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The Editor's Corner

With this new issue, the journal enters a new phase of gaining international recognition. The journal has been recently included in two international databases: the International Bibliography of the Social Sciences (IBSS) and the EconPapers database (the Research Papers in Economics Database – REPEC). At this occasion I would like to thank the members of the editorial team and all others who contributed with their activities to the internationalization of the journal.

The journal continues focusing on the transition research and emphasizing its openness to different research areas, topics, and methods, as well as the international and interdisciplinary research nature of scholarly articles published in the journal. The current issue covers topics such as the impact of organizational ownership on the leadership and job characteristics, the relationship between stock returns and trading volume, the nature of economic growth, the comparison between information systems and knowledge management systems, and the relationship between entrepreneurship education quality and continuation.

This issue starts with a paper on the application of the Western theory of organization's ownership in Russia. The analyses of the authors Moshe Banai and Jacob Weisberg suggest that ownership types influence the leadership style and employees' jobs characteristics. In the second paper, Henryk Gurgul, Paweł Majdosz, and Roland Mestel analyze the relationship between stock returns and trading volume by using stock data from Poland. In the third paper, Matjaž Novak and Štefan Bojnec expose findings of the analysis of the nature of economic growth of the Slovenian economy at the aggregate and at the municipality level. The fourth paper of Imandra Galandere-Zile and Viktorija Vinogradova examines the border between information systems and knowledge management systems. In the last paper, Boštjan Antončič, Cezar Scarlat, and Barbara Hvalič Erzetič compare entrepreneurship education satisfaction and quality between Slovenia and Romania and assess the relationship between education quality and continuation in both countries.

Boštjan Antončič
Editor

Corporate Ownership, Leadership and Job Charateristics in Russian Enterprises

Moshe Banai
Jacob Weisberg

This study tests the application of the Western theory of organization's ownership in Russia, suggesting that ownership types – such as state-owned and private – influence leadership style and employees' jobs characteristics. A sample of 724 Russian employees in 15 service and manufacturing companies was surveyed. The results indicate that, contrary to Western theories, the leadership in Russian state-owned enterprises tends to be perceived as being more effective than the leadership in private enterprises. Similarly, jobs in state-owned enterprises are more enriched than in private companies. Explanations and implications are provided.

Key Words: leadership, job characteristics, state-owned enterprises, private organizations, Russia
JEL *Classification:* F, H, M

Introduction

OWNERSHIP SYSTEMS

This study tests the application of the Western theory of organization's ownership in Russia. More specifically, it tests the relationship between organizations' ownership, the perceived leadership style of their management, and the degree of job enrichment. The study extends the Western research of similarities and differences between public and private sector organizations (Allison 1979; Bozeman 1987; Buchanan 1974; 1975; Chubb and Moe 1988; Coursey and Rainey 1990; Lawler 1981; Perry and Porter 1982; Perry and Rainey 1988; Rainey 1979, 1983; Rainey, Backoff, and Levine 1976, Solomon 1986) to Russia, a country that is different

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The authors' names are presented in an alphabetical order indicating equal contribution. The authors would like to thank two anonymous reviewers for their valuable comments.

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from the USA in its political, economic and social systems. Western studies that analysed organizational economic performance have found no relationship between ownership and performance in the USA (Becker and Potter 2002) or in other countries such as the Czech Republic (Kocenda and Svejnar 2003), Greece or Portugal (Barbosa and Louri 2005). Yet, the theory of ownership (Pierce and Rodgers 2004) has provided continuous support to the argument that employees' ownership influences employees' perceptions and attitudes towards their organization, and consequently their performance (Employee Ownership Foundation 2005). The question is to what extent an organization's ownership type actually influences workers' attitudes towards their leadership and jobs in the transitional economy of Russia. To answer this question we provide a short history of Russia's ideological system and its present ownership system.

Communism was the law of the state from the Bolshevik revolution in 1917. Private property was outlawed and a centrally planned economy, based on Lenin's vision of the Russian economic system as one large enterprise, was established. The Politburo was at the top of the national vertical chain of command, while the individual worker was at the bottom. Gosplan, the central planning committee, was the Politburo's economic arm, which designed five-year plans for the entire nation. These plans dictated what product would be produced in each plant, in what quantities, and at what internal price. Industrial ministries oversaw the execution of those five-year plans. Enterprise managers were personally responsible for meeting the production plans. Managers expected their subordinates to execute orders without questions in exchange for housing, health and day care, recreational centers and other fringe benefits. As a direct result of Gorbachev's *Glasnost* (openness) and *Perestroika* (change) policies, the centrally planned economic system collapsed. In 1991 the Soviet Union ceased to exist and since then the country has been steadily shifting from its previous political and economic structure into a more democratic and free market economy.

This new economic system is however still in its rudimentary stage. Students who investigated the Russian transformation into a free market economy have concluded that this transformation is less successful than that of other former Soviet states (Goldman 1997; Shama 1995). Thus, although the cultural difference between Russia and Western countries may not be as great as one may expect, the distinction between a free market economy and a transitional economy could be substantial.

Some theoreticians advised against the use of Western management ideas in other nations (Hofstede 1980, 1983; Spender 1993). Adler (1983, 1991) further contended that to assume that what was true for American workers in the USA would also be true for workers in other countries was wrong. Moreover, Western findings about the relationship between organizations' ownership type and performance are, at best, mixed. Hence, we use theories of job characteristics rather than the theory of ownership to hypothesize about a possible variance in leadership styles in Russian state-owned and private companies. The next sections describe theories of leadership and those of job characteristics.

LEADERSHIP

This study investigates contingencies of leadership in state-owned and private enterprises in Russia. It applies a variation on Fiedler's (1967, 1996), House and Mitchell's (1974) as well as Hersey and Blanchard's (1993) interpretation of the contingencies of effective leadership and Blake and Mouton's (1985) measure of leadership effectiveness. It uses job characteristics of employees to evaluate the perceived leadership style of management in state-owned and private enterprises in Russia. The differences between perceived leadership styles of managers in state-owned enterprises and in private enterprises in Russia could be delineated along three main issues: participation of employees in decision-making, managerial abilities, and employees' incentives. The leadership style of Russian managers seems to be changing from a centrally controlled to a market oriented style. If in the past power was centralized, today managers are trying to shift some of the decision making power to their subordinates. Yet, in a study comparing Russian managers with US managers it was found that middle level managers in Russia enjoy less authority in decision-making than their US counterparts (Puffer and McCrathy 1993). Today's Russian managers believe that with good management they can achieve most of their organization's objectives and therefore they are geared towards doing business. They have adopted the US belief that time is a scarce resource and therefore they struggle to achieve as much as possible within time constraints. While greasing palms to promote business they still demonstrate personal trust, even though it sometimes may mean over-promising and cutting corners (Puffer 1994). By doing so, new entrepreneurs tarnish the reputation of private enterprises.

Critical abilities that may lead to the success of Russian managers are networking, socializing, and politicking, followed by motivating and re-

warding subordinates (Luthans et al. 1993). Puffer and Shekshnia (1994) found that the more foreign and the more privatized the company is the better will be workers' compensation.

Theories of leadership (Hersey and Blanchard 1993; House 1974) suggest that the more mature the employees are in their jobs and the more familiar they are with their specific tasks, the more participative would be the leader's style. A positive profile of leadership should reduce the amount of uncertainty inherent in workers' tasks and, therefore, enhance workers' sense of control with regard to receiving their rewards. Employees in state-owned enterprises have been employed by their organizations longer than employees in the private sector because the private sector is a new creation in Russia. It is assumed that since employees in state-owned organizations have been there longer than their counterparts in the private sector they are more familiar with their jobs. It is also assumed that since employees in state-owned organizations are better prepared to carry out their jobs they enjoy a more participative leadership style than their counterparts in the private sector, and therefore they would perceive their leaders to be more positive than would employees in private enterprises perceive their managers to be. Consequently, the following hypothesis is delineated:

Hypothesis 1: Russian workers employed in state-owned enterprises perceive their organizations' leadership more positively than their counterparts in private companies.

JOB CHARACTERISTICS

One job diagnosis that can be used to delineate variance in organizational leadership appears to be the Hackman and Oldham's (1975, 1980) Job Characteristics Model. Banai and Teng (1996) found that Russian workers employed in state-owned enterprises enjoyed more enriched jobs than their counterparts employed in the private sector. We suggest a set of hypotheses relating to seven job characteristics, namely: autonomy, feedback from agents, feedback from job, dealing with others, task identity, task significance and skills variety that correspond with Hackman and Oldham's structure. These are hypothesized to differentiate between state-owned and private companies as follows:

Autonomy. Russian private companies are by definition small newly established companies that are managed by one or a few partners/owners. Owner managers were not trained in Western-style management. They are concerned with relinquishing too much knowledge to their subordi-

nates fearing that the subordinates would 'steal' their contacts and therefore their companies. They are also afraid that employees would leak information to the competition to be used against their own companies. This attitude is not unique to Russian private businesses and could also be found in Western organizations. Yet, the fear of 'stealing the business' is not common in state-owned monopolies. Hence, managers in private businesses would refrain from delegation of authority to their employees. With less delegation from their managers, workers in private companies would possess very little autonomy.

