group reflects that the competence 9 (Ability to write reports, memos or documents), competence 10 (Ability to come up with new ideas and solutions), competence 11 (Analytical thinking), and competence 12 (Willingness to question your own and others' ideas) are not necessarily required in higher levels as compared to their immediate lower income groups.

We have observed similarity in the levels of significance of the coefficients of ordered probit and OLS regression for "Total Monthly Income (in Euros)".

Highly regular and coherent (in theory and practice) patterns are observed for the variable "Appropriate Education Level for Current Job". Young knowledge workers who declared that higher level education is required, ceteris paribus, have higher probability of having declared requisition of and a lower probability of not having declared requisition of greater level of almost all 12 competences in current job. Young knowledge workers who believe in lower education level as appropriate, ceteris paribus, have lower probability of having declared requisition of and a higher probability of not having declared requisition of greater level of almost all 12 competences in current job. In rather simple words we can say that young knowledge workers, who considered that higher education level (compared with reference

category i.e. same education level) was appropriate for their current job, declared higher requirement of competence levels accordingly and vice versa.

Similarity in the levels of significance of the coefficients of ordered probit and OLS regression is observable for “Appropriate Education Level for Current Job”.

Highly regular and coherent (in theory and practice) patterns are observed for the variable “Time to be Expert in Current Job”. Young knowledge workers from subcategory ‘5 Years to be expert’, ceteris paribus, have higher probability of having declared requisition of and a lower probability of not having declared requisition of greater level of almost all 12 competences in current job with respect to reference category i.e. 2 Years to be expert. Similar trends are observed for rest of two categories ‘10 Years to be expert’ and ‘More Years to be expert’.

We detect similarity in the levels of significance of the coefficients of ordered probit and OLS regression for “Time to be Expert in Current Job”.

There is another side of the picture. Coherence could be marked easily in young knowledge workers’ assessment at two different points of enquiry. This marked coherence lends reliability to young knowledge workers’ responses all through the process of enquiry. If we take this subjective opinion reliable, it is interesting, however, that the young knowledge workers who followed more demanding study programmes have required higher level of certain competences. Truthfulness of this finding is favoured by virtue and convention.

These observations are articulating what it is in theory as well as practice. We can say that veracity of these observations could be reliable as these are found consistent to what is

expected theoretically and what is observed practically. These results ceteris paribus are coherent to what is expected theoretically and what we observe through our analyses.

Although a good discussion can be provoked regarding the interpretation of country and gender estimates mentioned in the tables, but we leave this for they are included in the model as control variables. Reader may look into them for their interest.

The pseudo R^2 (often referred to as McFadden (1973) pseudo R^2) varies between 0 and 1. According to many authors (for example Greene, 2000) there is not natural interpretation of this statistic. However it is observed to be increasing as the fit of the model improves (Borooah, 2001). The χ^2 value, with excellent significant difference, helps us to reject the null hypothesis that our model does not have greater explanatory power than an "intercept only" model. We have not mentioned the cutoff points simply because here we do not intend to discuss them for our required reason. We just overlooked this and come to compare ordered probit and OLS regression.

Most of the cases in the tables above are evident that corresponding coefficient estimates of ordered probit and OLS regression resemble each other to a high extent. They do differ sometimes, but this difference is restricted to their immediate significance levels. We have defined four levels of significance, if it is there, just to elucidate the situation. Prime difference between ordered probit and OLS regression is that of cardinal and ordinal values of numbers. Former considers the ordinal values of the numbers whereas the later takes their cardinal values into consideration in their operations. Although, we have discussed this in some earlier paragraphs of this section prior to discuss the results; however, some deeper insight could be more fruitful.

We, as rational beings, are convinced to believe (or at least, consider) more in exactitude; and are attracted towards numbers' cardinal value. In addition to this, as we know that their cardinal value includes the ordinal (too), we are, intrinsically, dragged more to believe in this property of numbers. Since the set of young knowledge workers we are investigating in this study does belong to same population of rational beings, therefore, has no exception. As a researcher we believe (we have observed in our analyses) that despite self imposed restriction to consider only the ordinal value of numbers we appear helpless to elope ourselves from considering their cardinal value. Thus young knowledge workers' ordinal consideration of numbers may have a tinge of cardinality. This could be the possible reason of startling resemblance in the significance levels of estimates of two different analyses mentioned above in tables. This subconscious shift of young knowledge workers towards exactitude (ordinal cardinality of numbers) may have some positive conviction to what we intend to investigate (i.e. to what extent young knowledge workers' assessment is reliable?).

In fact we run two different models, namely, OLS and ordered probit regression, retaining same variables to see the explained variance by the independent variables. Unfortunately, the suitable estimation model, i.e. ordered probit model, according to the nature of the data, is mute to tell us the required information. Juxtaposition of the two outputs better help us to decide which direction we should move in. We find surprising similarity between the outputs of ordered probit regression and OLS regression. We are least concerned with the interpretation of the coefficient estimates of the later model; however, a resemblance of highest degree regarding the levels of significance (of coefficient estimates in the two models) is remarkable. Logically, it permits us to rely upon the outputs given by OLS regression as well, which is not advised to rely upon under usual circumstances with the type and set of variables we are dealing with. Hence, the uniqueness of our case is statistically proved and

established. This surprising similarity between the levels of significance of two analyses encourages us to rely upon the results of OLS regression with relatively greater confidence.

5.10. Conclusion

This chapter discusses the reliability of assessment of required competences in the labour market by the young knowledge workers. We used Reflex data for doing the analyses presented in this chapter. We have exercised SPSS and Stata for statistical analyses.

We select three variables (income, time to be expert and appropriate education level) which appear to be closely related to the required competences. Assortment of competences has also been judiciously made. To address our reliability of competence assessment we follow the same logic as discussed in the previous chapter. In order to see the effect of these three variables upon the requisition of competences we run ordered probit (and OLS regression as well for making a comparison).

We find coherence as well as consistency in the results. Momentarily, there was no contradiction traced. 'Appropriate education level' and 'time to be expert' reflected hierarchical order in the required levels of competences. Although these variables are subjective, yet, express a very regular behaviour in our analyses. As there is not oddity found, we may maintain that the young knowledge workers have rightly assessed their required levels of competences. It is true if we apply the criterion of falsifiability.

Income as an independent variable in our analyses offered an objective measure to respond to our question. It mirrored a highly regular hierarchical pattern. We may say that high required competence level corresponds to high income and vice versa. We found this through

knowledge workers assessment of their required competences which is true in practical situation in the labour market. Again, applying the parameters of coherence and consistency, these findings relate that the assessment of required competences by the knowledge workers is reliable at least in Popperian terms. However we suggest further investigating this sturdy competence-earning relationship in more detail with greater care. This is what we are going to present in the next chapter. Coming to our concern in this chapter, we are not reluctant to accept our alternative hypothesis because we cannot accept its null counterpart at all.

> *H_A: Knowledge workers of different subcategories do differ in their assessment of required competence level*

In conclusion, young knowledge workers' assessment of competence, modestly speaking, has been proved to be reliable. We could think and propose competence as a measure of HC. We encourage some investigation in this direction and we ourselves would like to do this, subjected to the opportunity. We do invite researchers for this venture. We think that competence could be a valid measure of HC, but it is a long run objective. Anyhow it will be interesting to take the 'road not taken'.

CHAPTER 6

RELIABILITY OF COMPETENCE ASSESSMENT AND COMPETENCE-EARNING RELATIONSHIP

SUMMARY

To explore into the reliability of (self) assessment of (acquired as well required levels of) competences is the aim of present discourse. Data set came from the Reflex project. Simply, OLS regressions are carried out in Stata environment. We selected 'earnings' – an objective measure – to analyse their relationship with competences. Through this analysis we tried to examine reliability of (self) assessment of competences on the basis of coherence and consistency. We find Popper's falsifiability criterion very helpful in establishing the reliability. However, we propose further in depth analyses with other comparable data sets. Further analyses with some other relevant variables might be useful as well.

6.1. Introduction

It is not new to take competence(s) as an indicator for earnings. Roy (1951) says, "The distribution of earnings depends on certain 'real factors', i.e. the character of the distribution of various kinds of human skill and the state of technique existing in different occupations". Higher education graduates are believed to earn more, simply, because they are more competent. The difference in the earnings of two individuals with same degree and/or number of (successful) school years could be due to the difference in competence. We will see in the following lines that a number of researchers have investigated the relationship of competences and earnings. For example, Van Loo & Semeijn (2004) found that use of competences and level of competences are better predictors for wages of higher education graduates than importance of skills. However, we do neither intend to prove the competences-earnings relationship nor propose competence as an exquisite earnings determinant. Rather, we are going to make use of this sufficiently studied mutual relationship to study the reliability of competence evaluation. We exploit our data set to study competence-earnings phenomenon in a different way. Following is very brief survey of literature on competences-earnings relationship.

It was customary to calculate the stock of human capital by the total amount of school years. Hartog (2001) discusses the link between individual abilities, skills, schooling and earnings. He thinks that the economic significance of abilities, in terms of their effect on earnings prediction, is certainly not negligible. Quality of schooling is closely related to quality of work, or in simpler terms, to school leavers' success in the labour market. Semeijn et al (2006) suggest that educational competence of students is relevant for the quality of work (indicated by job level, horizontal mismatch and wages). For successful functioning and

development, Nijhof (1998) considered the labour market relevant knowledge and skills as well as a set of personal competences as crucial.

Both specific as well as generic competences have been investigated and some researchers (for example: Kang and Bishop, 1989; Campbell and Laughlin, 1991; and Mane, 1998) are inclined to merit specific competences, whereas some others (for example: Bowen, 1977; and Teichler, 1999) are in favour of the generic competences for their increased importance in the world of work. Researchers (like Teichler and Kehm, 1995; Garcia-Aracil et al, 2004; Busato et al, 2000; Heijke et al, 2002) are interested in the identification of more relevant competences for professional success; and to investigate new concerns about the accuracy of match between higher education and employment for better productivity both at individual and at collective level.

Although, Allen and van der Velden (2001) found only a small proportion of wage effects of educational mismatches accounted for by skill mismatches. However, Garci-Aracil and van der Velden (2008) discovered strong support for the assumption that the match between individual human capital competencies and the characteristics of the job does matter. Yet this domain is waiting for new invaders. Like other spheres, there is ample space for exploration in this area.

After a glance we come back to our concern. This brief note helps us presume the existing competences-earnings relationship as priori in order to study the reliability of competence (self) assessment by the higher education graduates (or young knowledge workers). Coherence and consistency are two parameters we rely upon in our discourse. If our analyses reveal the results and findings which are not only consistent but also coherent with other researchers' results and findings, then we may say that our objective is achieved. In other

words, if no contradictory revelation is marked through our analyses then, in Popperian terms, the reliability of (self) assessment of competences is affirmed. Previous pages are evident that we used pretty subjective measures in our earlier analyses but in present chapter we are using earnings variable in relationship with competences. We think this is an objective measure. This will make us able to draw rather objective inference.

Our goal in this discourse is to explore into the reliability of graduates (self) assessment of acquired as well as required competence level. The research question is formulated as under.

To what extent is graduates' (self) assessment of competences reliable?

6.2. Data

We are using the Reflex data set. It contains information about graduates some three to four years after their graduation. Concisely speaking, this data set offers about forty thousand observations from fifteen countries over the globe including Japan. But we have filtered out the observations for which no response had marked. After this filtration, the subset obtained from the original data set was also sufficiently large.

6.3. Methodology

There is a relationship between the earnings and the level of competences. Usually, higher competence level indicates higher earnings and vice versa. It is true for those graduates and competences for which higher education is required. This might not be a workable idea for non graduate occupations.

Graduates declared acquired level of competences after their higher education, as well as their reported required levels in the labour market is being studied in relationship with their earnings. In addition to this, we think, the difference in acquired and required levels could also be interesting to study. We analyse the data set for each of them. In order to study aforementioned three possible ways we formulate three research hypotheses. We develop a common model to test all three hypotheses.

Suppose that earnings (Y_i) are a function of various factors. We are considering only the level of competences and occupation titles as the independent variables, along with countries and gender as the control variables. Following is a general expression of this regression.

$$\ln Y_i = \beta_0 + \sum_1^j \beta_j X1_{ij} + \sum_1^k \beta_k X2_{ik} + \sum_1^l \beta_l X3_{il} + \sum_1^m \beta_m X4_{im} + \varepsilon_i \qquad (6.1)$$

X_i in this equation represents all the independent variables under consideration. These are country (*X1*), occupation (*X2*), competence (*X3*), and gender (*X4*). All these variables are explained briefly in the following paragraphs. Where βs represent the corresponding coefficients associated with the variable. An increase in the value of the factor for a particular graduate will rise the earnings if $\beta_k > 0$ and fall if $\beta_k < 0$. The error term is included to represent all the relevant factors left out of the equation and/or inaccurate measurements. Stata is used for this regression.

The variable *country* is included only as a control variable. There are fifteen countries in the data set. The Netherlands is a reference category. Other countries are Austria, Belgium, Czech Republic, Estonia, Finland, France, Germany, Italy, Japan, Norway, Portugal, Spain, Switzerland, and United Kingdom.