Hypothesis 2: Russian workers employed in state-owned enterprises are perceived to enjoy more autonomy than their peers employed in private companies.

Feedback from job and from agents. As earlier suggested managers in private companies limit workers' contacts with suppliers, customers and others, fearing that the workers will take advantage of the networking to create a competition for the newly established business. Hence, workers in private companies would generally have less feedback than their counterparts in state-owned companies.

Hypothesis 3: Russian workers employed in state-owned enterprises are perceived to enjoy more feedback from job than their peers employed in private companies.

Hypothesis 4: Russian workers employed in state-owned enterprises are perceived to enjoy more feedback from agents than their peers employed in private companies.

Dealing with others. Based on the same explanations delineated above, workers in state-owned enterprises would have more contacts with entities external to the firms than workers in private companies.

Hypothesis 5: Russian workers in state-owned enterprises are perceived to deal with others more than their peers employed in private companies.

Task Identity. The newly established private company structures are more likely to be simple production lines. Workers in small newly established production lines have fewer opportunities to observe the final product than workers in large state-owned enterprises in industries such as grains (bakeries) and heating (installing and repairing electric and gas appliances) or other state monopolies.

Hypothesis 6: Russian workers employed in state-owned enterprises are perceived to enjoy more task identity than their peers employed in private companies.

Task Significance. Extending the logic applied regarding the first five hypotheses and based on the description that workers in privately owned companies experience less enriched jobs than employees in state-owned enterprises, the following hypothesis is formulated:

Hypothesis 7: Russian workers employed in state-owned enterprises are perceived to enjoy more task significance than their peers employed in private companies.

Skills Variety. Extending the logic applied regarding the first five hypotheses and based on the description that workers in privately owned companies experience less enriched jobs than their counterparts in state-owned enterprises, the following hypothesis is formulated:

Hypothesis 8: Russian workers employed in state-owned enterprises are perceived to enjoy more skills variety than their peers employed in private companies.

Methods

SETTING

The study was conducted in Kazan, the capital city of Tatarstan, Russia. The sampling has been conducted at two points in time. In the first sample three private companies and two state-owned companies were studied. Among private companies there were a specialty shoes factory, a wholesale trading firm, and a plastic consumer products manufacturer. Local entrepreneurs created these three companies from scratch. They had to secure facilities, machinery, raw materials, labour, and financing. The state-owned companies included a major polymer production factory and a utility company. The factory was the largest in the city and the utility company had a monopoly in providing energy to the city.

A private plastic consumer product plant and four state-owned companies were sampled in the second case. The state-owned companies included a utility company, a grain products company, an oil products company, and a gelatin company, all major employers in the city.

The sample employed in this study was quasi-random. State-owned and private firms were used as proxy indicators of what might be found if one can get a representative sample of firms in Russia. State-owned companies were large enough to allow for a random sampling of employees by the administration. Managers were instructed by the researchers to go

through the list of workers in production and manufacturing functions in their organization and, based on the size of the company, to ask every (n) person to complete a questionnaire. To control the type and level of job, managers and service people were omitted from the study. Due to the small size of the private specialty shoes factory and the private trading company, all employees were asked to be included. The plastic products company was large enough for a random sampling of the employees.

The final statistics of the responses in the first sample are as follows: In the private plastic company, where about 150 people were employed, 50 employees received questionnaires and 36 completed them (72% response rate). In the private trading and shoe company, 18 out of a total of 25 employees responded to the survey (72%). The state-owned utility company had about 3000 employees of whom 100 were approached and 93 (92%) completed the questionnaire. In the state-owned polymer company with around 3,000 employees, 100 were approached and 61 (61%) completed the questionnaire.

The statistics for the second sample are as follows: A private plastic company with 300 employees was sampled and 86 out of 100 (86%) completed the questionnaire. In the state-owned utility company with 3000 employees 95 out of 100 (95%) completed the questionnaire, while in the gelatin company where about 300 employees were employed 27 out of 50 (74%) completed the questionnaire. 225 out of 300 (75%) completed the questionnaire in the grains company where about 1000 employees were employed, and 66 out of 100 (66%) answered the questionnaire in the oil company where about 300 people were employed. In total, 724 out of 950 (76%) respondents completed the questionnaire.

As can be learned from the statistics, state-owned companies were much larger than private ones. The newly established private companies were at the beginning of their life cycle, and therefore they were small. The state-owned companies have been there for many years and they were large.

SAMPLE

Education. All but a few of the 724 employees received at least a high school diploma. The scale of this measure, ranging from 1 to 5, represents the following degrees: high school, associate, bachelor, master, and Ph.D. respectively. Employees in state-owned companies had significantly ($p = .00$) more education ($M = 2.35$, $SD = .85$) than their counterparts in private companies ($M = 2.02$, $SD = .80$).

Age. The average respondent was 36.6 years of age ($n = 724$); employees

in private companies were 34.0 years of age ($n = 158$) while the age of employees in state-owned companies was 37.5 years ($n = 566$).

Tenure. Since all companies in the private sector have been recently founded, the average job tenure of private sector employees was only 3.65 years ($n = 158$) compared with 11.5 years for employees in state-owned companies ($n = 566$).

Gender. Ten percent of all respondents were women. There was no significant difference between the presence of women in state-owned and private companies.

Too many missing cases limited our ability to introduce the bio-demographic variables into bi-variate and multivariate analyses. The incompletion of the bio data information is a result of the fact that while questions regarding all other items were photocopied on one side of the page of the questionnaire some of the questions regarding bio information were written on the backside of the page causing many respondents to miss it.

PROCEDURE

The survey data for this study were collected through questionnaires and interviews. A graduate student from Russia, under the supervision of a management professor who is bilingual, translated the questionnaire from English into Russian. A second graduate student from Russia translated the questionnaire back from Russian to English. Any resulting discrepancies between the two versions were then resolved. This back-translation technique has been advocated in cross-national studies in order to provide reliability to the questionnaire (Brislin 1980; Rosenthal and Rosnow 1991). One of the authors controlled the distribution of questionnaires to employees by their managers. The workers were gathered for the distribution and they completed the questionnaires without disclosing their names. Confidentiality was assured. Once completed, the questionnaires were then turned to the author and therefore there was no interference of management in the process.

MEASURES AND STATISTICAL ANALYSES

All participants were asked to complete a questionnaire that contained measures of leadership, job characteristics, and background information such as age, gender, education, and work experience.

Leadership. The instrument measuring leadership used (Korman 1994) is based on the expectancy theory (Vroom 1964), which suggests that

TABLE 1 Loadings of 3 perceived leadership-style factors

Item	F1	F2	F3
Organization makes jobs as interesting as possible	**.81**	.08	.05
Organization emphasizes performance evaluation and employees growth	**.78**	.03	.13
Organization's rewards system is clear and consistent	**.76**	.01	.22
Organization leadership all powerful	**.75**	.12	.14
Organization states the problem it is facing in realistic and straight forward terms	**.75**	.13	.06
Organization rewards good job performance	**.74**	.19	.16
Org. structured for independent decision making	**.72**	–.08	–.02
Organization states its plans realistically	**.71**	.30	–.03
There are long range organizational goals	**.68**	.22	.11
Organization uses mistakes for learning	**.64**	.25	–.15
Job provides opportunity for individual initiative	**.57**	.14	–.13
Employees know and understand the standards for effective job performance	.16	**.76**	.11
Job rules and/or performance guidelines exist	.24	**.75**	–.12
Organization requires to perform unethically	.09	**.43**	.32
Employees have a sense of control in the organisation	.10	–.12	**–.68**
Organization is hesitant in stating long term goals	.06	.06	**.68**
Organization takes negative view of the world	.33	–.27	**.52**
Eigenvalue	6.36	1.44	1.38
Percentage of variance	37.4	8.5	8.1
Cumulative percentage	37.4	45.9	54.0

Notes: F1 – positive leadership; F2 – performance management; F3 – negative leadership. $N = 724$.

the level of work motivation is a function of valence, instrumentality, and expectancy. The instrument used here focuses on these aspects of leadership style and it contains 17 items. The Cronbach Alpha reliability test of the internal consistency of the items is .87.

A factor analysis procedure measuring the perceived leadership yielded three factors (see table 1).