Occupation Title as a variable is included in the regression equation to see the earnings patterns for different occupations along with the competences. This variable may help to study the use of competence. Yet we have not gone deeper to fully uncover the operational effect of this variable merely because we are not attracted to study earnings' dynamics. The graduates were asked about their occupation on two places in the questionnaire. First, after graduation i.e. section D (Reflex questionnaire), First Job: What was your occupation or job title at that time? *(e.g. civil engineer, lawyer, assistant accountant, nurse)*; second, at the time of survey. See below:

F2	Please describe your current main tasks or activities. *(e.g. analysing test results, making diagnoses, teaching classes, developing a marketing plan)*	☐ the same as listed above for the first job ☐ other *(please specify)*:

For occupation titles, International Standard Classification of Occupation (ISCO) 1988 has been followed. There are 10 subcategories of occupations in our data set. We regroup first two subcategories which include *Armed Forces*, and *Legislators, Senior Officials, and Managers*; and rename it as *High Officials*. Second subcategory is *Professionals* which served as a reference in this regression analyses. Third one contains *Technicians and Associate professionals*. Fourth one is *Office Workers* (clerks). Next subcategory comprises *service workers, shop and market sales workers*, and *craft and related workers*. We rename this after regrouping as *Service and Craft Workers*. The second last subcategory also encloses two subcategories regrouped into one. These are *skilled agriculture and fishery workers*, and *plant and machine operators and assemblers*. We rename this as *Low Skilled Workers*. The last one is the *Other Workers*.

F7	**What are your gross monthly earnings?**		
	From contract hours in main employment	about |___|___|___|___|___|	EURO per month
	From overtime or extras in main employment	about |___|___|___|___|___|	EURO per month
	From other work	about |___|___|___|___|___|	EURO per month

Earnings are not normally distributed when we observe its histogram in our data set. We take logged earnings to normalise this variable. Following is the question about earnings. We use total monthly earnings from all sources.

H1	**Below is a list of competencies. Please provide the following information:** **. How do you rate your own level of competence?** **. What is the required level of competence in your current work?** *If you are not currently employed, only fill in column A*	**A Own level** Very low ⟷ very high 1 2 3 4 5 6 7	**B Required level in current work** Very low ⟷ very high 1 2 3 4 5 6 7
a	Mastery of your own field or discipline	☐ ☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
b	Knowledge of other fields or disciplines	☐ ☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
c	Analytical thinking	☐ ☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
d	Ability to rapidly acquire new knowledge	☐ ☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
e	Ability to negotiate effectively	☐ ☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
f	Ability to perform well under pressure	☐ ☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
g	Alertness to new opportunities	☐ ☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
h	Ability to coordinate activities	☐ ☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
i	Ability to use time efficiently	☐ ☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
j	Ability to work productively with others	☐ ☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
k	Ability to mobilize the capacities of others	☐ ☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
l	Ability to make your meaning clear to others	☐ ☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
m	Ability to assert your authority	☐ ☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
n	Ability to use computers and the internet	☐ ☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
o	Ability to come up with new ideas and solutions	☐ ☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
p	Willingness to question your own and others' ideas	☐ ☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
q	Ability to present products, ideas or reports to an audience	☐ ☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
r	Ability to write reports, memos or documents	☐ ☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐
s	Ability to write and speak in a foreign language	☐ ☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐

Competence is the most important variable in this analysis. We have explained the selection of 12 competences in previous chapters. We intend to use the same 12 competences in the present regression analyses. In first instance we are using the acquired level of competences and then we will include the required level of competence followed by the difference of (required – acquired) competences. Three regression analyses included in this chapter differ

only in this variable. The variable *gender* includes male and female. Female is a reference subcategory in this analysis. This variable, as mentioned earlier, is not more than a control variable in the analyses.

K1	Gender	☐	male
		☐	female

6.4. Basic Statistics

Here is description of the variables through their basic statistics. We have calculated this only for the valid cases. We have also merged certain subcategories for the sake of convenience.

Table 44: Country, Occupation Title, and Gender (Percentages)

S. No.	Variable	*n*	Percentage
	Country		
16.	Portugal	496	1.77
17.	Spain	2742	9.76
18.	Italy	1370	4.88
19.	France	1079	3.84
20.	Switzerland	4882	17.38
21.	Austria	1132	4.03
22.	Germany	1204	4.29
23.	Netherlands	2366	8.42
24.	Belgium	1067	3.80
25.	United Kingdom	1131	4.03
26.	Norway	1651	5.88
27.	Finland	1780	6.34
28.	Estonia	699	2.49
29.	Czech Republic	4741	16.88
30.	Japan	1751	6.23
	Total	**28091**	**100.00**
	Occupation Title		
9.	High Officials	2349	8.65
10.	Professionals	17003	62.61
11.	Technicians	5307	19.54
12.	Office Workers	1619	5.96
13.	Service and Craft Workers	661	2.43
14.	Low Skilled Workers	99	0.36
15.	Other Workers	119	0.44
	Total	**27157**	**100.00**
	Gender		
1.	Male	12532	44.82
2.	Female	15429	55.18
	Total	**27961**	**100.00**

Table 43 contains percentage share of subcategories along with the number of observations represented by '*n*'.

Table 45: Country, Occupation Title, Gender, and Earnings (Basic statistics)

S. No.	Variable	n	$\bar{x}$	σ
1.	Country	28091	8.689	4.793
2.	Occupation Titles	27157	2.346	0.945
3.	Gender	27961	1.552	0.497
4.	Earnings	27252	2376.355	1557.929

Table 44 holds some basic statistics for the variables 'Country', 'Occupation Title', 'Gender' and 'Earnings'. Young knowledge workers have shown their earnings with mean about 2376 and standard deviation about 1558.

Table 46: Competences Acquired Level (Basic statistics)

S. No.	Acquired Level of Competences	n_A	$\bar{x}_A$	σ_A
1.	Ability to use computers and the internet	27804	5.854	1.182
2.	Ability to rapidly acquire new knowledge	27809	5.650	1.067
3.	Ability to work productively with others	27803	5.601	1.099
4.	Ability to coordinate activities	27804	5.460	1.177
5.	Ability to perform well under pressure	27809	5.420	1.246
6.	Ability to write reports, memos or documents	27799	5.399	1.267
7.	Willingness to question your own and others' ideas	27801	5.387	1.166
8.	Ability to use time efficiently	27804	5.376	1.196
9.	Analytical thinking	27806	5.339	1.203
10.	Ability to make your meaning clear to others	27797	5.334	1.151
11.	Ability to come up with new ideas and solutions	27795	5.317	1.151
12.	Mastery of your own field or discipline	27819	5.300	1.069

Table 45 contains basic statistics for acquired competence level. Competences have been arranged in alphabetical order. The subscript "*A*" stands for acquired competence level. Mean values are greater than 5 and standard deviations are larger than 1. About twenty eight thousand graduates have calibrated their acquired level of competences at the time of graduation (some three to four years ago).

Table 46 depicts statistically some basic information about the self reported required level of competences in the labour market. Competences are in the same alphabetical order as these were in previous table. The subscript "*R*" stands for required competence level. Responding graduates are found lesser in number as compared to that in the table 45. This might be due to

the fact that all graduates do not have job, at least at the time of survey. Mean values are a bit smaller but standard deviations are somewhat larger in contrast with that of the table before.

Table 47: Competences Required Level (Basic statistics)

S. No.	Required Level of Competences	n_R	$\overline{x}_R$	σ_R
1.	Ability to use computers and the internet	27434	5.445	1.458
2.	Ability to rapidly acquire new knowledge	27439	5.360	1.369
3.	Ability to work productively with others	27429	5.418	1.439
4.	Ability to coordinate activities	27425	5.354	1.438
5.	Ability to perform well under pressure	27434	5.552	1.409
6.	Ability to write reports, memos or documents	27429	5.170	1.592
7.	Willingness to question your own and others' ideas	27426	4.942	1.479
8.	Ability to use time efficiently	27429	5.580	1.329
9.	Analytical thinking	27424	5.104	1.460
10.	Ability to make your meaning clear to others	27426	5.388	1.374
11.	Ability to come up with new ideas and solutions	27421	5.160	1.473
12.	Mastery of your own field or discipline	27445	5.313	1.468

Acquired competences levels as well as required competences levels are marked with increased levels (greater than 5 on a scale of seven) of competences. This reflects negatively skewed curves for both cases. For most of the competences we observe higher acquired competences levels than the corresponding required competences levels. It will be interesting to look at this aspect in detail. We will be doing this later in this discourse.

Table 48: Competences Net Level (Basic statistics)

S. No.	Net Level of Competences	n_N	$\overline{x}_N$	σ_N
1.	Ability to use computers and the internet	27421	-0.410	1.347
2.	Ability to rapidly acquire new knowledge	27425	-0.288	1.379
3.	Ability to work productively with others	27417	-0.183	1.344
4.	Ability to coordinate activities	27414	-0.107	1.367
5.	Ability to perform well under pressure	27424	0.132	1.406
6.	Ability to write reports, memos or documents	27414	-0.227	1.491
7.	Willingness to question your own and others' ideas	27414	-0.443	1.486
8.	Ability to use time efficiently	27415	0.203	1.477
9.	Analytical thinking	27412	-0.231	1.330
10.	Ability to make your meaning clear to others	27412	0.053	1.428
11.	Ability to come up with new ideas and solutions	27406	-0.156	1.472
12.	Mastery of your own field or discipline	27436	0.013	1.411

We have generated a new variable by subtracting above mentioned two competence levels (i.e. required competences levels minus acquired competences levels). In Table 47, given below, we explain basic analyses for this new variable. Consequently, numbers of

observations have been decreased further. Mean values (somewhat around zero) show that the curve is pretty normal. The subscript "*N*" stands for net competence level.

6.5. Data Analyses

Subsequent pages take account of the analyses we carried out. We have not yet mentioned the hypotheses. We will be doing so during the course of presenting the results from regression analyses in the ensuing paragraphs.

6.5.1. Acquired Level of Competence

It is logical to believe that the graduates with higher acquired levels of competences, ceteris paribus, earn more than their counterparts. We have uniquely tried to explore the reliability of self assessment of competences acquired levels through the graduates' reported earnings. We believe that the results are objective because we have introduced an objective measure of earnings (as a response variable in the regression equation); and in addition to this we have also incorporated occupation titles (as an independent variable) which is also an objective measure. Thus if graduates reporting higher acquired levels of competence do report higher earnings then we may say that their self assessment of competence is reliable. We would like to remind that this will hold only for those competences which are required in graduate occupations. Results are shown in the following table. Consistency and coherence are two hallmarks to let us believe in the reliability of self assessment.

Hypothesis 1: Earnings are function of acquired level of competence

We include acquired levels of competences and occupation titles in the regression equation as the predictors (country and gender, as usual, are the control variables), and logged earnings as a response variable.

Table 49: Regression analysis for Competence Acquired Level and Occupation Title

Variable	β	S. E.	t	VIF	1/VIF
Austria	**0.011**	0.015	0.72	1.46	0.68
Belgium	0.087††	0.015	5.68	1.40	0.71
Czech Republic	- 1.053††	0.011	-98.87	2.61	0.38
Estonia	- 1.051††	0.018	-58.79	1.28	0.78
Finland	0.074††	0.013	5.70	1.66	0.60
France	- 0.145††	0.015	-9.51	1.42	0.70
Germany	0.285††	0.015	19.33	1.47	0.68
Italy	- 0.398††	0.014	-28.24	1.52	0.66
Japan	- 0.130††	0.014	-9.16	1.94	0.52
Norway	0.412††	0.013	30.81	1.63	0.61
Portugal	- 0.626††	0.020	-30.62	1.20	0.83
Spain	- 0.433††	0.012	-36.42	2.05	0.49
Switzerland	0.467††	0.011	42.60	2.30	0.43
United Kingdom	0.068††	0.015	4.54	1.44	0.69
High Officials	0.170††	0.009	18.04	1.08	0.93
Technicians	- 0.050††	0.007	-7.37	1.12	0.89
Office Workers	- 0.186††	0.012	-15.82	1.23	0.81
Service and Craft Workers	- 0.250††	0.017	-14.79	1.05	0.95
Low Skilled Workers	- 0.291††	0.043	-6.80	1.01	0.99
Other Workers	- 0.404††	0.039	-10.43	1.02	0.98
Ability to come up with new ideas and solutions	- 0.014††	0.003	-4.94	1.80	0.55
Ability to coordinate activities	**0.005**	0.003	1.57	1.83	0.55
Ability to make your meaning clear to others	- **0.004**	0.003	-1.54	1.55	0.64
Ability to perform well under pressure	0.036††	0.003	14.27	1.56	0.64
Ability to rapidly acquire new knowledge	**0.005**	0.003	1.61	1.75	0.57
Ability to use computers and the internet	0.017††	0.003	6.78	1.40	0.72
Ability to use time efficiently	**0.002**	0.003	0.63	1.62	0.62
Ability to work productively with others	0.008†	0.003	2.95	1.51	0.66
Ability to write reports, memos or documents	**0.001**	0.002	0.61	1.38	0.73
Analytical thinking	0.032††	0.003	12.14	1.56	0.64
Mastery of your own field or discipline	- 0.014††	0.003	-4.76	1.47	0.68
Willingness to question your own and others' ideas	- 0.013††	0.003	-4.66	1.63	0.61
Male	0.205††	0.005	37.74	1.16	0.86
Constant	7.323††	0.023	317.15		

n = 26991; R^2 = 0.6455; F (33, 26957) = 1487.35††

Values in bold–$(p > 0.100)$–No; *–$(p \leq 0.100)$–Marginal; **–$(p \leq 0.050)$–Fair; †–$(p \leq 0.010)$–Good; ††–$(p \leq 0.001)$–Excellent

A female professional from the Netherlands is a reference. The results are quite favourable to what we have hypothesised. Knowledge workers from higher (lower) occupation categories are enjoying higher (lower) earnings with respect to the reference category i.e. *Professionals*; For example, the *High Officials* are earning more than the *professionals*. Steadily decreasing

patterns in the earnings of knowledge workers from the rest of occupations are obvious in the table. These findings are in coherence with those of the former researches. It is remarkable to note excellent significant difference in all the subcategories of occupation titles.

Acquired levels of competences show positive impact on earnings, in general, as we expected earlier. This is true for the most of the cases. Four competences have been observed deviating from this behaviour. These are: "*Ability to come up with new ideas and solutions*", "*Ability to make your meaning clear to others*", "*Mastery of your own field or discipline*", and "*Willingness to question your own and others' ideas*". One of these four (i.e. "*Ability to make your meaning clear to others*") is insignificant. Four more competences have been marked statistically insignificant. These are: "*Ability to coordinate activities*", "*Ability to rapidly acquire new knowledge*", "*Ability to use time efficiently*", and "*Ability to write reports, memos or documents*". Rest of five competences manifest statically significant difference (to excellent level) with positive coefficient estimates representing higher earnings for higher acquired levels of these competences. This is highly favourable to what we have hypothesised for this analysis. We are apprehensive of those competences which are statistically significant but include negative signs. These three competences are unsettling. Let us examine these competences in rather more detail.

These negative signs of competence coefficients with high statistical significant difference could be indicative of multicollinearity. The competences, most of the times, are found transversal and are likely to be used in various occupations more or less at equal extent of exercise. We suspect that this deviation is due to likely multicollinearity for the reason of transversality among various competences. We calculated correlations but got no useful information about the multicollinearity. For its statistical confirmation we applied formal tests

of multicollinearity i.e. variance inflation factor (VIF), or tolerance which is simply the reciprocal of VIF. Although there are no standard values to decide if there is multicollinearity, however, value of VIF more than 10 or of tolerance less than 0.1 is considered an indication of multicollinearity (Jeeshim and Kucc, 2002). According to this test, there is no multicollinearity found among the predictors. Values of standard errors are also not very large to determine multicollinearity; however, R^2 is quite high. Despite all this, it is suspected that multicollinearity could be operative therein to a certain extent in the negative signs of the competence level estimates. Acquired level of competence reflecting insignificance is not strange but the negative signed coefficient estimates are suspected. Apparently, we have no reason except to suspect multicollinearity.

Presuming likely multicollinearity, we went on for its correction. We used centring techniques to correct this multicollinearity. And then redid the analysis. It made no remarkable change. This remained useless. Then we used variable omission technique. We started checking one by one each competence with significant difference to see their effects upon the others. This technique also lent no substantial difference with that of the results of original regression.

This earnings regression helped us to study the reliability of self assessment of acquired level of competences on the one hand, and earnings distribution (as a by-product) among the occupation titles, on the other hand. We suspected that there is multicollinearity and tried unsuccessfully to correct this. We suggest checking the earnings regression for the required level of competences; and for the differences (required–acquired) of competence levels in order to better observe the effects of competence deficits and surpluses on the earnings.

6.5.2. Required Level of Competence

In practical situations in labour market it is observed that more demanding professions are highly remunerated. As a matter of fact, demanding professions require higher competence level. If a young professional realises that his/her occupation requires higher level of a competence and concurrently reports that he/she is getting high earnings then on the basis of coherence in these two different responses we may say that their assessment of required level of competences has proved to be, reliable. We will be relying always on the parameters of coherence and consistency to explore into the reliability of self reported required levels of competences. Following is the research hypothesis to be investigated in this part of the discourse.

Hypothesis 2: Earnings are function of required level of competence

Required levels of competences and occupation titles have been taken as the predictors (country and gender, as usual, are the control variables), and logged earnings as a response variable. Results of this regression analysis are shown in the following table.

As accustomed, a female young professional of the Netherlands is the reference in this regression analysis. Knowledge workers from lower earning occupation categories are attributed with lower earnings and those from higher occupation categories are enjoying higher earnings with respect to the reference category i.e. *Professionals*. *High Officials* are earnings more than *Professionals* which is quite logical. Other subcategories of occupation titles illustrate methodologically lesser earnings compared to *Professionals*. Excellent significant difference is marked all through the occupation titles. Trends in occupation titles

are concomitant with that of previous analysis. These are coherent to what it is in practical situations as well as discovered by other researchers.

Table 50: Regression analysis for Competence Required Level and Occupation Title

Variable	β	S. E.	t	VIF	1/VIF
Austria	**0.001**	0.015	0.10	1.47	0.68
Belgium	0.082††	0.015	5.40	1.40	0.72
Czech Republic	- 1.089††	0.011	-102.35	2.63	0.38
Estonia	- 1.075††	0.018	-60.28	1.29	0.78
Finland	0.060††	0.013	4.63	1.66	0.60
France	- 0.148††	0.015	-9.77	1.42	0.71
Germany	0.274††	0.015	18.60	1.48	0.67
Italy	- 0.418††	0.014	-29.79	1.53	0.66
Japan	- 0.201††	0.014	-14.48	1.86	0.54
Norway	0.410††	0.013	30.77	1.63	0.61
Portugal	- 0.640††	0.020	-31.45	1.20	0.84
Spain	- 0.443††	0.012	-37.46	2.05	0.49
Switzerland	0.463††	0.011	42.06	2.31	0.43
United Kingdom	0.066††	0.015	4.39	1.44	0.69
High Officials	0.172††	0.009	18.24	1.08	0.93
Technicians	- 0.043††	0.007	-6.36	1.13	0.88
Office Workers	- 0.159††	0.012	-13.43	1.26	0.79
Service and Craft Workers	- 0.209††	0.017	-12.19	1.08	0.93
Low Skilled Workers	- 0.250††	0.043	-5.85	1.02	0.98
Other Workers	- 0.317††	0.039	-8.15	1.03	0.97
Ability to come up with new ideas and solutions	- 0.010††	0.003	-4.06	2.21	0.45
Ability to coordinate activities	0.007†	0.002	3.17	1.82	0.55
Ability to make your meaning clear to others	**0.000**	0.002	0.04	1.69	0.59
Ability to perform well under pressure	0.028††	0.002	12.47	1.57	0.64
Ability to rapidly acquire new knowledge	- 0.008††	0.002	-3.30	1.84	0.54
Ability to use computers and the internet	0.020††	0.002	9.58	1.45	0.69
Ability to use time efficiently	- 0.010††	0.003	-3.71	1.86	0.54
Ability to work productively with others	0.008††	0.002	3.64	1.60	0.62
Ability to write reports, memos or documents	0.004**	0.002	2.19	1.49	0.67
Analytical thinking	0.030††	0.002	13.46	1.70	0.59
Mastery of your own field or discipline	**0.003**	0.002	1.46	1.43	0.70
Willingness to question your own and others' ideas	**0.000**	0.002	0.14	2.10	0.48
Male	0.211††	0.005	40.26	1.09	0.92
Constant	7.284††	0.018	413.04		

n = 26936; R^2 = 0.6486; F (33, 26902) = 1504.84††

Values in bold–$(p > 0.100)$–No; *–$(p \leq 0.100)$–Marginal; **–$(p \leq 0.050)$–Fair; †–$(p \leq 0.010)$–Good; ††–$(p \leq 0.001)$–Excellent

Required levels of competences show positive impact on earnings as we have observed in previous analysis for the acquired levels of competences. It is according to our expectation. This is true for, most of the cases. Four competences, namely, "*Ability to come up with new ideas and solutions*", "*Ability to rapidly acquire new knowledge*", and "*Ability to use time efficiently*" have been observed deviating. The competence "*Willingness to question your own*

and others' ideas" is found statistically insignificant. Other competences showing insignificant difference are "*Ability to make your meaning clear to others*" and "*Mastery of your own field or discipline*". Most of the competences reflect strong direct relationship with (logged) earnings as excellent significant difference is noted for a majority of them.

The competences with positive signs are clearly approving to what we have hypothesised in the beginning of this analysis. We are apprehensive of those competences which are statistically significant but encompass negative signs. These three competences are unsettling. Let us examine these competences in some detail.

We suspect again that there could be multicollinearity. After having found nothing out of correlations calculated for all of the variables included in the analysis, we applied tests of multicollinearity i.e. variance inflation factor (VIF), or tolerance (reciprocal of VIF). According to this test, there is no multicollinearity found among the predictors as the values of VIF are substantially less than 10. Values of standard errors are also not very large to indicate multicollinearity; however, R^2 is quite high.

In case of incoherence, multicollinearity becomes the only possible justification for the negative signs found with statistically significant estimates of competences. Following the earlier path, presuming the existence of multicollinearity, we went for its correction. We used centring techniques to correct this multicollinearity. This remained useless, as it did before. We converted to variable omission technique. We checked one by one each competence by including and excluding them. Nothing useful was found to better the previous regression results. However, this earnings regression helped us to study the reliability of assessment of required level of competences on the one hand, and earnings distribution (as a by-product)

among the occupation titles, on the other hand. We may say that their assessment of required level of competences has proved to be reliable, nonetheless, in low tones.

6.5.3. Net Level of Competence

We have studied the reliability of self assessment of acquired level of competences and assessment of required level of competences through their relationship with earnings in the preceding paragraphs. As we have the information of required level and acquired level by the same individuals, it is pertinent to study the difference of the required and acquired levels also. We create a new variable called 'net competence level' by subtracting the acquired from the required competences levels. Keeping the same model as we have used for acquired competences levels as well as required competences levels, we run the regression for the net competences levels. Hypothesis for this analysis is given here.

Hypothesis 3: Earnings are function of net level of competence

Net level of competence has been defined as the required level of competence minus the acquired level of competence. We incorporate the net level of competences and occupation titles in the regression equation as the predictors (country and gender, as usual, are the control variables), and logged earnings as a response variable. In the following table we present the regression results for the difference of competence level. The results are favourable to what we have hypothesised and are confirming the previous result. A female professional of the Netherlands is the reference in this analysis also. Knowledge workers from higher (lower) occupation categories are enjoying higher (lower) earnings with respect to the reference category i.e. Professionals. Only two competences ("*Ability to rapidly acquire new knowledge*" and "*Ability to use time efficiently*") are found to be with negative signs which are

significantly different. All the rest of significantly different competences are positively affecting the earnings. Very straight forward interpretation is that there is a positive relationship between earnings and competences. This is in favour of our hypothesis; and this is exactly what we have observed in case of earnings analyses of acquired as well as required competences mentioned previously.

Table 51: Regression analysis for Competence Net Level and Occupation Title

Variable	β	S. E.	t	VIF	1/VIF
Austria	0.050††	0.015	3.30	1.44	0.69
Belgium	0.083††	0.015	5.42	1.40	0.72
Czech Republic	- 1.059††	0.011	-99.79	2.55	0.39
Estonia	- 1.056††	0.018	-58.68	1.28	0.78
Finland	0.065††	0.013	4.98	1.65	0.60
France	- 0.156††	0.015	-10.21	1.41	0.71
Germany	0.311††	0.015	21.01	1.46	0.69
Italy	- 0.403††	0.014	-28.31	1.52	0.66
Japan	- 0.224††	0.014	-15.60	1.96	0.51
Norway	0.402††	0.013	30.04	1.61	0.62
Portugal	- 0.619††	0.021	-30.09	1.19	0.84
Spain	- 0.447††	0.012	-37.39	2.03	0.49
Switzerland	0.487††	0.011	44.08	2.25	0.44
United Kingdom	0.089††	0.015	5.88	1.43	0.70
High Officials	0.186††	0.009	19.59	1.07	0.94
Technicians	- 0.046††	0.007	-6.70	1.13	0.89
Office Workers	- 0.171††	0.012	-14.34	1.24	0.81
Service and Craft Workers	- 0.233††	0.017	-13.49	1.06	0.94
Low Skilled Workers	- 0.303††	0.043	-7.02	1.01	0.99
Other Workers	- 0.366††	0.039	-9.30	1.03	0.97
Ability to come up with new ideas and solutions	- **0.001**	0.002	-0.42	1.94	0.52
Ability to coordinate activities	**0.004**	0.002	1.61	1.73	0.58
Ability to make your meaning clear to others	**0.002**	0.002	0.74	1.54	0.65
Ability to perform well under pressure	**0.000**	0.002	0.05	1.44	0.70
Ability to rapidly acquire new knowledge	- 0.009††	0.002	-3.53	1.79	0.56
Ability to use computers and the internet	0.010††	0.002	4.51	1.33	0.75
Ability to use time efficiently	- 0.007†	0.002	-3.09	1.59	0.63
Ability to work productively with others	0.007†	0.002	3.06	1.46	0.68
Ability to write reports, memos or documents	0.005**	0.002	2.30	1.43	0.70
Analytical thinking	0.009††	0.002	3.80	1.72	0.58
Mastery of your own field or discipline	0.010††	0.002	4.63	1.33	0.75
Willingness to question your own and others' ideas	0.011††	0.002	4.89	1.75	0.57
Male	0.221††	0.005	41.97	1.06	0.94
Constant	7.667††	0.009	831.08		

n = 26900; R^2 = 0.6392; F (33, 26866) = 1442.61††

Values in bold–$(p > 0.100)$–No; *–$(p \leq 0.100)$–Marginal; **–$(p \leq 0.050)$–Fair; †–$(p \leq 0.010)$–Good; ††–$(p \leq 0.001)$–Excellent

However we discover that following four competences are insignificant while explaining the earnings as a function of net level of competences. These are: "*Ability to come up with new*

ideas and solutions", "*Ability to coordinate activities*", "*Ability to make your meaning clear to others*", and "*Ability to perform well under pressure*". We may infer from this analysis that earnings are the function of (net level of) competences.