The first factor contains 11 items and it has been labelled 'positive leadership'. The Cronbach Alpha reliability coefficient value for the factor is .92. The second factor, containing three items, reflects performance man-

agement and has been therefore labelled 'performance management'. The Cronbach Alpha reliability coefficient value for the factor is .52. The third factor is limited to three negative aspects of leadership and has been labelled 'negative leadership'. The Cronbach Alpha Reliability coefficient value for this construct is .54. Though the last two values are below the level recommended by the literature we used the newly established constructs because of the exploratory nature of this study.

Job Characteristics. The Job Characteristics Model (Hackman and Oldham 1974) differentiates organizations by the prevalence of seven characteristics: autonomy, task identity, task significance, skill variety, feedback from job, feedback from agents, and dealing with others. According to Hackman and Oldham (1980) these characteristics are positively related to a number of desirable organizational outcomes, such as higher internal work motivation and job satisfaction. The model was criticized for failing to distinguish between the objective characteristics of jobs and the respondents' perception of job characteristics (Roberts and Glick 1981). However, the validity of the model was generally supported by empirical studies (Fried and Ferris 1987) in the USA as well as in other countries (Birnbaum, Farh and Wong 1986).

The Cronbach Alpha reliability test of the internal consistency of 21 items is .78.

In this study a factor analysis procedure revealed six factors with eigenvalue greater than one (see table 2).

The factors yielded in this analysis correspond reasonably with theoretical constructs proposed by Hackman and Oldham (1974). Out of seven original factors proposed in Hackman and Oldham's model we were able to replicate six factors. Factor 1 (JC1) includes a variety of items, two of which are concerned with autonomy; hence, it has been labelled 'autonomy'. The Cronbach Alpha reliability coefficient value for the factor is .84. Factor 2 (JC2) is comprised of 'feedback from agent' items (Alpha = .83); two items out of four on the third factor (JC3) belong to the 'dealing with others' construct (Alpha = .74), and two out of three items on the fourth factor (JC4) belong to the 'task identity' construct (Alpha = .67). The fifth factor (JC5) includes three items that belong to three different theoretical constructs. However, all three could be interpreted to indicate 'task significance' (Alpha = .54). The last factor (JC6) includes two items, one of which is feedback from job, and is therefore entitled 'feedback from job' (Alpha = .53). Oldham and Hackman's original construct of skills variety did not show up in the factor analysis procedure.

TABLE 2 Loadings of 6 job characteristics factors

Items	Original	F1	F2	F3	F4	F5	F6
To decide on your own how to work	AUT	**.77**	.04	.10	.08	−.04	.02
To see the end result	TKI	**.73**	.13	.09	.01	−.09	−.14
Performance info. is provided by job	FBJ	**.58**	.22	.18	.21	.07	.00
To do many different things at work	SKV	**.51**	.07	.39	−.07	.30	.09
The job affects the life of people	TKS	**.49**	.32	.20	.03	.20	.19
Freedom in how to do your job	AUT	**.47**	.17	−.06	.18	.25	.37
Feedback about your performance	FBA	.15	**.84**	.15	.07	.04	−.01
Supervisor's evaluation of performance	FBA	.09	**.84**	.15	.07	−.04	−.01
To know how well you are doing	FBA	.28	**.80**	.11	−.00	.01	−.00
A lot of cooperative work	DWO	.07	.09	**.80**	.11	.12	.03
To work closely with other people	DWO	.20	.17	**.74**	−.09	−.21	−.03
People are affected by your job	TKS	.13	.29	**.59**	.15	.23	.10
To use a number of high level skills	SKV	.26	.21	**.44**	.02	.38	.13
To do an entire piece of work	TKI	.09	.08	.00	**.79**	−.08	.02
To complete the job to end	TKI	.06	−.03	.01	**.77**	−.13	.11
The job provides feedback	FBJ	.18	.18	.37	**.52**	.12	.02
The job is unimportant to other people	TKS	−.08	.08	.02	.21	**.67**	−.10
The job is simple and repetitive	SKV	.13	.02	.01	−.24	**.63**	−.18
The job can be done by one person	DWO	.05	−.15	.13	−.26	**.61**	−.02
Personal initiative in carrying out the job	AUT	.02	.07	.03	−.02	−.10	**.77**
Clues about performance from job	FBJ	−.02	−.07	.08	.12	−.12	**.74**
Eigenvalue		4.86	2.13	1.49	1.29	1.28	1.12
Percentage of variance explained		23.1	10.1	7.1	6.1	6.1	5.4
Cumulative percentage		23.1	33.2	40.4	46.5	52.7	58.0

Notes: F1 – autonomy (AUT); F2 – feedback from agents (FBA); F3 – dealing with others (DWO); F4 – task identity (TI); F5 – task significance (TS); F6 – feedback from job (FBJ). $N = 724$.

Significant statistical differences between the means of workers' attitudes in state-owned companies and private companies were calculated using ANOVA tests. Finally, logistic regression was conducted to reveal the variables that contribute to the explanations of differences in perceived leadership style and job characteristics in state-owned and private enterprises. The findings are presented below.

TABLE 3 Pearson correlations among job characteristics and leadership style

Variables	JC1	JC2	JC3	JC4	JC5	JC6
LD1	.23**	.52**	.12**	−.04	.12**	−.04
LD2	.01	.20**	.37**	.18**	.01	.10*
LD3	.09*	−.07	.02	.05	.09*	−.28**

Notes: JC1 – autonomy; JC2 – feedback from agents; JC3 – dealing with others; JC4 – task identity; JC5 – negative job characteristics; JC6 – feedback from job; LD1 – positive leadership; LD2 – performance management; LD3 – negative leadership; * $p < .05$; ** $p < .01$. $N = 724$.

Findings

Correlations between job characteristics and leadership are presented in table 3.

Positive leadership is positively and significantly correlated with autonomy, feedback from agents, dealing with others, and task significance. Negative leadership is negatively and significantly correlated with feedback from job, and positively with autonomy, and task significance. Performance management is positively and significantly correlated with feedback from agents, dealing with others, task identity, and feedback from job.

Table 4 presents ANOVA for 3 factors obtained for the Leadership Style Model and 6 factors obtained for the Job Characteristics Model in the private and state-owned organizations.

LEADERSHIP STYLE BY OWNERSHIP

Performance management was significantly lower in private organizations (M = −.02; SD = .75) than in state-owned enterprises (M = −.06; SD = 1.05). Negative leadership was significantly lower in state-owned enterprises (M = .05; SD = 1.00) than in private organizations (M = .18; SD = .75). Hence, two out of three factors measuring different constructs of leadership in this study were found to follow the hypothesis. Positive leadership was not found to cause a distinction between private and state-owned enterprises.

JOB CHARACTERISTICS BY OWNERSHIP

Three out of 6 hypotheses tested for the relationship between job characteristics and ownership type (private versus state-owned) were confirmed. Feedback from agents was significantly lower in private organizations (M = −.15; SD = .98) than in state-owned enterprises (M = −.04;

TABLE 4 Leadership style and job characteristics: Comparison between private companies and state-owned enterprises

Leadership style	Private*		State-owned**			
	Mean	SD	Mean	SD	F	Sig.
LD1 positive leadership	.05	1.02	–.01	1.00	.44	.51
LD2 performance management	–.02	.75	.06	1.05	8.02	.00
LD3 negative leadership	.18	.75	.05	1.00	6.03	.01
Job characteristics						
JC1 autonomy	–.06	1.00	.02	1.00	.62	.43
JC2 feedback from agents	–.15	.98	–.04	1.00	4.23	.04
JC3 dealing with others	–.32	.85	–.09	1.02	19.99	.00
JC4 task identity	.02	.77	–.00	1.06	.11	.74
JC5 negative characteristics	–.09	1.04	.028	.99	1.64	.20
JC6 feedback from job	–.14	1.00	.04	1.00	3.38	.05

Notes: * $n = 158$; ** $n = 566$; $N = 724$.

SD = 1.00). Dealing with others was significantly lower in private organizations (M = –.32; SD = .85) than in state-owned enterprises (M = –.09; SD = 1.02). Feedback from job was significantly lower in private organizations (M = –.14; SD = 1.00) than in state-owned enterprises (M = .04; SD = 1.00), thus hypotheses 3, 4, and 7 are corroborated. Hypotheses 2, 5, and 6, suggesting significant differences by sector, were not found to be significant, and were therefore not confirmed. Hypothesis 8 could not be tested.

MULTIVARIATE LOGISTIC REGRESSION

In order to learn about the multivariate profile of being employed either in private or in state-owned enterprises a multivariate logistic regression analysis was performed employing 3 factors representing leadership style, 6 factors representing job characteristics, and the variable of the SAMPLE which differentiated between sample one and sample two.

The results presented in table 5 demonstrate that two out of three leadership style factors show a significant difference by type of ownership. Additionally, state-owned enterprises are characterized by 3 out of 6 job characteristics that are significantly different from job characteristics in private enterprises. Specific results are described here.