The competences which are significant and possess negative signs are a matter of concern. On the pretext of suspected multicollinearity we compute correlations. This reflected no considerable information in this regard. Then we applied tests of multicollinearity i.e. variance inflation factor (VIF), or tolerance (1/VIF). According to this test, there is no multicollinearity found in this analysis, too. It could be suspected that there may be a very low level of multicollinearity which is not being identified through a statistical test. Although it is strange to believe; anyhow, we continue to think unless we come to find some logically true justification of it. Presumption of likely multicollinearity leads us to rectify this irregularity in the regression analysis. We used centring as well as the variable omission techniques; both, unsuccessfully.

Up to so far we have tried our level best to correct multicollinearity presupposing its probable occurrence on account of negative signed (highly) significant coefficient estimates of competences all through three aforementioned analyses. There could be the other side of the picture that there is no multicollinearity at all, as we have observed through the formal identification test for this. We cannot help discussing this.

Before going to further analyse the behaviour of strange competences let us pre conclude our findings for positive signed significant competences. These competences are found to reflect their factual behaviour in our data set. At least, we have found nothing contradictory for these competences. In Popperian sense of terms, it could be concluded that the assessment of these competences are reliable, however, to a realistic extent. We may generalise this conclusion for

the acquired level of competences as well as required level of competences. As a result this could be said that the self assessment of acquired level of competences and the assessment of self reported required level of competences are found reliable. However, apparently, there are some oddities in the results mentioned in the above tables. We intend to analyses these oddities in the following pages.

6.5.4. A Note on the Negative Coefficient Estimates of Competences

We think that it could be useful to study competence deficits and surpluses in this regard. In order to calculate the deficits and surpluses of competences we took the difference of mean values of acquired and required levels of competences. We present competences in the following table the deficits and surpluses of competence's levels.

Table 52: Deficits and surpluses of competences' levels

S. No.	Competences	$\bar{x}_A - \bar{x}_R$
1.	Ability to come up with new ideas and solutions	0.157
2.	Ability to coordinate activities	0.106
3.	Ability to make your meaning clear to others	-0.054
4.	Ability to perform well under pressure	-0.132
5.	Ability to rapidly acquire new knowledge	0.290
6.	Ability to use computers and the internet	0.409
7.	Ability to use time efficiently	-0.204
8.	Ability to work productively with others	0.183
9.	Ability to write reports, memos or documents	0.229
10.	Analytical thinking	0.235
11.	Mastery of your own field or discipline	-0.013
12.	Willingness to question your own and others' ideas	0.445

Subscript "*A*" and "*R*" refers to acquired and required levels of competences respectively. We see four competences are in deficit. Knowledge workers have declared that their acquired competence level in these four competences is less than the required level in the labour market. If review our previous results of the regression analyses mentioned above, this will reflect a new dimension.

"*Mastery of your own field or discipline*" is found to be in deficit. This competence has been marked among those acquired level of competences which are negatively significantly different in the analysis of acquired level of competences. Deficit in this competence is an evidence and justification for its negative sign. In rather simple terms we can say that this competence is acquired to a lesser level than to what is required in the labour market. And the knowledge workers think that they would have been earning more than their actual earnings if this competence be acquired, at least, up to the required level in the labour market. The competence "*Ability to use time efficiently*" appears to be in deficit. We may say that the negative sign in the net level of this competence is because of this deficit in it. And similarly, in the required level of competences this very competence has also been found negatively signed but significantly different only because of this reason. Whereas, we have observed in acquired level this very competence appears to be insignificant. Briefly speaking, we have found the deficit of this competence in accordance with the actual situation and there is nothing contradictory in our analyses. As nothing contradictory has been come out of the analyses, we may say that the assessment of this competence is also reliable. Other competence deficits are usually found insignificant in the foregoing analyses.

"*Ability to come up with new ideas and solutions*" is traced significant but with negative sign in the analysis of acquired as well required level of competence. Perhaps, this competence is not among those which are more demanding in terms of financial output in the labour market. Either this is not for knowledge workers at all or is less remunerated, at least, in the beginning of the career of young knowledge workers in labour market. Similar is the case with "*Willingness to question your own and other's ideas*". This competence is significant but with negative sign in its acquired level analysis; and this is insignificant when its required level is included in the analysis. This competence might also be not among those which are very

demanding in the labour market. Required level as well as net level of "*Ability to rapidly acquire new knowledge*" could also be regarded as of similar comportment.

Let us peep into the literature for clear guidance in this regard. Garcia-Aracil et al. (2004) comments, "*with respect to specialised competences, it is ironic, though not surprising, that jobs where specialised competences (that is, those related to field specific knowledge) were highly required but not better paid. It is likely that these are more traditional jobs, in many cases in the public sector, having lower salaries at least at the beginning of the career*".

Hause (1972) says, "*The relative slope of the logarithm of the earnings profile for high and low ability people is not obvious. A priori, initial earnings of people first entering the labour force could have a positive, zero, or negative simple correlation with ability. A positive correlation could indicate that those with higher ability are initially more productive and that employers can determine this fact at the time of hiring. A low positive or zero simple correlation between ability and initial earnings could reflect imprecise information.... A negative simple correlation between initial earnings and ability could arise if ability is a strong complement of on-the-job training which may be paid for by reduced initial earnings*".

These two citations are fairly explaining the situation we suspected for multicollinearity. Now we may state with confidence that there is no multicollinearity at all and the negative signs have their connotation.

6.6. Discussion

In previous chapters we try to study the reliability of self assessment of acquired levels of competences by the *graduates* and the reliability of assessment of required levels of

competences by the *knowledge workers*. The *graduates* and the *knowledge workers* are the same individuals. In fact, these are the individuals who were working in the labour market after their higher education. We prefer to use the word "*graduates*" when we are analysing their acquired level of competences, and the word "*knowledge workers*" when we are exploring their required level of competences.

Higher education has been widely studied in economic perspective. It is established that competence could be considered as a good earnings determinant, if measured objectively. Van Loo & Semeijn (2004) found that use of competences and level of competences are better predictors for wages of higher education graduates than importance of skills. The level of competence is pertinent to mention here as we are interested in it. In this chapter we continue to answer the same research questions (to which we tried to address in the previous chapters) but in a rather different way. This time we have selected an objective measure of earnings to study the reliability of (self) assessment of competences levels.

The research question is given in the following:

To what extent is graduates' (self) assessment of competences reliable?

The model we have used is very simple. It comprises simply OLS regression. We have regressed earnings against occupation titles and a subset of 12 competences. For occupation titles, International Standard Classification of Occupation (ISCO) 1988 has been followed. However, we have regrouped certain closely related subcategories for our convenience to explain the results. Selection of a subset of 12 competences has been explained in previous chapters.

Countries included in the analyses are: Austria, Belgium, Czech Republic, Estonia, Finland, France, Germany, Italy, Japan, the Netherlands, Norway, Portugal, Spain, Switzerland and the United Kingdom. Japan – a leading economy over the globe – is the only country out of European Union. It gives the data set an international dimension and lends our analyses a likely generalisability of global scale.

There are eight subcategories of occupation titles. The first subcategory "*High Officials*" contains "*Armed Forces*", and "*Legislators, Senior Officials, and Managers*". Second subcategory is "*Professionals*" which served as a reference in this regression analyses. Third one is "*Technicians*" which also includes "*Associate professionals*", besides technical workers. Fourth one is *Office Workers* (clerks). Fifth subcategory is "*Service and Craft Workers*". This comprises "*service workers, shop and market sales workers*", and "*craft and related workers*". The second last subcategory, "*Low Skilled Workers*", also encloses "*skilled agriculture and fishery workers*", and "*plant and machine operators and assemblers*". The last one is the "*Other Workers*".

We have run the OLS regression for acquired levels of competences, required levels of competences and net level of competences. Net level of competences is a newly created variable generated by subtracting required level of competences by the acquired level of competences. Four of 12 competences are observed with deficit. These are: "Ability to make your meaning clear to others", "Ability to perform well under pressure", "Ability to use time efficiently", and "Mastery of your own field or discipline". The rest of the competences are in surplus.

Country and gender have been included in the model as control variables. Our data set includes natural bifurcation of gender comprising male and female. We select female as a

reference. The Netherlands is a reference country. Earnings are logged in order to have normalised this dependent variable (of total monthly income) as usual.

Following are three research hypotheses addressed in this chapter.

1. Earnings are a function of acquired level of competences
2. Earnings are a function of required level of competences
3. Earnings are a function of net level of competences

We observe a quite regular pattern of earnings in occupations. Occupations lower in rank show lesser earnings with reference to "*Professionals*" and vice versa. They are evenly distributed in a hierarchical order. No deviation has been found at all. This lends credibility to our model.

Higher acquired competence levels are found to be better remunerated as it was expected earlier. This is quite logical to believe. Those graduates who have acquired higher competence level should have been getting higher earnings in the labour market. As this coherence in theory and practice has been reflected through our analyses so we may rightly pronounce that graduates' self assessment of their acquired level of competences is, modestly speaking, reliable.

Higher required competence level serves as a signal for a demanding job in the labour market. Demanding job entails higher earnings. Only those knowledge workers will be successful in (getting) such jobs who have acquired greater (or at least) compatible level of competence for a demanding job. In simple words, we may relate higher earnings with higher required competence levels. Our analysis is vividly tracing the same phenomenon. Our findings

coherent to theory and practice may relate to reliability of assessment of required levels of competences by knowledge workers. Higher earnings of employed knowledge workers establish higher requirement of competence levels on one hand and higher acquired competence levels on the other hand. Hence, this analysis not only addresses to the reliability of assessment of required competence levels but also to the reliability of assessment of acquired competence levels.

Net level of competences also confirmed the previous results. Positive relationship has been noted between net level of competences and earnings. Both required level of competences and acquired level of competences have been assessed by the same individuals. Net level of competences is resulted from these two variables. We found our results by and large favourable for each of above mentioned three research hypotheses. Our results are confirming to what other researchers (for example, Loo and Semeijn, 2004) had discovered.

Positive coefficient estimates of (acquired, required and net) levels of competences indicate positive relationship of them with the (logged) earnings. Such competences ensure higher earnings to knowledge workers. Whereas negative coefficient estimates are evidence of their negative relationship to the (logged) earnings. At first instance, we suspected for likely occurrence of multicollinearity. We tried to confirm it through correlation coefficients (not shown here) but it gave no favourable indication in this regard. Then we went for VIF (or tolerance) which is believed to check the collinearity in statistical terms. We have given VIF values for the predictors in the tables above. This parameter exhibited very low value (less than 3) as compared to the standard one (i.e. 10) which is not sufficient to establish if there is collinearity to disturb the regression model. Yet, presuming the likely existence of multicollinearity among the predictors (which we suspected for negative signs of coefficient

estimates) we continue to rectify this, although, this has not been confirmed statistically. We tried centring technique as well as variable omission technique. Despite all efforts we remain unsuccessful to rectify the presumed likely multicollinearity.

We found very useful to seek the guidance from earlier works. For example: "A negative simple correlation between initial earnings and ability could arise if ability is a strong complement of on-the-job training which may be paid for by reduced initial earnings. In this case, at some point the relative earnings of high ability people would have to rise more rapidly than those of people with less ability to make worthwhile the investment financed by reduced levels of initial earnings" (Hause, 1972).

We now come to discuss the coefficient estimates of competence levels with negative signs. One possible reason is competence deficit. We take "*Mastery of your own field or discipline*" as a sole example of competence deficit in our subset of 12 competences. Acquired level of this competence has shown negative coefficient estimate against logged earnings. This may be due to the fact that the individuals have acquired this competence less than the required level in the labour market; hence this competence is being remunerated but inferior to what was expected. We think it is pertinent to quote from Garcia-Aracil et al (2004): "*With respect to specialised competences, it is ironic, though not surprising, that jobs where specialised competences (that is, those related to field specific knowledge) were highly required but not better paid. It is likely that these are more traditional jobs, in many cases in the public sector, having lower salaries at least at the beginning of the career*".

Acquired level of "*Willingness to question your own and others' ideas*" has also been found among underpaid competences. Young knowledge workers are not being well paid for this competence; perhaps, they are not encouraged (in monetary terms) to exercise this

competence, at least, at the very outset of their career. Similar interpretation could be linked to "*Ability to come up with new ideas and solutions*" (for both acquired and required levels).