Performance management is positively and significantly correlated

TABLE 5 Logistic regression of private and state-owned enterprises on job characteristics and leadership style factors

Variable	B	SE	Wald	Sig
Constant	.57	.17	11.51	.00
Sample/Year	1.10	.22	24.15	.00
LD2 job evaluation	.29	.12	6.08	.01
LD3 negative leadership	–.31	.11	8.62	.00
JC2 feedback from agents	–.38	.11	11.57	.00
JC3 dealing with others	.43	.11	14.87	.00
JC5 task significance	.21	.10	4.14	.04

Variables excluded from the equation: JC1 – autonomy; JC4 – task identity; JC6 – feedback from job; LD1 – positive leadership. $N = 724$.

with employment in state-owned enterprises (B = .29; SE = .12; WALD test of significance = 6.08; Sig. = .01)

Negative leadership is positively and significantly correlated with employment in private organizations (B = –.31; SE = .11; WALD test of significance = 8.62; Sig. = .01).

Feedback from agents is positively and significantly correlated with employment in private organizations (B = –.38; SE = .11; WALD test of significance = 11.57; Sig. = .00).

Dealing with others is positively and significantly correlated with employment in state-owned enterprises (B = .43, SE = .11; WALD test of significance = 14.87; Sig. = .00).

Task significance is positively and significantly correlated with employment in state-owned enterprises (B = .21; SE = .10; WALD test of significance = 4.14; Sig. = .04)

The model is significant (chi-square = 62.61, df = 6; Sig. = .00, –2 Log Likelihood = 583.95 and Goodness of Fit = 552.43). The overall prediction power is 75.25%.

Discussion and Conclusions

As Russia is moving from a centrally planned economy to a free market economy, its workers in the private and state-owned enterprises are changing the perceptions of their organizational leadership and jobs. A profile constructed of two elements of leadership style and three elements of job characteristics may best predict that a change occurred in the perceptions of workers in private enterprises and not in state-owned

companies. State-owned organizations are characterized by a leadership style that maximizes 'performance management' and minimizes 'negative leadership,' and job characteristics that include 'feedback from agents,' 'dealing with others' and 'task significance.'

This profile could be regarded as part of the culture of the enterprises studied. Perceived negative organizational culture may spill over into employees' perceptions of their leadership and, among others, of their jobs. This major finding could be used by researchers and managers of transitional organizations. Researchers should aim to use holistic methods in analyzing transitional organizations, methods that measure and control as many organizational variables as possible. Managers should aim to improve not only their leadership style but also job characteristics of their employees as part of their improvement of the culture of their organizations.

While a profile of characteristics enables scholars and managers to look at the big picture, the study results could be used also to discuss each factor's potency in predicting the ownership system.

The first hypothesis suggested that Russian workers employed in state-owned enterprises perceive their organizations' leadership more positively than their counterparts in private companies. This hypothesis has been corroborated by two independent explanatory factors that have indicated differences in the perceptions of workers in private and state-owned enterprises. The first independent explanatory factor is *performance management.* This factor includes items on a leadership questionnaire that refer to workers' jobs, such as understanding the standards for an effective job performance, existing job rules and/ or performance guidelines, and requirements by the organization to perform unethically. While in both private and state-owned enterprises there was a negative shift in this factor over the years, the changes in state-owned enterprises were much more significant. It seems that workers in state-owned enterprises have changed the perceptions of their leadership to be less and less definitive and clear about the leadership expectations from the workers.

The second independent explanatory factor that may explain differences between workers' perceptions of their leaders in private and state-owned enterprises is the factor of *negative leadership.* It includes items such as employees who have a sense of control in the organization, management that is hesitant in stating long-term goals, and leadership that takes a negative view of the world. This factor that was perceived to prevail in state-owned enterprises has improved in privately owned enter-

prises. Employees in private companies see their organizations' leadership to be more negative and less orderly than their counterparts in state-owned enterprises.

The second hypothesis suggested that Russian workers employed in state-owned enterprises are perceived to enjoy more *autonomy* than their peers employed in private companies. This hypothesis has not been corroborated by the data and therefore it is rejected. Autonomy on the job could be an imperative of the nature of the job itself, which is mostly a result of the technology employed (Woodward 1958), rather than a consequence of the ownership type.

The third hypothesis suggested that Russian workers employed in state-owned enterprises are perceived to enjoy more *feedback from job* than their peers employed in private companies. Feedback from job could not explain differences between jobs in state-owned and private organizations and therefore the third hypothesis has been rejected. Again, feedback from job may be a function of the technology used rather than the ownership's type of the organization.

The fourth hypothesis has predicted that Russian workers employed in state-owned enterprises are perceived to enjoy more *feedback from agents* than their peers employed in private companies. This independent factor explained differences between jobs in state-owned and private enterprises and therefore hypothesis four has been corroborated. *Feedback from agents* – includes feedback on job performance (the worker knows how well he or she is doing on his/her job), and supervisor's evaluation of job performance. While over the year workers in private enterprises have learned to ask and to receive this feedback, workers in state-owned enterprises have lost some of the same feedback. The first possible explanation is that in the private enterprises performance is strongly linked to rewards and therefore it is not surprising that, as the economy is shifting to a more competitive mode, managers and workers have focused on this issue. On the contrary, workers in state-owned enterprises, which traditionally have not linked performance to rewards, just got confused over this issue in the face of the changing societal values.

The second possible explanation is that facing weakening state-owned enterprises, managers actually could not provide workers with a good performance management since the managers themselves did not have the authority or the means to link employees' performance to their rewards.

The third possible explanation is that this finding may be a statement

of self justification, as if workers in state-owned enterprises were trying to tell that job security in their companies is independent of the employees' performance and is therefore preferable to a job in the private enterprises where non performance might lead to dismissal.

The fifth hypothesis suggested that Russian workers in state-owned enterprises are perceived to *deal with others* more than their peers employed in private companies. This hypothesis has been corroborated, as dealing with others has been found to be a significant explanatory factor of the differences between jobs in private and state-owned enterprises. Dealing with others includes items such as: cooperative work, working closely with other people, affecting other people by one's job, and the use of high level skills on the job.

As workers in private enterprises perceived their jobs to include more and more elements referring to dealing with others, workers in state-owned enterprises seem to have lost some of these aspects over the years. The first possible explanation is that in private companies workers have been forced to work closely with each other to solve operational problems while workers in state-owned enterprises continue to refer to their supervisors to make decisions for them, as used to be the tradition in the central planning economy, and therefore they do not have to cooperate in their work activities. A second possible explanation is that as private organizations are improving their performance, workers have to take more and more responsibility, and hence they have to cooperate in their jobs. In state-owned enterprises, there are no incentives for taking responsibility and therefore workers do not really care about the end results of their jobs and, hence, would not bother to cooperate to solve organizational or operational problems.

The sixth hypothesis suggested that Russian workers employed in state-owned enterprises are perceived to enjoy more *task identity* than their peers employed in private enterprises. This hypothesis has been rejected. Task identity is the extent to which the worker can see the end results of his/her job and it may be related to the nature of the final product/ service rather than to the organization's ownership type.

The seventh hypothesis suggested that Russian workers employed in state-owned enterprises are perceived to enjoy more *task significance* than their peers employed in private enterprises. Task significance encompasses items such as: a job unimportant to other people, a simple and repetitive job, and a job that could be done by one person. While in private organizations the tendency to perceive a job as less significant has

been reduced over the years, in state-owned enterprises it has increased. Since it is plausible to believe that workers in state-owned enterprises have changed very little of their job characteristics over one year, the change in their perceptions could be attributed more to the change in their attitudes towards their jobs rather than to a real job change. It is possible that as a result of the changing societal perceptions of organizational efficiency and the private market shift in focus to high level skills jobs, workers in private organizations see their jobs to be more positive in general than workers in state-owned enterprises.

The eighth hypothesis suggested that Russian workers employed in state-owned enterprises are perceived to enjoy more *skills variety* than their peers employed in private enterprises. The hypothesis could not be tested since the factor analysis procedure of the Job Characteristics Model has not yielded a skills variety factor.

The study is not free of limitations. First, the survey results show that there are differences in some aspects of leadership and job characteristics between state-owned and private enterprises in Russia. The results do not indicate which factors cause the differences. Ownership may be one affecting factor, but not necessarily the definite one. Since the study did not control the samples as a comparable set, there are many other plausible factors contributing to the differences, such as a company's size or age. Second, the sample that is comprehensive and includes many organizations is still quasi-random. Third, the sampling has been conducted in one city in Russia and may not be representative of other Russian places, after all Russia is a huge country with eleven time zones. Fourth, despite the careful translation of the questionnaire it is difficult to estimate its face value. Russian workers were not experienced in taking questionnaires and they may have found the whole experience confusing and even threatening. Despite all these limitations, the study is unique in its investigation of organizational attitudes during a major economic and political transition.