We have also traced that "*Ability to rapidly acquire new knowledge*" and "*Ability to use time efficiently*" possess negative coefficient estimates for their required as well as net levels. We do believe that these competences are not rewarded during the initial years of the young workers' professional life. This is in accordance to the findings of Garcia-Aracil et al (2004). They were dealing with a data set somewhat similar to Reflex dataset. They had eight broader groups of competences. They placed these two competences in a group named as *Organisational Competences*. According to them, "*organisational competences had a negative effect, which might indicate that these competences are not rewarded in the first years of a graduate's professional career*".

"*With respect to occupational titles, the model provides the expected evidence that individuals working in more demanding jobs had higher incomes*" (Garcia-Aracil et al, 2004) and "*female graduates earned less*" (Garcia-Aracil et al, 2004), are two more findings which have been noted analogous between our findings in present study and that of Garcia-Aracil et al (2004). These instances add to the credibility of our analyses. It has been viewed through the above analyses that there is coherence as well as consistency when compared with the results detected by the other researchers. Assessment of acquired as well as required (and net) levels of competences is objectively proved to be reliable. Stating this in other words we may say that the reliability of (self) assessment of (acquired as well as required levels of) competences by the graduates (or young workers) has been established.

6.7. Conclusion

Present discourse is elaborated with an ultimate objective of studying the reliability of (self) assessment of competences by the higher education graduates (or young knowledge workers). We do not intend to study earning differentials here. Rather, taking the advantage of already surveyed relationship of earnings and competences, we want to explore into the reliability of (self) assessment of competences.

Although this is a relatively newer sphere yet the literature holds a good number of studies on this theme. It is established that earnings are the function of (levels of) competences. We make use of this actuality to address our research objective. "Earnings are the function of (acquired, required, and net) levels of competences", form the research hypotheses. The data set for this discourse has been provided by the Reflex team. All the analyses have been undertaken with the help of Stata – statistical software. In our data set we have information about the levels of competences (self) assessed by the graduates. Coherence and consistency are two parameters we use to make final decisions. We are tempted to follow Popper's criterion of falsifiability. According to this criterion a theory is acceptable until it is rejected. In our analyses we have found nothing contradictory. If theses competences levels (self) assessed by the graduates reflect a behaviour similar to what other researchers have presented then we may say that this (self) assessment, in Popperian terms, could be reliable.

In a three phase analyses we come to conclude that the (logged) earnings are the function of (acquired, required and net) level of competences. The negative coefficient estimates are not the consequence of multicollinearity. The negative signs have their own connotation which we tried to discuss in detail in the preceding paragraphs. In addition to this we come to

confirm the hierarchical distribution of earnings among occupation titles (ISCED 1988) and lower earnings for females. All these analogous findings affirm the validity of our analyses to demonstrate the reliability of (self) assessment of competences as long as our data set is concerned. Although earning is an objective measure, yet the extent of reliability is modest in the sense that there are always a variety of factors involved in social strata; and it is difficult, if not impossible, to take account of all those factors.

Our findings may be of some interest for educationists, economists, administrators, policy makers, labour market stakeholders and higher education institutions. It could be useful to other researchers as well. It is remarkable that we remain stuck to one data set i.e. reflex data set, which contains mostly European countries. Japan is the only country in the data set which may lend it some global scale generalisability. There is ample space to include other variables from the same data set as it forms a large data base including a number of factors. Analyses including institutions, fields of study, parent education, partner education, area of residence, work organisation, job level, professional experience, etc. could reveal some useful pieces of information. It may be interesting to carry out a comparative study using other comparable data bases from same and/or different localities over the globe. One such data set is of CHEERS (Careers after Higher Education: a European Research Study).

CONCLUDING REMARKS

CONCLUSION

Herbert Spencer's "survival of the fittest" is evidently observable in this age of knowledge economy. Those who are competent enough will survive; and consequently will enjoy a continued progress. Question of survival is basic. One steps forward, once it is achieved. It is not only interesting but also necessary to learn the dynamics of competence in our global society. This research is all about the competences of higher education graduates confronting in the labour market which is becoming more and more competitive.

Among various methods oft quoted are the self assessment and the expert rating (chapter 6). It is perceptible that self assessment could be biased. Expert rating is another, apparently objective, tool but this too is of mixed reliability. This method may be considered as a good measure if (and only if) self assessment has obviously been compromised. Allen and van der Velden (2005) believe, "although it is plausible that expert ratings provide better data than other methods, the difference in data quality may not be as great as sometimes assumed". Researchers have revealed the potential strength of self assessment besides discussing potential hazards of this. Richter and Johnson (2001, cited by Allen and van der Velden, 2005) list a number of clear advantages of using self-assessments in social research. We have listed its advantages in chapter 6. A more detailed account is demanded, however. Allen and van der Velden (2005) launched a very convincing argument, "a more substantive advantage of self-assessment as a method of data-collection, namely the fact that individuals have access to information about themselves that outside observers may not be aware of". This argument appears attractive if we come to open the black box and, of course, let everybody know about the reliability of self assessment. Undoubtedly, it needs rigorous work. This was the pretext which caught our attention to study the "contributions and limitations of self assessment of

competences confronting in the labour market". It was fortunate to have immediate access to Reflex data base. We are indebted to reflex team for this provision. This data set comes out appropriate for this study.

It is logical as well as critical to investigate into the subtlety of the concept of competence. In first part of the dissertation we tried to probe into this subtle aspect. This part comprises three chapters. Chapter 1 is about the study of the definitional design of competence. Competence is defined differently by various experts and in various domains. In order to study the effects of competence it is recommended that one should have come to define it purposefully. Despite its importance, let alone as this not our concern here in this study. We study etymologically the term "competence". We found its roots in French literature long before it came in use in English literature. We propose to chose "competence" than "competency" merely for better congruity in English and French literatures. We also unskilfully conceived a unique representation of competence in a three dimensional space. To us it appears to be a vector which could be resolved in three complementary dimensions and even more than three like any vector representing a physical quantity. However, we realise the need to develop this idea because still it is immature. In chapter 2 we randomly studied competence dynamics over the globe. This helped us peep into international interest in competence. We have clearly observed the effects of internationalisation; however, we were not concerned to mention these effects. We may say in brief that the competences we have dealt with in this dissertation are of universal dimension. Competences being studied indifferently in various parts of the world have much of them in common. Chapter 3 provides backdrop to subsequent rigorous econometric analyses presented in the second part of the dissertation.

The research question is "*to what extent is the assessment of competence reliable?*" Endeavour to answer this question econometrically provided the substance for this part of the dissertation. Symmetrically, it also contains three chapters like that of the previous part. All of three chapters come in a logical sequence. Although we do not claim that this is the only logical sequence. Every chapter treats the same question from a different angle. Each one of them is distinct but at the same time appears to be contributing to a monolithic whole. Thus we can say that these are unique bits of a strange whole.

We disintegrate the research question in to two further, rather simple, questions given below:

1. *To what extent is the self assessment of acquired levels of competence by the higher education graduates reliable?*

2. *To what extent is the assessment of required levels of competence by the young knowledge workers reliable?*

Answer to question 1 produces chapter 4 and that of the 2 generates chapter 5. Two chapters highly resembling in form and construction address two separate questions mentioned above. We have avoided many details in the chapter 5 as these had already been given in the earlier chapter. Same individuals have been referred to as "*the higher education graduates*" in chapter 4 and "*the young knowledge workers*" in chapter 5. We used to do this on aesthetic grounds besides a rationalistic pretext. As, in chapter 4 we have presented the analyses for the reliability of the assessment of competences acquired in the academic setting. For this we have selected the variables which correspond to academic career of the graduates. In chapter 5, we have followed the same theoretical framework for analyses but with different variables. Individuals are "*the young knowledge workers*" as they are working in a labour market

characterised with knowledge economy. The variables used in this chapter do belong to labour market dynamics.

In chapter 4, comparison of coefficient estimates of ordered probit with those of OLS regression reflected startling similarity in their levels of significance. Suitable model we believed was the ordered probit. Similar findings have been observed in parametric and non parametric analyses of variance. We considered that non parametric analyses are appropriate in our case. There was observed internal consistency as well as coherence. These surprising occurrences may be of some interest to econometricians for further investigation. Anyhow, out of our analyses we found nothing incongruous or contradictory all through the process. We studied the reliability of the higher education graduates' self assessment of their competences acquired during their academic experience by the end of their higher education. This gave answer to the question 1, as below:

1. *the self assessment of acquired levels of competence by the higher education graduates is reliable, however, to a modest extent.*

Chapter 5, following the same footprints of the earlier chapter, presents a comparative view of coefficient estimates of ordered probit and OLS regression. This chapter studies the reliability of the knowledge workers' assessment of competences required in the labour market. Same resembling effects have been observed among the two coefficient estimates. The data type did not permit us rationally to go further for the analyses of variances. No contradiction or incongruities have been traced. Addressing to question 2 mentioned above, this chapter concludes with its answer given in the following:

2. *the assessment of required levels of competence by the young knowledge workers' is reliable, however, to a modest extent.*

However, we recommend replicating the analyses including some other (and more) variables in the analyses. Applying same methodology to other comparable data sets could also be beneficial for future ventures.

Chapter 6 assumes the responsibility to address to the same issue but in a different manner. We have mapped out researchers looking at the competence-earnings relationship and making successful inferences to explain earnings differentials. Taking the advantage of this reflection we checked our competences, not for earnings interpretation but for using this as *priori* in service of our basic research question. It worked well. However we suspected some multicollinearity and judiciously investigated into this aspect, concluding at the end that there was no multicollinearity at all. Here again we marked internal consistency in our findings and coherence of them with what it is in practical and real situations in the labour market.

Some researchers have therefore proposed the use of self reported skill *requirements* in jobs as indicators of the actual skills of the holder of those jobs (Allen and van der Velden, 2005 referred to Green, 2004). In this aspect the findings of chapter 5 are endorsing what have been inferred in chapter 4. Summing up the discourse we come to answer the principal research question, "*to what extent is the assessment of competence reliable?*" we may come back with what we have reached upon, is:

"The (self) assessment of competences is found to be reliable, however to a modest level"

However, we do not affirm that self assessment of competence is always a reliable measure. It could be, sometimes, more reliable; some times less reliable or even devoid of reliability. We do not suggest relying upon this blindly. It does not undermine our results prestige. This is just to be more careful. It looks apposite to relate from (Welch, 1975, p. 67) "My only justification for such a crude measure is that I can find nothing better". Summing up the discourse we recapitulate the findings of this project. Following conclusions have been made:

1. Concept of competence is not as simple as it appears to be.

2. Etymologically, the word 'competence' emerged in English literature long after it had been used in French.

3. Three dimensional interpretation of competence vector is yet to be worked out.

4. Common interest in competences we observed in different geopolitical locations might be considered indicative of true wave of internationalisation over the globe.

5. Self reported assessment of competences, though pregnant apparently with subjectivity, has some advantages over other assessment methods

6. Self assessment of acquired competences by the higher education graduates is found reliable to a modest level

7. Assessment of required competence by the young knowledge workers is found reliable to a modest level

8. Reliability of Assessment of required competences further adds to the reliability of self assessment of acquired competences

9. Competence-earning relationship offers a valid measure for studying the reliability of competence assessment.

Japan is the only country out of Europe in the data set which may lend it some global scale generalisability. However we are reluctant to consider our results be generalisable over the globe. Yet, similar findings have been internationally drawn already. As we have observed that similar competences are emphasised in various geopolitical locations, we may infer that our findings have pseudogeneralisability over the globe. Nonetheless we suggest deeper insight in this regard.

It is remarkable that our analyses were restricted to one data set i.e. Reflex data set, which contains mostly European countries. It is suggested that other comparable data sets should also be provided to compare the analyses of the results for more confident generalisability. Furthermore, there is ample space to include other variables from the same data set as it contains variety of variables. For example, the analyses involving institutions, fields of study, parent education, partner education, area of residence, work organisation, job level, professional experience, etc. could reveal more useful pieces of information.

"I may not have gone where I intended to go, but I think I have ended up where I needed to be".

Douglas Adams, *Mostly Harmless*
English humorist & science fiction novelist (1952 - 2001)

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ANNEXES

ANNEXE – A: GLOSSARY OF COMPETENCE SYNONYMS

This appendix includes Glossary of Competence Synonyms. This glossary contributes to the content of chapter 1. It may help understanding the concept of competence.

Glossary of Competence Synonyms

Attribute

An attribute is a quality or feature (BBC English Dictionary, 1992). It is a quality or character considered to belong to or be inherent in a person or thing (The Oxford English Dictionary, 1961).

Attitude

An attitude is a settled behaviour or manner of acting, as representative of feeling or opinion (The Oxford English Dictionary, 1961). Your attitude to something is the way you think and feel about it (BBC English Dictionary, 1992). Your attitude to someone is the way you behave when you are dealing with them (BBC English Dictionary, 1992).

Aptitude

It is the quality of being fit for a purpose or position, or suited to general requirements (The Oxford English Dictionary, 1961). If you have an aptitude for something, you are able to learn it quickly and do it well (BBC English Dictionary, 1992). It may also be defined as:

1. natural ability to acquire knowledge or skill

2. the condition of being suitable

Ability

Ability is the quality in an agent which makes an action possible (The Oxford English Dictionary, 1961). It is capacity to do something (The Oxford English Dictionary, 1961). It may be considered as a special power of the mind (The Oxford English Dictionary, 1961). Your ability to do something is the quality or skill that makes it possible for you to do it (BBC English Dictionary, 1992). It is interpreted as the quality or state of being able; power to perform, whether physical, moral, intellectual, conventional, or legal; capacity; or skill in doing; sufficiency of strength, skill, resources, etc.; abilities mean faculty, talent.

Capability

Capability is the power or ability in general, whether physical or mental (The Oxford English Dictionary, 1961). If you have the capability to do something, you are able to do it (BBC English Dictionary, 1992).

Capacity

Capacity is an active power or force of mind (The Oxford English Dictionary, 1961). It is the power, ability, or faculty for anything in particular (The Oxford English Dictionary, 1961). It may signify the mental or intellectual receiving power; ability to grasp or take in impressions, ideas, knowledge (The Oxford English Dictionary, 1961). The capacity of something is the amount that it can hold or produce (BBC English Dictionary, 1992). Your capacity to do something is your ability to do it (BBC English Dictionary, 1992).

Faculty

It is the power of doing anything (The Oxford English Dictionary, 1961). It is an ability or aptitude, whether natural or acquired, for any special kind of action (The Oxford English Dictionary, 1961). Your faculties are your physical and mental abilities (BBC English Dictionary, 1992).

Cognition

Cognition is the action or faculty of knowing taken in its widest sense, including sensation, perception, conception, etc., and distinguished from feeling and volition (The Oxford English Dictionary, 1961). Cognition is the mental process involved in knowing, learning, and understanding things (BBC English Dictionary, 1992).

Talent

A special natural ability or aptitude, usually for something expressed or implied is termed as talent (The Oxford English Dictionary, 1961). It refers to mental powers of a superior order (The Oxford English Dictionary, 1961). Talent is the natural ability to do something well (BBC English Dictionary, 1992).

Potential

Possessing potency (inherent powerfulness or capacity) or power is defined as potential (The Oxford English Dictionary, 1961). You use potential to describe something as capable of becoming a particular kind of thing (BBC English Dictionary, 1992). If something has

potential, it is capable of being useful or successful in future (BBC English Dictionary, 1992). If something has a particular potential, it is possible that it may develop in the way mentioned (BBC English Dictionary, 1992).

Intelligence

Intelligence is the action or fact of mentally apprehending something (The Oxford English Dictionary, 1961). It is superior understanding; quickness of mental apprehension, sagacity (The Oxford English Dictionary, 1961). Someone's intelligence is their ability to understand and learn things (BBC English Dictionary, 1992). Intelligence is the ability to think and understand instead of doing things by instinct or automatically (BBC English Dictionary, 1992).

Emotional intelligence

Emotional means relating to your feelings (BBC English Dictionary, 1992). This term is referred to the intelligent use of emotions and making them out effective at work.

Achievement

An achievement is something which someone has succeeded in doing, especially after a lot of effort (BBC English Dictionary, 1992). It is a distinguished and successful action (The Oxford English Dictionary, 1961).

Qualification

It is considered as the determining or distinctive quality of a person or thing (The Oxford English Dictionary, 1961). It is a quality, accomplishment, etc., which qualifies or fits a person for office or function (The Oxford English Dictionary, 1961). Qualification is the act of passing examinations that you need to pass in order to work in a particular profession (BBC English Dictionary, 1992). Your qualifications are the examinations that you have passed (BBC English Dictionary, 1992). The qualifications needed for a particular activity or task are the qualities and skills that you need in order to do it (BBC English Dictionary, 1992).

Adequacy

Adequacy defines the state or quality of being adequate or sufficient for any purpose (The Oxford English Dictionary, 1961). The adequacy of something is the fact that it is large or effective enough for its purpose (BBC English Dictionary, 1992).

Suitability

Suitability is the quality or condition of being suitable (confirming or agreeing in nature, condition, or action) (The Oxford English Dictionary, 1961). Someone or something that is suitable for a particular purpose or occasion is right or acceptable for it (BBC English Dictionary, 1992).

Fitness

Fitness can be said the quality or state of being fit or suitable (The Oxford English Dictionary, 1961). It may also called as the quality or condition of being fit and proper, conformity with what is demanded by the circumstances (The Oxford English Dictionary, 1961). Someone who is fit is healthy and physically strong (BBC English Dictionary, 1992). Fitness is the quality of person who is fit.

Sufficiency

It is the adequate provision of food and bodily comfort (The Oxford English Dictionary, 1961). It is the quality or condition of being sufficient or enough (The Oxford English Dictionary, 1961). If there is a sufficiency of something, there is enough of it (BBC English Dictionary, 1992).

Efficiency

Efficiency is the fact or action of being operative agent or efficient cause (The Oxford English Dictionary, 1961). Efficiency is the quality of being able to do a task successfully and without wasting time and energy (BBC English Dictionary, 1992).

Proficiency

Efficiency is known as progress towards completeness or perfection (The Oxford English Dictionary, 1961). It is the ability to do something well (BBC English Dictionary, 1992).

Perfection

We take it as a quality, trait, feature, endowment, or accomplishment of a high order or great excellence (The Oxford English Dictionary, 1961).

Performance

One may regard performance as the carrying of a command, duty, purpose, promise, etc (The Oxford English Dictionary, 1961). It could be the accomplishment, execution, carrying out, working out, of anything ordered or undertaken (The Oxford English Dictionary, 1961). Your performance is how well you do something (BBC English Dictionary, 1992). The performance of a task or action is the dong of it (BBC English Dictionary, 1992).

Knowledge

We define knowledge as the fact, state, or condition of understanding (The Oxford English Dictionary, 1961). It is the intellectual acquaintance with, or perception of, fact or truth (The Oxford English Dictionary, 1961). Knowledge is information and understanding about a subject, which someone has in their mind (BBC English Dictionary, 1992).

Meta-knowledge

It is the knowledge about knowledge and deals with the cultural and individual repertoire of rules and regularities for the proper use of the available knowledge. It is also known as the meta-competencies.

Skill

It is the capability of accomplishing something with precision and certainty; practical knowledge in combination with ability (The Oxford English Dictionary, 1961). The knowledge and ability that enables you to do something well (BBC English Dictionary, 1992). A skill is a type of work or craft which requires special training and knowledge (BBC English Dictionary, 1992).

Competency

It is basically identified as the condition of having a sufficient income (The Oxford English Dictionary, 1961). Other definitions are: The ability to perform some task; meeting specified qualifications to perform (in *law* and related fields), and sub-conscious knowledge of a native language's structure (in linguistics) are all aimed at to define the concept.

Competence

Some person may be suitable or sufficient for comfortable living (The Oxford English Dictionary, 1961). It is a sufficiency of means fro living comfortably (The Oxford English Dictionary, 1961). It is the condition of having sufficient means for living comfortably (The Oxford English Dictionary, 1961). Sufficiency of qualification (The Oxford English Dictionary, 1961); it may be regarded as the capacity to deal adequately with a subject (The Oxford English Dictionary, 1961). It is the quality or position of being legally competent (The Oxford English Dictionary, 1961). Competence is the ability to do something well, effectively, and following professional standards (BBC English Dictionary, 1992). Someone who is competent is sufficient, effective, and follows professional standards (BBC English

Dictionary, 1992). Competence motive is the individual's active need to contact and master the environment as an end in itself as apart from the extrinsic benefits of this activity (BBC English Dictionary, 1992). Your motive for doing something is your reason for doing it (BBC English Dictionary, 1992).

Competentness

It is referred to the state or quality of being competent.

Nous

Philosophical meaning of the term is the mind or intellect. It is also known as common sense; practical intelligence etc.

Savoir-faire

It is the ability to do or say what is appropriate for the occasion.

Knack (*plural* **knacks**)

Knack is defined as following:

1. A readiness in performance; aptness at doing something; skill; facility; dexterity.

2. A petty contrivance; a toy; a plaything; a knickknack.

3. Something performed, or to be done, requiring aptness and dexterity; a trick; a device.

ANNEXE – B: GLOSSARY OF COMPETENCE DEFINITIONS

This appendix contains Glossary of Competence Definitions. This glossary contributes to the content of chapter 1. It helps in understanding the concept of competence.

Glossary of Competence Definitions

1. The ability to perform effectively the functions associated with management in a work situation (Hornby and Thomas, 1989).

2. A knowledge, skill, ability or characteristic associated with high performance on a job (Mirable, 1997).

3. Observable or habitual behaviours that enable a person to succeed in her activity or function (Cardona and Chinchilla, 1999).

4. A combination of motives, traits, self-concepts, attitudes or values, skills, and abilities that differentiate superior performers from average performers (Lee and Beard, 1994).

5. The capacity to transfer skills and abilities from one area to another (Hogg, 1989 as cited in Lee and Beard, 1994).

6. Ensembles stabilisés de savoirs et de savoir-faire, de conduites types, de procédures standard, de type de raisonnement que l'on peut mettre en œuvre sans apprentissage nouveau et qui sédimentent et structurent les acquis de l'histoire professionnelles : elles permettent l'anticipation des phénomènes, l'implicite dans les instructions, la variabilité dans le tâche. *(Stabilised sets of knowledge and know-how, of conducted types, of standard procedures, of the type of reasoning that we can implement without new learning and which form and construct the professional achievement history: that allow*

the anticipation of phenomena, implicit in the instructions, the variability in the task.) Montmollin (1986)

7. Le système de connaissance qui permettre d'engendrer l'activité répondant aux exigences des tâches d'une certaine classe. *(The system of knowledge that can generate activity that meets the requirements of the tasks of a certain class.)* Leplat (1991)

8. Les compétences sont des répertoires de comportements que certaines personnes maîtrisent mieux que d'autres, ce qui les rend efficaces dans une situation donnée. *(The competences are the directories of behaviours that some people have mastered better than others, making them effective in a given situation.)* (Levy-Leboyer, 1996)

9. La compétence est un système de connaissance, déclarative (le quoi) ainsi que conditionnelles (le quand et le pourquoi) et procédurales (le comment), organisées en schémas opératoires et qui permettent, à l'intérieur d'une famille de situation, non seulement l'indentification de problèmes, mais également leur résolution efficace. *(The competence is a system of knowledge, declarative (what) and conditional (when and why) and procedural (how), organized and operating in schemes that permit, within a family situation, not only the identification of problems, but also their effective resolution.)* (Tardif, 1994)

10. La compétence est un savoir en usage désignant une totalité complexe et mouvante mais structurée, opératoire, c'est-à-dire ajusté à l'action et à ses différentes occurrences. *(The competence is knowledge used to refer to all complex and moving, but structured procedure, i.e. adjusted for action and its various occurrences.)* (Malglaive, 1990)

11. La compétence est un savoir validé et exercé. *(The competence is a validated and exercised knowledge.)* (Aubert *et al*., 1993)

12. La compétence est un ensemble de connaissances, de capacité durable et d'habiletés acquises par l'assimilation de connaissance pertinentes et d'expériences qui sont reliées entre elle dans un domaine déterminé. *(The competence is a combination (or set) of awareness (i.e. knowledge), sustainable capacity (i.e. ability) and acquired skills by the assimilation of relevant knowledge and experience which are interconnected in a specific area.)* (de Ketele *et al*. Cités dans Baudin, 1996)

13. La compétence est un savoir-agir reconnu. *(The competence is a recognized knowledge-in-action.)* (Le Boterf, 1994)

14. La compétence correspond à la mobilisation d'un l'action d'un certain nombre de savoirs combinés de façon spécifique en fonction de cadre de perception que se construit l'acteur (individu ou collectif) de la situation. *(The competence is the mobilization of the action of a number of combined knowledge in a specific manner depending on context of perception that builds the actor (individual or collective) of the situation.)* (Wittorski, 1997)

15. La compétence est la capacité de sélectionner et de fédérer en un tout applicable à une situation, des savoirs, des habileté et des attitudes. *(The competence is the ability to select and unite knowledge, skills and attitudes in a whole applicable to a situation.)* (Taupin, 1995)

16. Day's (1989) definition of competence, "the ability to put skills and knowledge into action"

17. KASOC concept was the basis for the following definition of competency: A specific, identifiable, definable, and measurable knowledge, skill, ability, and/or other employment-related characteristics (e.g. attitude, behaviour, physical ability) which a human resource may posses and which is necessary for, or material to, the performance of an activity within a specific business context.

18. Boyatzis adopted the term "competency", plural "competencies", which he described as: … an underlying characteristic of an individual that is related to effective or superior performance in a job (Boyatzis, 1982).

19. Boyatzis' (1982) also defined competence(ies) in the following way. … the behavioural characteristics of an individual which is causally related to effective or superior performance in a job.

20. The "distinctive competence" idea was promoted by Prahalad and Hamel (1990; 1993; 1995). Core competencies are the collective learning in the organisation especially how to co-ordinate diverse production skills and integrate multiple streams of technologies … core competency does not diminish with use, competencies are enhanced as they are applied and shared (Prahalad and Hamel, 1991, p.82)

ANNEXE – C: REFLEX MASTER QUESTIONNAIRE

This appendix presents original version of Reflex Master Questionnaire. It is a very long and comprehensive instrument for data collection.