From current knowledge about the transition in Russia it may be possible to infer that significant differences among workers could be better identified in organizations that vary in their size and age, represent various industries, and are located in certain regions of Russia, rather than in state-owned and private enterprises. Moreover, since Russian economic and political systems are still in transition it is possible that employees' attitudes that were measured a few years ago have changed again. It is therefore recommended to view this study's results as a snapshot that

has the potential to explain current differences between state-owned and private enterprises in Russia, yet the application should be carefully done by testing those attitudes again. A replication of this study may refine the theories used to enable them to explain the relationship between job characteristics and leadership style.

Local and foreign managers in Russia may realize that modern Russian state-owned and private enterprises do not resemble public and private sectors in the West. State-owned enterprises seem to be more stable and less diffused in their activities, probably as a consequence of seventy years of tradition. Private companies have just been created and therefore they seem to be more chaotic and less focused than state-owned enterprises. Yet, despite this tendency, it is likely that as the free market matures and managers learn how to prioritize, manage and measure profit, their organizations will more and more resemble western-style private organizations. Managers should learn how to integrate western-style management into the Russian business environment to design better jobs for their employees and to exercise a desirable leadership style. This may enhance the culture and performance of Russian organizations.

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Joint Dynamics of Prices and Trading Volume on the Polish Stock Market

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This paper concerns the relationship between stock returns and trading volume. We use daily stock data of the Polish companies included in the WIG20 segment (the twenty most liquid companies quoted on the primary market of the Warsaw Stock Exchange). The sample covers the period from January 1995 to April 2005. We find that there is no empirical support for a relationship between stock return levels and trading volume. On the other hand, our calculations provide evidence for a significant contemporaneous interaction between return volatility and trading volume. Our investigations reveal empirical evidence for the importance of volume data as an indicator of the flow of information into the market. These results are in line with suggestions from the *Mixture of Distribution Hypothesis.* By means of the Granger causality test, we establish causality from both stock returns and return volatility to trading volume. Our results indicate that series on trading activities have little additional explanatory power for subsequent price changes over that already contained in the price series.

Key Words: abnormal stock returns, return volatility, abnormal trading volume, GARCH-cum-volume, causal relations
JEL *Classification:* C32, G14

1 Introduction

Most empirical research about stock markets focuses on stock price movements over time. The stock price of a company reflects investors' expectations about the future prospects of the firm. New information

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causes investors to change their expectations and is the main reason for stock price changes.

However, the release of new information does not necessarily induce stock prices to move. One can imagine that investors may evaluate the news heterogeneously (as either good or bad). Think of a company that announces an increase in dividend payout. Investors may interpret this as a positive signal about the future performance of the company and raise their demand prices. On the other hand, investors interested in capital gains might wish to sell the stock on the basis of this information, rather than receive dividend payouts (e. g. due to tax reasons). On average, despite its importance to individual investors, such information does not noticeably affect prices. Another situation in which new information might leave stock prices unaltered can arise if investors interpret the news homogeneously but start with different prior expectations (e. g. due to asymmetrically distributed information). One can conclude that stock prices do not mirror the information content of news in all cases.

On the other hand, a necessary condition for price movement is positive trading volume. Trading volume can be treated as descriptive statistics, but may also be considered as an important source of information in the context of the future price and price volatility process. Prices and trading volume build a market information aggregate out of each new piece of information. Unlike stock price behaviour, which reflects the average change in investors' beliefs due to the arrival of new information, trading volume reflects the sum of investors' reactions. Differences in the price reactions of investors are usually lost by averaging of prices, but they are preserved in trading volume. In this sense, the observation of trading volume is an important supplement of stock price behaviour.

In 1989 Poland, and thereupon other Eastern European countries, started the transition process from a centrally planned economy to a market economy. There was no pre-existing economic theory of such a process to rely on. The early 1990s were extremely difficult for these countries. Stock quotations on the WSE were launched on April 16, 1991. This was the day of the re-establishment of the WSE as the exclusive place of trading on the Polish stock market after a break of more than 50 years. Continuous trading started in 1996, but only the most liquid stocks were included in this system. Hence, an interesting question arises as to whether the initial difficulties of the Polish stock market have now been overcome, and whether the same mechanisms on the Polish stock market as in developed capital markets can be identified.

To answer this question, we concentrate on the role of trading volume in the process that generates stock returns and return volatilities on the Polish stock market. Unlike most other studies on this issue, we use individual stock data instead of index data. Our investigation covers not only contemporaneous but also dynamic (causal) relationships because we are mainly interested in whether trading volume can be regarded as a prognosis of stock return levels and/or return volatilities. One important difference distinguishing this study from contributions in the existing literature is methodological. We do not use simple return and volume data but replace these two variables with abnormal stock returns and abnormal trading volume. To obtain these variables, we first calculate normal (expected) returns and trading volume and then compute abnormal realizations as the difference between the actual ex-post observations and those expected from the model. Note that such a variable can be regarded as a measure of the unexpected part of a given realization.

Our computations show that, on average, there is almost no relationship between abnormal stock returns and excess trading volume in either direction. It follows that knowledge of trading volume cannot improve short-run return forecasts and vice versa. On the other hand, our data support the hypothesis of a positive contemporaneous as well as causal relationship between return volatility and trading volume. We find that these results are mostly independent of the direction of stock price changes. Finally, our models show that return volatility in many cases precedes trading volume.

The rest of the paper is organized as follows. Section 2 contains a brief overview of the existing literature on the relationship between stock prices and trading volume. Section 3 describes our data, reports preliminary results, and also gives a detailed description of the applied methodology to obtain abnormal return and excess volume outcomes. Section 4 is dedicated to the tests used to check the contemporaneous relationship between stock returns, return volatility and trading volume. Section 5 extends our analysis to the examination of dynamic (causal) relationships. Section 6 concludes and provides suggestions for further research.

2 Existing Literature

An early work dedicated to the role of trading volume in the price generating process is that by Clark (1973). He developed the well known *Mixture of Distribution Hypothesis* (MDH). This hypothesis argue that stock returns are generated by a mixture of distributions. Clark states

that stock returns and trading volume are related due to the common dependence on a latent information flow variable. According to Clark, the more information arrives on the market within a given time interval, the more strongly stock prices tend to change. The author advises the use of volume data as a proxy for the stochastic (information) process. From the MDH assumption it follows that there are strong positive contemporaneous but no causal linkages between trading volume and return volatility data. Under the assumptions of the MDH model, innovations in the information process lead to momentum in stock return volatility. At the same time, return levels and volume data exhibit no common patterns. The theoretical framework developed by Clark has been generalized among others by Epps and Epps (1976), Tauchen and Pitts (1983), Lamoureux and Lastrapes (1990), and Andersen (1996).

An important model explaining the arrival of information on a market is the sequential information flow model introduced by Copeland (1976). It implies that news is revealed to investors sequentially rather than simultaneously. This causes a sequence of transitional price equilibrium which is accompanied by a persistently high trading volume. The most important conclusion from this model is that there exist positive contemporaneous and causal relationships between price volatility and trading activities.

In a framework which assumes stochastic fluctuations of stock prices, recent studies, e. g. by Blume et al. (1994) and Suominen (2001) state that data concerning trading volume deliver unique information to market participants; information which is not available from prices. Blume et al. argues that informed traders transmit their private information to the market through their trading activities. Uninformed traders can draw conclusions about the reliability of informational signals from volume data. Therefore, return volatility and trading volume show time persistence even in a case where the arrival of information does not show it. As do Blume et al., Suominen (2001) applies a market microstructure model in which trading volume is used as a signal to the market by uninformed traders and can help to reduce information asymmetries. These two studies argue that trading volume describes market behaviour and influences market participants' decisions. Both authors suggest strong relationships, not only contemporaneous but also causal, between volume and return volatility.

These theoretical contributions have been accompanied by a number of empirical studies which deal with volume-price relationships on cap-

ital markets. The most important findings are those by Karpoff (1987), Hiemstra and Jones (1994), Brailsford (1996) and Lee and Rui (2002). The cited authors mainly use index data. Although these studies differ significantly with respect to sample data and applied methodologies, they convey empirical evidence of the existence of a positive volume-to-price relationship.

The interdependencies between stock return volatility and trading volume have been the subject of investigation by Karpoff (1987), Bessembinder and Seguin (1993), Brock and LeBaron (1996), Avouyi-Dovi and Jondeau (2000), and Lee and Rui (2002). All these studies give evidence of a strong relationship (contemporaneous as well as dynamic) between return volatility and trading volume. In contrast to these authors, Darrat et al. (2003), using intraday data from DJIA stocks find evidence of significant lead and lag relations only. They do not report a contemporaneous correlation between return volatility and trading volume.

Lamoureux and Lastrapes (1990) were the first to apply stochastic time series models of conditional heteroscedasticity (GARCH-type) in the context of price-volume investigations. They analyzed the contemporaneous relationship between volatility and volume. They found that the persistence of stock return variance vanishes when trading volume is included in the conditional variance equation. Considering that trading volume is a proxy for the flow of information into the market, this result supports the MDH. A paper by Lamoureux and Lastrapes (1990) gives general proof of the fact that trading volume and return volatility are driven by the same factors. They do not, however, answer the question on the identity of these factors. Lamoureux and Lastrapes (1994), Andersen (1996), Brailsford (1996), and Omran and McKenzie (2000) expanded this GARCH-cum-volume approach.

3 The Data and Preliminary Results

Our data set consists of daily stock price and trading volume series for all companies listed in the WIG20 on April 29, 2005. The WIG20 reflects the performance of the twenty most liquid Polish companies in terms of free float market capitalization. Our time series are derived from the database of PARKIET. The investigation covers the period from January 1995 to April 2005. An appendix at the end of the paper contains a list of all companies included in the sample as well as their period of quotation. We use continuously compounded stock returns calculated from daily stock prices at close, adjusted for dividend payouts and stock splits.

As a proxy for return volatility we employ the squared values of daily stock returns. We repeated all computations using absolute instead of squared stock returns and find that the use of this alternative measure for stock return volatility delivers almost the same results. To measure trading volume the daily number of shares traded is being used.

DESCRIPTIVE STATISTICS

We start with some basic descriptive analysis of the time series of stock returns and trading volume. As can be seen from panel A of table 1, the average daily stock return over the period under study ranges from –0.28% (Netia) to 0.12% (BRE) with a median of –0.05%. Standard deviation is the lowest for PKN (1.85%) and the highest for Netia (4.45%).

The commonly reported fact of fat-tailed and highly-peaked return distributions is being supported by most of our series. The median of stock return kurtosis is 6.88 and ranges from 34.98 (SFC) to 3.9 (PKN). Return skewness is the highest for Netia (0.92) and the lowest for SFC (–1.8) with a median of 0.19. By applying Jarque-Bera and chi-square goodness-of-fit tests for normality, we additionally find strong support for the hypothesis that our return series do not come from a normal distribution. Concerning autocorrelation properties, the Ljung-Box *Q*-test statistics for the 15th order autocorrelation provide evidence of significant low-order autocorrelation in about 50% of all cases.

Unlike stock returns, both return volatility and trading volume commonly display strong persistence in their time series. By means of Ljung-Box *Q* (15)-statistics we find strong support for the hypothesis that trading volume exhibits serial autocorrelation. Consistent with the stylized facts of volume series listed by Andersen (1996), our volume data exhibit a high degree of non-normality, expressed by their considerable kurtosis and their being skewed to the right (see panel C of table 1).

As a proxy for return volatility we use the squared values of daily stock returns. These time series display the usual time dependency of stock returns in the second order moment (volatility persistence) implying, among other things, that returns cannot be assumed to be i. i. d. As for trading volume, the null hypothesis of squared returns coming from a normal distribution is strongly rejected (panel B in table 1).

ABNORMAL RETURNS AND ABNORMAL TRADING VOLUME

One point that is essential in distinguishing our study from other contributions is that we focus on interactions between abnormal stock returns

TABLE 1 Aggregated summary statistics for stock market data of WIG20 companies

	Mean · 10^3	Std. dev. · 10^3	Skewness	Kurtosis
Panel A: Daily stock returns				
Min	−2.81	18.50	−1.80	3.90
1st Quartile	0.10	24.85	−0.07	6.50
Median	0.52	26.33	0.19	6.88
3rd Quartile	0.73	32.00	0.27	8.78
Max	1.15	44.49	0.92	34.98
Panel B: Daily squared stock returns				
Min	0.34	0.59	3.89	22.83
1st Quartile	0.62	1.47	5.83	49.55
Median	0.69	1.93	7.18	77.15
3rd Quartile	1.03	2.69	8.53	120.20
Max	1.99	7.83	35.35	1 435.61
Panel C: Daily trading volume				
Min	9.80	16.42	1.66	7.82
1st Quartile	28.57	41.03	2.98	17.24
Median	70.10	73.98	4.11	29.22
3rd Quartile	231.53	314.82	7.40	119.33
Max	1337.54	1286.82	34.97	1359.58

and abnormal trading volume, instead of simple return and volume data. Since we concentrate on individual companies, instead of index data, our goal is to establish unique firm-specific relationships, i. e. we filter out systematic price and volume effects. For each trading day t we compute the abnormal return $AR_{i,t}$ for company i as the difference between the actual ex-post return and the security's normal (expected) return. Formally we have

$$AR_{i,t} = R_{i,t} - E\left[R_{i,t}|I_{i,t-1}\right] \tag{1}$$

where $R_{i,t}$ stands for the actual return of firm i on day t and $E[R_{i,t}|I_{t-1}]$ stands for the predicted (normal) return conditional on the information set I_{t-1}.

To model risk-adjusted expected returns $E[R_{i,t}|I_{t-1}]$ we use the Market Model approach, which relates a security's return to the return of the market. The latter is approximated in our study by the log-returns of the WIG, which comprises the majority of firms listed on the primary

market of the Warsaw Stock Exchange. For each day the relevant model parameters are estimated by means of an OLS method. The estimation window comprises 100 trading days prior to that date. Since our analysis starts on January 2, 1995, this implies that the first realisation of abnormal stock returns for each company can be observed for the 101st trading day in 1995.

Abnormal trading volume is computed in a similar way. To isolate information-related trading activity, we follow Tkac (1999) who found that market-wide trading is also an important component of the trading activity of individual firms, and that it should be taken into account when modeling volume time series. However, the application of a 'Volume Market Model' proposed in Ajinkya and Jain (1989) generates many statistical problems. We find that the resulting abnormal volume series mostly depart from the underlying model assumptions. This leads to biased inferences. Taking this into account, we follow, among others, Beneish and Whaley (1996) by using firm-specific average volume data as a benchmark for normal trading volume. As was the case with the estimation window for the return parameters in the Market Model, the estimation window for the mean firm-specific volume also covers 100 trading days.

TESTING FOR UNIT ROOT

Testing for causal relationships between trading volume and stock price data can be sensitive to non-stationarities. Therefore, we check whether the time series of stock returns and trading volume can be assumed to be stationary by using the augmented Dickey-Fuller (ADF) test. This is necessary to avoid model misspecifications and biased inferences. The ADF test is based on the regression:

$$\Delta y_t = \mu + \gamma y_{t-1} + \sum_{i=1}^{p} \delta \Delta y_{t-i} + \varepsilon_t, \tag{2}$$

where y_t stands for stock return or trading volume on day t, μ, γ and δ are model parameters, and ε_t represents a white noise variable. The unit root test is carried out by testing the null hypothesis of a unit root in the stochastic process generating $y_t(\gamma = 0)$ against the one-sided alternative $\gamma < 0$.

We conduct ADF tests for each company's time series of stock returns. We find the parameter γ to be negative and statistically significant at reasonable levels in all cases. The same is true for the time series of trading

TABLE 2 Cross-correlation coefficients between abnormal stock returns (AR), abnormal return volatility (AR^2) and abnormal trading volume (AV)

	$j = -2$	$j = -1$	$j = 0$	$j = 1$	$j = 2$
Panel A: $Corr(AR_t, AV_{t-j})$					
Min	−0.02	−0.01	0.04	−0.03	−0.02
1st Quartile	0.03	0.08	0.09	−0.01	−0.01
Median	0.04	0.10	0.12	0.00	0.00
3rd Quartile	0.07	0.13	0.13	0.03	0.02
Max	0.13	0.18	0.16	0.05	0.04
Panel B: $Corr(AR_t^2, AV_{t-j})$					
Min	−0.10	−0.06	−0.07	−0.08	−0.13
1st Quartile	0.05	0.08	0.09	0.03	0.01
Median	0.08	0.15	0.17	0.07	0.04
3rd Quartile	0.11	0.20	0.20	0.10	0.07
Max	0.17	0.30	0.32	0.14	0.13

volume. Hence we come to the conclusion that both time series of stock returns and trading volume can be assumed to be invariant with respect to time.

CROSS-CORRELATION ANALYSIS

At the beginning of our investigation of interactions between abnormal stock return and abnormal trading volume data we calculate simple cross-correlation coefficients *Corr* for all companies:

$$Corr[AR_t, AV_t] = \frac{Cov[AR_t, AV_t]}{SD[AR_t] \cdot SD[AV_t]}, \tag{3}$$

where AR_t (AV_t) denotes abnormal stock return (abnormal trading volume) on day t, *Cov* stands for covariance and *SD* is standard deviation. From panel A of table 2 we see that there is no direct contemporaneous correlation between abnormal stock return levels and excess trading volume. The same results are obtained when one computes *Corr* between *AR* and lagged (leading) data of *AV*.