Reflex Master Questionnaire

Reflex

Master questionnaire

- This questionnaire is about the study programme that you finished in 1999/2000. Unless explicitly indicated otherwise, the term 'study programme' refers to this study programme.
- If you finished more than one study programme in 1999/2000, we would like you to refer to the study programme you consider the most important for your professional development.
- Please use a black or blue pen to fill in the questionnaire.
- Please mark your answer by placing a cross ☒ in the relevant box. Some questions allow multiple answers. Where this is the case, this is clearly indicated.
- If you would like to correct your answer, completely blacken the box, and mark the right answer.
- If the question requires you to fill in a number, please fill in only one digit per box.
- If the question requires you to fill in text, please use capital letters.
- If you are unsure of the exact answer to some questions, please estimate the answer to the best of your ability.

A Study programme you graduated from in 1999/2000

A1 **What was the name of the study programme?**

Study programme *(e.g. economics, civil engineering)*:

.....

Major or specialisation:

.....

What was the type of qualification?

☐ Bachelors *(please specify, e.g. BA, BSc Hons)*

.....

☐ Masters *(please specify, e.g. MA, MEd)*

.....

☐ Other *(please specify)*

.....

What was the name of the institution from which you graduated?

Name of the institution:

.....

A2 **What was the start and end date of this study programme?**

Start: ☐☐ (month) ☐☐☐☐ (year)

End: ☐☐ (month) ☐☐☐☐ (year)

If your study programme was a masters programme, what was the start and end date of your preceding bachelors programme?

Start: ☐☐ (month) ☐☐☐☐ (year)

End: ☐☐ (month) ☐☐☐☐ (year)

☐ not applicable

Did you at any time interrupt this study programme (including, if applicable, the preceding bachelors programme) for 4 or more months? If so, for how many months?

- *Do not count interruptions related to your study, such as internships or study abroad*
- *Do not count interruptions between bachelors and masters programmes*

☐ yes, for ☐☐ (months

☐ no

A3 **What was your average grade when you finished this study?**

6 ☐ 6.5 ☐ 7 ☐ 7.5 ☐ 8 ☐ 8.5 ☐ 9 or higher ☐

How do you rate this grade compared to other students that graduated from your study programme?

much lower than average 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ much higher than average

cannot tell ☐

A4 **How would you describe your situation in the last one to two years of your study?**

☐ fulltime student *(study was my main activity)*

☐ part-time student *(study was not my main activity)*

A5 **Which of the following were used as selection criteria for your entry to the study programme?**

diploma in secondary education	☐ yes ☐ no
grades achieved in secondary education	☐ yes ☐ no
prior qualification in higher education	☐ yes ☐ no
grades achieved in prior higher education	☐ yes ☐ no
results of special entry exams	☐ yes ☐ no
other selection *(please specify)*:	☐ yes ☐ no

.....

A6 **To what extent did the following descriptions apply to your study programme?**

	not at all	1	2	3	4	5	to a very high extent
The programme was generally regarded as demanding		☐	☐	☐	☐	☐	
Employers are familiar with the content of the programme		☐	☐	☐	☐	☐	
There was freedom in composing your own programme		☐	☐	☐	☐	☐	
The programme had a broad focus		☐	☐	☐	☐	☐	
The programme was vocationally orientated		☐	☐	☐	☐	☐	
The programme was academically prestigious		☐	☐	☐	☐	☐	

A7 **To what extent were the following modes of teaching and learning emphasized in your study programme?**

	not at all	1	2	3	4	5	to a very high extent
Lectures		☐	☐	☐	☐	☐	
Group assignments		☐	☐	☐	☐	☐	
Participation in research projects		☐	☐	☐	☐	☐	
Internships, work placement		☐	☐	☐	☐	☐	
Facts and practical knowledge		☐	☐	☐	☐	☐	
Theories and paradigms		☐	☐	☐	☐	☐	
Teacher as the main source of information		☐	☐	☐	☐	☐	
Project and/or problem-based learning		☐	☐	☐	☐	☐	
Written assignments		☐	☐	☐	☐	☐	
Oral presentations by students		☐	☐	☐	☐	☐	
Multiple choice exams		☐	☐	☐	☐	☐	

A8 **Did you take part in one or more work placements/internships as part of your study programme?**

☐ yes, for approximately ⌊__⌋ months in total
☐ no

A9 **To what extent do the following descriptions apply to your study behaviour?**

	not at all	1	2	3	4	5	to a very high extent
I did extra work above what was required to pass my exams		☐	☐	☐	☐	☐	
I strived for the highest possible marks		☐	☐	☐	☐	☐	

A10 **Altogether, approximately how many hours did you spend on your study?**

- *Please refer to a typical semester week during the last one to two years of the programme*
- *Include activities such as lectures, self-study, internships etc.*

⌊__⌋ hours per **week**

B Other educational and related experiences

B1 **What was your highest qualification before you entered higher education for the first time?**

☐ academic secondary education
☐ non-academic general secondary education
☐ vocational secondary education
☐ other *(please specify)*

.....

B2 **What was your average final examination grade when you finished secondary education?**

6	6.5	7	7.5	8	8.5	9 or higher
☐	☐	☐	☐	☐	☐	☐

B3 Did you acquire any ***study-related*** work experience:
- *Either fulltime or part-time*
- *Not work placements/internships already reported in A8*

before higher education?	☐ yes, for approximately ⌊_⌋⌊_⌋ months	☐ no
during higher education?	☐ yes, for approximately ⌊_⌋⌊_⌋ months	☐ no

B4 Did you acquire any ***non study-related*** work experience:
- *Either fulltime or part-time*

before higher education?	☐ yes, for approximately ⌊_⌋⌊_⌋ months	☐ no
during higher education?	☐ yes, for approximately ⌊_⌋⌊_⌋ months	☐ no

B5 During your time in higher education, did you hold a position in student or other voluntary organizations? *(e.g. chair, committee member)*

☐ yes, for approximately ⌊_⌋⌊_⌋ months ☐ no

B6 In addition to the study programme described in block A, have you ever enrolled in any of the following types of study/training programme?
- *Include only study/training programmes of at least one academic year or equivalent. Multiple reply possible*

☐ (additional) bachelor or master level programmes
☐ PhD programme
☐ other postgraduate qualifications *(including professional qualifications pursued in combination with work)*
☐ no → ***go to C1***

B7 Please provide information on these study/training programmes
- *If more than 2, select the 2 programmes you regard as most important for your professional development*

	Study/training programme 1	*Study/training programme 2*
Name of study/training programme	.....	.....
Type of study/training programme	☐ bachelor ☐ master ☐ PhD ☐ other postgraduate qualification ☐ other *(please specify)*	☐ bachelor ☐ master ☐ PhD ☐ other postgraduate qualification ☐ other *(please specify)* .....
When did you start?	⌊_⌋⌊_⌋ (month) ⌊_⌋⌊_⌋⌊_⌋⌊_⌋ (year)	⌊_⌋⌊_⌋ (month) ⌊_⌋⌊_⌋⌊_⌋⌊_⌋ (year)
Did you gain the qualification?	☐ yes, on ⌊_⌋⌊_⌋ (month) ⌊_⌋⌊_⌋⌊_⌋⌊_⌋ (year) ☐ no, left without qualification ☐ no, still enrolled	☐ yes, on ⌊_⌋⌊_⌋ (month) ⌊_⌋⌊_⌋⌊_⌋⌊_⌋ (year) ☐ no, left without qualification ☐ no, still enrolled

C Transition from study to work

C1 Have you ever had ***paid*** work since graduation in 1999/2000?
- *Exclude jobs that you left within 6 months of graduation*
- *Include self-employment*
- *Include trainee jobs*

☐ yes, I continued (for more than 6 months) the work I already had during study → ***go to C5***
☐ yes, I have started to work
☐ no → ***go to E3***

C2 When did you start being employed after graduation in 1999/2000?

⌊_⌋⌊_⌋ (month) ⌊_⌋⌊_⌋⌊_⌋⌊_⌋ (year)

C3 When did you begin looking for work?

☐ Prior to graduation in 1999/2000
☐ Around the time of graduation
☐ After graduation in 1999/2000
☐ Got work without searching → ***go to C5***

C4 How many months did you search before you obtained this employment:

before graduation: ⌊__⌋ months

after graduation: ⌊__⌋ months

C5 How did you find this work?
· *Single answer only*

- ☐ through advertisement in newspaper
- ☐ through public employment agency
- ☐ through private employment agency
- ☐ through internet
- ☐ contacted employer on own initiative
- ☐ approached by employer
- ☐ through work placement during higher education
- ☐ through family, friends or acquaintances
- ☐ through help of higher education institution
- ☐ set up my own business
- ☐ other *(please specify)*

.....

D First job after graduation

The following questions refer to your situation as it was when you ***first started*** (self)employment after graduation in 1999/2000.
· *Exclude jobs you left within 6 months after graduation*
· *If you continued (for more than 6 months) in (self)employment you already had before graduation, please refer to the situation as it was* ***immediately after graduation***
· *Include trainee jobs*

D1 What was your occupation or job title at that time?
(e.g. civil engineer, lawyer, assistant accountant, nurse)

.....

.....

D2 Please describe your main tasks or activities at that time.
(e.g. analysing test results, making diagnoses, teaching classes, developing a marketing plan)

.....

.....

D3 In what economic sector did you work?
(e.g. car manufacturing, primary school, hospital)

.....

What kind of product or service did the organization or – if you were self-employed – you provide?
(e.g. nursing patients, computer components, legal advice, scientific research)

.....

.....

D4 Were you self-employed?

- ☐ yes → ***go to D6***
- ☐ no

D5 What type of contract did you have when you started/at the time of graduation?

- ☐ unlimited term
- ☐ fixed-term, for ⌊__⌋ months
- ☐ other *(please specify)*:

.....

D6 What was the number of regular/contract hours?

⌊__⌋ Hours **per week**

D7 What were your ***gross monthly*** earnings when you started this work *or* at the time of graduation, if you were already in this job?

Approximately ⌊__⌋ Euros **per month**

or ⌊__⌋ DM **per month**

D8 Did this work involve an initial training period?
· *Multiple reply possible*

- ☐ yes, through training or courses for ⌊__⌋ months
- ☐ yes, through informal learning for ⌊__⌋ months
- ☐ no

D9 What type of education do you feel was most appropriate for this work?

- ☐ PhD
- ☐ other postgraduate qualification
- ☐ master
- ☐ bachelor
- ☐ lower than higher education

D10 What field of study do you feel was most appropriate for this work?

- ☐ exclusively own field
- ☐ own or a related field
- ☐ a completely different field
- ☐ no particular field

D11 To what extent were your knowledge and skills utilized in this work?

not at all ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ to a very high extent

D12 To what extent did this work demand more knowledge and skills than you could actually offer?

not at all ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ to a very high extent

D13 Are you still in your first employment?

- ☐ yes
- ☐ no, I left that employment in:

  ⌊_⌋⌊_⌋ (month) ⌊_⌋⌊_⌋⌊_⌋⌊_⌋ (year)

E Employment history and current situation

E1 How many employers have you had altogether since graduation in 1999/2000?

· *Including yourself if you have been self- employed*
· *Including current employer*

⌊_⌋⌊_⌋ employers

E2 How long in total have you been employed since graduation in 1999/2000?

approximately ⌊_⌋⌊_⌋ months

E3 Have you ever been unemployed (that is, not employed ***and*** seeking employment) since graduation in 1999/2000?

- ☐ yes, ⌊_⌋⌊_⌋ times,
  for a total of approximately ⌊_⌋⌊_⌋ months
- ☐ no

E4 In the past 4 weeks, were you engaged in:

further education or other training related to your professional development?	☐ yes, for approximately ⌊_⌋⌊_⌋ hours per week ☐ no
child rearing or family care?	☐ yes, for approximately ⌊_⌋⌊_⌋ hours per week ☐ no
unpaid/voluntary work?	☐ yes, for approximately ⌊_⌋⌊_⌋ hours per week ☐ no

E5 Have you actively tried to obtain (other) paid work in the past 4 weeks?

- ☐ yes
- ☐ no
- ☐ no, but I am awaiting the results of earlier job applications

E6 How useful do you consider your social network (friends, relatives, colleagues, former teachers etc.) would be if you:

	not very useful 1	2	3	4	5 very useful
needed information on job opportunities?	☐	☐	☐	☐	☐
needed help in directly obtaining work?	☐	☐	☐	☐	☐
needed help in setting up your own business?	☐	☐	☐	☐	☐

E7 Are you currently in paid employment?

· *Include self-employment*

- ☐ yes, I have one job
- ☐ yes, I have more than one job
- ☐ no → ***go to H1***

F Current work

Please answer these questions about your ***current (self)employment situation***

· *If you are still in the job you first held after graduation in 1999/2000, please answer these questions for the situation as it is* ***now***

· *If you have more than one job, please answer the questions for the job in which you work the* ***highest number of hours***

F1 **What is your current occupation or job title?**
(e.g. civil engineer, lawyer, assistant accountant, nurse)

☐ the same as listed above for first job
☐ other *(please specify)*:

.....

F2 **Please describe your current main tasks or activities.**
(e.g. analysing test results, making diagnoses, teaching classes, developing a marketing plan)

☐ the same as listed above for first job
☐ other *(please specify)*:

.....

F3 **Are you self-employed?**

☐ yes
☐ no → ***go to F5***

F4 **Are you mainly dependent on one client or several clients?**

☐ mainly one client → ***go to F6***
☐ several clients → ***go to F6***

F5 **What is your current type of contract?**

☐ unlimited term
☐ fixed-term, for ⌊_⌋⌊_⌋ months
☐ other *(please specify)*:

.....

F6 **What are your average working hours?**

Regular/contract hours in main employment	⌊_⌋⌊_⌋ **per week**
Paid or unpaid average overtime in main employment	⌊_⌋⌊_⌋ **per week**
Average hours in other paid work	⌊_⌋⌊_⌋ **per week**

F7 **What are your gross monthly earnings?**

From contract hours in main employment	about ⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋ EURO **per month**
From overtime or extras in main employment	about ⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋ EURO **per month**
From other work	about ⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋ EURO **per month**

F8 **What type of education do you feel is most appropriate for this work?**

☐ PhD
☐ other postgraduate qualification
☐ master
☐ bachelor
☐ lower than higher education

F9 **What field of study do you feel is most appropriate for this work?**

☐ exclusively own field
☐ own or a related field
☐ a completely different field
☐ no particular field

F10 **How much time would it take for an average graduate with the relevant educational background to become an expert in this kind of work?**

☐ 6 months or less
☐ 7 to 12 months
☐ 1 to 2 years
☐ 3 to 5 years
☐ 6 to 10 years
☐ more than 10 years

F11 **To what extent are your knowledge and skills utilized in your current work?**

not at all ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 to a very high extent

F12 **To what extent does your current work demand more knowledge and skills than you can actually offer?**

not at all ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 to a very high extent

F13 How satisfied are you with your current work?

very dissatisfied 1 2 3 4 5 very satisfied

☐ ☐ ☐ ☐ ☐

F14 Did you follow any work-related course/training in the past 12 months?
· *Not the ones you already mentioned previously in block B*

☐ yes
☐ no → ***go to G1***

F15 What was the **most important** reason you had for following this course?
· *If more than one course, please refer to the most important one*
· *One answer only*

☐ to update my knowledge for my present work
☐ to enhance my career
☐ to prepare myself for working in another field
☐ to prepare myself for self-employment
☐ other *(please specify)*:

.....

G Work organization

The following questions refer to the organization in which you are currently employed
· *If you are self-employed, these questions apply to yourself or, if applicable, to the organization you run*

G1 When did you start working with your current employer/ start your self-employment?

|_|_| months |_|_|_|_| (year)

G2 In what economic sector do you work?
(e.g. car manufacturing, primary school, hospital)

☐ the same as listed above for first job
☐ other *(please specify)*:

.....

What kind of product or service does the organization provide?
(e.g. nursing patients, computer components, legal advice, scientific research)

☐ the same as listed above for first job
☐ other *(please specify)*:

.....

G3 Do you work in the public or private sector?

☐ public sector
☐ private non-profit sector
☐ private profit sector
☐ other *(please specify)*:

.....

G4 Where do you work?

Town/city .....

Country: ☐ UK ☐ other *(please specify)*:

.....

G5 How strong is the competition in the market in which your organization operates?

very weak 1 2 3 4 5 very strong question not applicable

☐ ☐ ☐ ☐ ☐ ☐

G6 Does your organization compete mainly by price or by quality?

mainly price 1 2 3 4 5 mainly quality question not applicable

☐ ☐ ☐ ☐ ☐ ☐

G7 How stable is demand in the market in which your organization operates?

highly stable 1 2 3 4 5 highly unstable question not applicable

☐ ☐ ☐ ☐ ☐ ☐

G8 What is the scope of operations of your organization?

☐ local
☐ regional
☐ national
☐ international

G9 **Which of the following changes have taken place in your organization since you started working there?**

Major change in my own work tasks	☐ yes	☐ no
Reorganization	☐ yes	☐ no
Merger or takeover by another firm	☐ yes	☐ no
Large-scale layoffs of personnel	☐ yes	☐ no
Relocation to another region	☐ yes	☐ no

All kinds of organizations may be confronted with a need to innovate. This applies not only to industrial or commercially- based service organizations, but also to, for example, public service organizations.

G10 **How would you characterize the *extent of innovation* in your organization or your work, with respect to the following aspects?**

	very low 1	2	3	4	5 very high
product or service	☐	☐	☐	☐	☐
technology, tools or instruments	☐	☐	☐	☐	☐
knowledge or methods	☐	☐	☐	☐	☐

G11 **Do you play a role in *introducing* these innovations in your organisation?**

product or service	☐ yes	☐ no	☐ not applicable, no innovations
technology, tools or instruments	☐ yes	☐ no	☐ not applicable, no innovations
knowledge or methods	☐ yes	☐ no	☐ not applicable, no innovations

G12 **Is your organization normally at the forefront when it comes to adopting innovations, new knowledge or new methods, or is it more a follower?**

mainly at the forefront 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ mainly a folower

G13 **How are higher positions usually obtained in your organization?**

by internal appointments 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ by external appointments

question not applicable ☐

G14 **How many people work in your organization and, if applicable, your own location?**

total organization
- ☐ 1-9
- ☐ 10-49
- ☐ 50-99
- ☐ 100-249
- ☐ 250-999
- ☐ 1000 or more

location
- ☐ 1-9
- ☐ 10-49
- ☐ 50-99
- ☐ 100-249
- ☐ 250-999
- ☐ 1000 or more
- ☐ not applicable, only one location

G15 **Do you directly or indirectly supervise other members of staff?**

- ☐ yes, I supervise ⌊_____⌋ staff members
- ☐ no

G16 **To what extent are you responsible for:**

	not at all 1	2	3	4	5 to a very high extent
setting goals for the organization?	☐	☐	☐	☐	☐
setting goals for your own work?	☐	☐	☐	☐	☐
deciding work strategies for the organization?	☐	☐	☐	☐	☐
deciding how you do your own job?	☐	☐	☐	☐	☐

G17 To what extent do the following statements apply to your professional role?

	not at all	1	2	3	4	5	to a very high extent
Professional colleagues rely on me as an authoritative source of advice		☐	☐	☐	☐	☐	
I keep my professional colleagues informed about new developments in my field of work		☐	☐	☐	☐	☐	
I take the initiative in establishing professional contacts with experts outside the organization		☐	☐	☐	☐	☐	
Taking account of professional ethics is part of my work		☐	☐	☐	☐	☐	

G18 To what extent:

	not at all	1	2	3	4	5	to a very high extent	Not applicable, there are no others
are the results of your work dependent on the performance of others in the organization?		☐	☐	☐	☐	☐		☐
are the results of the work of others in the organization dependent on your performance?		☐	☐	☐	☐	☐		☐
are you responsible for assessing the quality of the work of others in the organisation?		☐	☐	☐	☐	☐		☐

G19 To what extent can your individual performance be objectively assessed by others *(e.g. supervisor, colleagues)*?

not at all	1	2	3	4	5	to a very high extent	Not applicable, I have no supervisor or colleagues
	☐	☐	☐	☐	☐		☐

G20 How closely is your performance monitored by your own supervisor?

not very closely	1	2	3	4	5	very closely	Not applicable, I have no supervisor
	☐	☐	☐	☐	☐		☐

G21 How damaging would it be for the organization if you made major mistakes or omissions in the performance of your work?

hardly damaging	1	2	3	4	5	extremely damaging
	☐	☐	☐	☐	☐	

H Competencies

H1 **Below is a list of competencies. Please provide the following information:**
· How do you rate your own level of competence?
· What is the required level of competence in your current work?
If you are not currently employed, only fill in column A

		A Own level (Very low ⟷ very high)							B Required level in current work (Very low ⟷ very high)						
		1	2	3	4	5	6	7	1	2	3	4	5	6	7
a	Mastery of your own field or discipline	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
b	Knowledge of other fields or disciplines	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
c	Analytical thinking	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
d	Ability to rapidly acquire new knowledge	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
e	Ability to negotiate effectively	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
f	Ability to perform well under pressure	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
g	Alertness to new opportunities	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
h	Ability to coordinate activities	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
i	Ability to use time efficiently	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
j	Ability to work productively with others	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
k	Ability to mobilize the capacities of others	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
l	Ability to make your meaning clear to others	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
m	Ability to assert your authority	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
n	Ability to use computers and the internet	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
o	Ability to come up with new ideas and solutions	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
p	Willingness to question your own and others' ideas	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
q	Ability to present products, ideas or reports to an audience	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
r	Ability to write reports, memos or documents	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
s	Ability to write and speak in a foreign language	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

H2 **Name a maximum of 3 competencies from the list above that you regard as *strong* points, and a maximum of three competencies that you regard as *weak* points of your study programme.**
- fill in letters corresponding to the relevant competencies

Strong points: 1 ⌊_⌋ 2 ⌊_⌋ 3 ⌊_⌋

Weak points: 1 ⌊_⌋ 2 ⌊_⌋ 3 ⌊_⌋

I Evaluation of study programme

I1 **To what extent has your *study programme* been a good basis for:**

	not at all 1	2	3	4	5 to a very high extent
Starting work?	☐	☐	☐	☐	☐
Further learning on the job?	☐	☐	☐	☐	☐
Performing your current work tasks?	☐	☐	☐	☐	☐
Future career?	☐	☐	☐	☐	☐
Your personal development?	☐	☐	☐	☐	☐
Development of entrepreneurial skills?	☐	☐	☐	☐	☐

I2 **Looking back, if you were free to choose again would you choose the same study programme at the same institute of higher education?**

- ☐ Yes
- ☐ No, a different study programme at the same institute
- ☐ No, the same study programme at a different institute
- ☐ No, a different study programme at a different institute
- ☐ No, I would decide not to study at all

J Values and orientations

J1 **Please indicate how important the following job characteristics are to you personally, and to what extent they actually apply to your current work situation**

· *If you are not currently employed, only fill in column A*

	A Importance not at all 1 2 3 4 5 very important	**B** Apply to current work not at all 1 2 3 4 5 to a very high extent
Work autonomy	☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐
Job security	☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐
Opportunity to learn new things	☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐
High earnings	☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐
New challenges	☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐
Good career prospects	☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐
Enough time for leisure activities	☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐
Social status	☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐
Chance of doing something useful for society	☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐
Good chance to combine work with family tasks	☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐

K About yourself

K1 **Gender**

- ☐ male
- ☐ female

K2 **Year of birth**

19 ☐☐

K3 **Country of birth of:**

Yourself

☐ UK ☐ other *(please specify)*

.....

Mother

☐ UK ☐ other *(please specify)*

.....

Father

☐ UK ☐ other *(please specify)*

.....

Optional ethnicity question

K4 **Where did/do you mainly live:**

At age 16?

Town/city: .....

Country: ☐ UK ☐ other *(please specify)*

.....

During your study programme?

Town/city: .....

Country: ☐ UK ☐ other *(please specify)*

.....

When starting first employment after graduation in 1999/2000?

Town/city: .....

Country: ☐ UK ☐ other *(please specify)*

.....

At present?

Town/city: .....

Country: ☐ UK ☐ other *(please specify)*

.....

K5 **Did you spend any time abroad *during* higher education for study or work?**
· *Multiple reply possible*

☐ yes, ⌊_⌋⌊_⌋ months for study
☐ yes, ⌊_⌋⌊_⌋ months for work-related reasons
☐ no

K6 **Have you spent any time abroad *since* graduating from higher education for study or work?**
· *Multiple reply possible*

☐ yes, ⌊_⌋⌊_⌋ months for study
☐ yes, ⌊_⌋⌊_⌋ months for work-related reasons
☐ no

K7 **How did you live during the last year of your study programme?**

☐ Alone (incl. single parent)
☐ With a partner
☐ With parents
☐ Other, please specify

.....

K8 **How do you live at present?**

☐ Alone (incl. single parent)
☐ With a partner
☐ With parents
☐ Other, please specify

.....

K9 **Do you have children?**

☐ yes, 1 child
☐ yes, 2 children
☐ yes, 3 or more children
☐ no → ***go to K11***

K10 **What is the age of the oldest and (in case of more than 1) the youngest?**

Age of oldest child ⌊_⌋⌊_⌋ years

Age of youngest child ⌊_⌋⌊_⌋ years

K11 **What is your parent's and, if applicable, partner's highest education?**

Father	**Mother**	**Partner**
☐ ISCED 1+2	☐ ISCED 1+2	☐ ISCED 1+2
☐ ISCED 3+4	☐ ISCED 3+4	☐ ISCED 5+6
☐ ISCED 5+6	☐ ISCED 3+4	☐ ISCED 5+6
		☐ not applicable

K12 **Date of completion of questionnaire**

Day: ⌊_⌋⌊_⌋ Month: ⌊_⌋⌊_⌋

Comments or suggestions

.....

.....

.....

.....

Thank you very much for your cooperation!

Feedback of results:

The results of this project will be made available through the project's website.
If you would like to receive a summary of the results, please fill in your e-mail address below:

☐ Yes I would like to receive a summary of the results.

My e-mail address is: .....

Follow-up survey:

It is possible that this study will be repeated in a few years from now. Would you be willing to participate in such a follow-up study? If so, please provide us with your name and current address.

☐ Yes, you can approach me for future research.

Name: .....

Address: .....

.....

Postal code: .....

Town: .....

Country: .....

☐ No, I don't want to participate in future research