On the other hand, panel B of table 2 shows a positive contemporaneous correlation between abnormal trading volume and abnormal return volatility. From this observation it follows that, due to its impact on return volatility, trading volume might indirectly contain information about stock price behaviour.

We also find an asymmetry in the cross correlation between squared *AR* and *AV* around zero. In all cases, $Corr[AR_t^2, AV_{t-j}]$ is greater for $j = -1$ than for $j = 1$. This fact is in line with the widespread expectation that trading volume is, at least partly, induced by heavy price fluctuations.

4 Contemporaneous Relationship

STOCK RETURNS AND TRADING VOLUME

In this section we test the contemporaneous relationship between abnormal stock returns and excess trading volume. We use a multivariate simultaneous equation model proposed by Lee and Rui (2002), which is defined by the two equations:

$$AR_t = \alpha_0 + \alpha_1 AV_t + \alpha_2 AR_{t-1} + \varepsilon_{1,t};$$
$$AV_t = \beta_0 + \beta_1 AR_t + \beta_2 AV_{t-1} + \beta_3 AV_{t-2} + \varepsilon_{2,t}. \quad (4)$$

We assume ε_t to be white noise. One has to take into account that the jointly determined endogenous variables in each equation are not independent of the disturbances. This is important in respect to the estimation process. To take this possible dependence into account, we apply Full-Information Maximum Likelihood (FIML) methodology. FIML generates asymptotically efficient estimators. An additional advantage is that the cross-equation correlations of the error terms are taken into account (see e. g. Davidson and MacKinnon 2003). The significance of all coefficients in models (4), (5) and (6) (see below), is proved by means of the *t*-Student test (*t*-ratio coefficients).

The findings are in line with our expectations of almost no essential contemporaneous relationship between abnormal stock returns and excess trading volume. Across the whole sample, the parameters α_1 and β_1 in (4) turn out to be statistically significant in only 4 cases. Since the majority of our abnormal return series exhibit no serial correlation, we find parameter α_2 to be significant in only 6 cases.

Time dependence in the trading volume time series is supported by the highly significant values found for parameters β_2 (16 cases) and β_3 (11 cases). As one would expect, the sign of these coefficients is positive in all but two cases, implying positive autocorrelation in volume data.

Even though we find abnormal stock return levels and trading volume to be mutually independent, this does not mean that no relationships can be found in these market data at all. Several authors report that price fluctuations tend to increase in face of high trading volume. Therefore,

a relation might exist between higher order moments of excess stock returns and trading volume.

In addition, we check whether this volatility-volume relationship is the same irrespective of the direction of the price change, or whether trading volume is predominantly accompanied by either a large rise or a large fall in stock prices. We test this by using a bivariate regression model, given by the following equation:

$$AV_t = \alpha_0 + \phi_1 AV_{t-1} + \phi_2 AV_{t-2} + \alpha_1 AR_t^2 + \alpha_2 D_t AR_t^2 + \varepsilon_t. \qquad (5)$$

In model (5), D_t denotes a dummy variable that equals 1 if the corresponding abnormal return AR_t is negative, and 0 otherwise. The estimator of parameter α_1 measures the relation between abnormal return volatility and excess trading volume, irrespective of the direction of the price change. The estimator of α_2, however, reflects the degree of asymmetry in this relationship. To avoid the problem of serially correlated residuals, we include lagged values of AV up to lag 2. After this, we find the error term ε_t in equation (5) to be largely serially uncorrelated.

By means of the ML method we estimate equation (5). According to our computations, the estimate of parameter ϕ_1 is significant in 17 cases and the estimate of parameter ϕ_2 is significant in 15 cases. We also establish that parameter α_1 is positive and significant for all but 2 companies. This is in line with our earlier hypothesis of a strong contemporaneous relationship between squared AR and AV. The estimate of parameter α_2 is significant in 13 cases and negative in all of these. We find that for our sample of the Warsaw Stock Exchange, strong price changes are always accompanied by an increase in trading volume, irrespective of the direction of price fluctuations.

TRADING VOLUME AND VOLATILITY

The stochastic process of stock returns is given by means of an augmented Market Model with an autoregressive term of order 1 in the conditional mean equation below. The conditional variance is captured by an adapted GJR-GARCH(1,1) model (Glosten et al. 1993). In this version, trading volume is included as an additional predetermined regressor. The GJR model captures the asymmetric (leverage) effect discovered by Black (1976), which states that bad information, reflected in an unexpected decrease in prices, causes volatility to increase more than good news. Engle and Ng (1993) supplied a theoretical and empirical support and stated that, among alternative models of time-varying volatility, the GJR model is the best at efficiently capturing this effect.

The model is represented by the following two equations:

$$R_t = \alpha_0 + \alpha_1 R_{t-1} + \alpha_2 R_{m,t} + \varepsilon_t,\ \varepsilon_t \sim (0, \sigma_t^2);$$
$$\sigma_t^2 = h_t = \beta_0 + \beta_1 h_{t-1} + \beta_2 \varepsilon_{t-1}^2 + \beta_3 S_{t-1}^- \varepsilon_{t-1}^2 + \gamma V_t. \tag{6}$$

Here ε_t is assumed to be distributed as t-Student with ν degrees of freedom conditional on the set of information available at $t-1$; σ_t^2 represents the conditional variance of ε_t; and S_{t-1}^- is a dummy variable, which takes the value of 1 in the case of the innovation ε_{t-1} being positive and 0 otherwise. Model (6) rests upon the assumption that trading volume is a proxy for the flow of information into the market: if return volatility is in fact mostly influenced by the information flow, the effect of volatility clustering should decrease if one incorporates trading volume in the conditional variance equation. In (6) the sum of parameters β_1 and β_2 reflects the persistence in the variance of the unexpected return ε_t, taking values between 0 and 1. The closer this sum is to unity, the greater the persistence of shocks to volatility (volatility clustering). The estimate of parameter β_3 accounts for potential asymmetries in the relationship between return innovation and volatility.

We apply a t-Student distribution for the return innovations ε_t because we find this to fit our turnover ratio series best. Thus, we use the conditional t-Student distribution for which the normal is a special case ($\nu > 30$). For model (6), a likelihood function L is defined as:

$$L = T\left\{\ln\Gamma\left(\frac{\nu+1}{2}\right) - \ln\Gamma\left(\frac{\nu}{2}\right) - \frac{1}{2}\ln[\pi(\nu-2)]\right\}$$
$$-\frac{1}{2}\sum_{t=1}^{t}\left[\ln(\sigma_t^2) + (1+\nu)\ln\left(1 + \frac{1}{\nu-2}\frac{\varepsilon_t}{\sigma_t^2}\right)\right], \tag{7}$$

where T denotes the sample size and $\Gamma(.)$ denotes the gamma function.

The model parameters are estimated by means of the ML method. As a first step, we estimate the parameters of model (6) assuming that γ is equal to 0 (restricted variance equation, see table 3). We find that the estimate of parameter β_1 as well as the estimate of parameter β_2 is significant in nearly all cases. For 14 companies, the observed sum $(\beta_1 + \beta_2)$ lies within the range $[0.9 - 1]$. The average is 0.93, which indicates high persistence in conditional volatility. In most cases, β_3 is positive, but turns out to be statistically significant for one company only. This indicates that the asymmetric reaction of conditional variance to return innovations is rather modest in our data. In the next step we are interested in the unrestricted equation for conditional variance. We find parameter γ

TABLE 3 Persistence in conditional stock return volatility [restricted versus unrestricted version of model (6)]

Symbol	$(\beta_1 + \beta_2)^a$	$(\beta_1 + \beta_2)^b$	Symbol	$(\beta_1 + \beta_2)^a$	$(\beta_1 + \beta_2)^b$
AGO	0.93	0.08	KTY	1.00	0.03
BPH	0.98	0.97	NET	1.00	0.88
BRE	0.95	0.13	ORB	0.97	0.21
BZW	0.81	0.90	PEO	0.87	0.91
CPL	0.99	0.08	PKM	0.96	0.06
CST	0.75	0.41	PKN	0.96	0.89
DBC	0.70	0.11	SFT	0.91	0.04
FSC	0.96	0.37	STX	0.96	0.89
KGH	0.98	0.89	TPS	0.98	0.83
			Average	0.93	0.48

to be positive and highly significant across the whole sample. Our data show a considerable decrease in the persistence of volatility when trading volume is included in (6). The sum of parameters β_1 and β_2 declines for almost all companies. The mean falls from 0.93 to 0.48. The estimate of parameter β_2 shows a significant drop. In the unrestricted form it becomes, for the most part, insignificant. Table 3 gives the degree of persistence in variance, measured by the sum $(\beta_1 + \beta_2)$ for the restricted and unrestricted form of (6). Results are shown for all stocks under consideration.

It cannot be derived from our data that trading volume is the true source of persistence in volatility. Empirical results support the conjecture that trading volume might itself be partly determined by return volatility, causing a simultaneity bias in the coefficient estimates. To solve this simultaneity problem we re-run model (6) substituting V_{t-1} for V_t. In line with Gallo and Pacini (2000), we find that volatility persistence under this approach remains almost the same as in the restricted version of (6). It can be concluded that contemporaneous trading volume is a sufficient statistic for the history of return volatility. Despite this, our results can only partly be interpreted as an indication that the MDH holds true.

5 Dynamic Relationship

Up to this point, our investigations focused exclusively on contemporaneous relationships between trading volume and stock returns, and

trading volume and return volatility. The following part of the paper studies dynamic (causal) interactions between these variables. Testing for causality is important because it permits a better understanding of the dynamics of stock markets, and may also have implications for other markets.

From section 3 we get a hint that it is probable that causality is present in the relationship between return volatility and trading volume. This hypothesis can be proved by means of the Granger causality test (Granger 1969). A variable Y is said not to Granger-cause a variable X if the distribution of X, conditional on past values of X alone, equals the distribution of X, conditional on past realizations of both X and Y. If this equality does not hold, Y is said to Granger-cause X. This is denoted by $Y \overset{G.c.}{\rightarrow} X$. Granger causality does not mean that Y causes X in the more common sense of the term, but only indicates that Y precedes X. In the case of the feedback relationship (i. e. X Granger-causes Y and vice versa) this relation is written as $Y \overset{G.c.}{\leftrightarrow} X$.

As a test of Granger causality, we apply a bivariate vector autoregression (VAR) of the form:

$$AR_t = \mu_1 + \sum_{i=1}^{p} \alpha_{1,i} AR_{t-i} + \sum_{i=1}^{p} \beta_{1,i} AV_{t-i} + \varepsilon_{1,t};$$

$$AV_t = \mu_2 + \sum_{i=1}^{p} \alpha_{2,i} AV_{t-i} + \sum_{i=1}^{p} \beta_{2,i} AR_{t-i} + \varepsilon_{2,t}. \tag{8}$$

Model (8) is estimated using an OLS method. In order to choose an appropriate autoregressive lag length p of the VAR, we apply the Akaike information criterion (AIC). Based on this measure of goodness-of-fit, we establish the proper lag length p to be equal to 2 for all companies.

In terms of the Granger causality concept, it is said that AR (AV) does not Granger-cause AV (AR) if the coefficients β_i ($i = 1, \ldots, p$) in (8), respectively, are not significant, i. e. the null hypothesis H_0: $\beta_1 = \beta_2 = \ldots = \beta_p = 0$ cannot be rejected.

To test the null, we calculate the F-statistic:

$$F = \frac{SSE_0 - SSE}{SSE} \cdot \frac{N - 2p - 1}{p}. \tag{9}$$

In (9) SSE_0 denotes the sum of squared residuals of the regression model constrained by $\beta_i = 0$ ($i = 1, \ldots, p$), SSE is the sum of squared residuals of the unrestricted equation, and N stands for the number of observations. The statistic (9) is asymptotically F distributed under the

TABLE 4 Number of rejected null hypotheses based on the Granger causality test

Panel A: *Causality between excess trading volume and abnormal stock returns*			
	$AR \overset{G.c.}{\rightarrow} AV$	$AV \overset{G.c.}{\rightarrow} AR$	$AR \overset{G.c.}{\leftrightarrow} AV$
Sample size: 18 companies	11	0	1
Panel B: *Causality between excess trading volume and squared abnormal stock returns*			
	$AR^2 \overset{G.c.}{\rightarrow} AV$	$AV \overset{G.c.}{\rightarrow} AR^2$	$AR^2 \overset{G.c.}{\leftrightarrow} AV$
Sample size: 18 companies	8	1	3

Level of significance is 5%. Order p in (8) is equal to 2.

non-causality assumption, with p degrees of freedom in the numerator and $(N - 2p - 1)$ degrees of freedom in the denominator.

Concentrating on the rejection of the null hypothesis of Granger non-causality, panel A of table 4 demonstrates that abnormal returns (excess trading volume) precede excess trading volume (abnormal returns) in 11 (0) cases. Both numbers reflect exclusively unidirectional causalities. Only in one case a two-way causality (feedback relation) is detected. To conclude, short-run forecasts of current or future stock returns in general cannot be improved by the knowledge of recent trading volume data. The observation that stock returns precede trading volume in approximately half of all cases is in line with similar findings by Glaser and Weber (2004) and confirms predictions from overconfidence models. To summarize, we find only weak evidence of causality between abnormal stock returns and excess trading volume, especially causality running from trading volume to stock returns. This is in line with our expectations.

To evaluate dynamic relationships between stock return volatility and trading volume, we substitute the abnormal return level for the squared values of abnormal stock returns, and re-estimate the model (8). Panel B of table 4 confirms the existence of causal relationships from AR^2 to AV. In 10 cases, AR^2 precedes AV, whereas in only 1 case does Granger causality run from AV to AR^2. This result is again in line with our earlier finding that stock price changes in any direction have information content for upcoming trading activities. The preceding return volatility can also be seen as some evidence that the arrival of new information might follow a sequential rather than a simultaneous process.

Our results indicate that data on trading activity have only little additional explanatory power for subsequent price changes that is independent of the price series. In this sense, our empirical results for the Polish stock market does not overall corroborate theoretical suggestions made by Blume et al. (1994) and more recently by Suominen (2001).

6 Conclusions

Our paper presents a joint dynamics study of daily trading volume and stock returns for Polish companies listed in the WIG20. We test whether volume data provide only a description of trading activities or whether they convey unique information that can be exploited for modeling stock returns or return volatilities. These relationships are investigated by the use of abnormal stock return and excess trading volume data. Our results give no evidence of a contemporaneous relationship between market adjusted stock returns and mean adjusted trading volume. The linear Granger causality test of dynamic relationships between these data does not indicate substantial causality. We can conclude that short-run forecasts of current or future stock returns cannot be improved by the knowledge of recent volume data and vice versa. This finding is in line with the efficient capital market hypothesis. However, the Polish data show extensive interactions between trading volume and stock price fluc-

APPENDIX A Companies included in the sample, symbol legend and period of quotation*

PLPKN0000018	20 April 1999 – 29 April 1999
PLPEKAO00016	7 February 1995 – 29 April 2005
PLTLKPL00017	2 January 1995 – 29 April 2005
PLKGHM000017	2 January 1995 – 29 April 2005
PLBPH0000019	27 October 1995 – 29 April 2005
PLAGORA00067	25 May 1998 – 29 April 2005
PLBZ00000044	2 January 1995 – 29 April 2005
PLPROKM00013	22 April 1997 – 17 February 2005
PLNETIA00014	10 July 1997 – 29 April 2005
PLBRE0000012	30 January 1996 – 29 April 2005
PLSTLEX00019	11 July 2000 – 29 April 2005
PLKETY000011	20 November 1997 – 29 April 2005
PLORBIS00014	30 June 1998 – 29 April 2005
PLSOFTB00016	10 February 1998 – 29 April 2005
PLCMPLD00016	26 November 1999 – 29 April 2005
PLCRSNT00011	2 June 1998 – 29 April 2005
PLCELZA00018	2 January 1995 – 29 April 2005
PLDEBCA00016	18 November 1998 – 29 April 2005

* In the case of two firms included in the WIG20, data series have been too short.

tuations. We find that squared abnormal stock returns and excess trading volume are contemporaneously related. This implies that both time series might be driven by the same underlying process. In contrast to Brailsford (1996), our findings provide evidence that for the Polish stock market this volatility-volume relationship is independent of the direction of the observed price change. We apply our investigations to a conditional asymmetric volatility framework in which trading volume serves as a proxy for the rate of information arrival on the market. The results to some extent support suggestions of the Mixture of Distribution Hypothesis, i. e. that ARCH is a manifestation of daily time dependence in the rate of new information arrival. We also detect dynamic relationships between return volatility and trading volume data.

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Human Capital and Economic Growth by Municipalities in Slovenia

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This article presents the analysis of the nature of economic growth of the Slovenian economy at the aggregate level and at the level of Slovenian municipalities for the period 1996–2002. The aggregate cross-sectoral time series dataset and the regional cross-sectional time series dataset are used to econometrically test the significance of labour reallocation between sectors and municipalities on the nature of economic growth of the Slovenian economy. For this purpose we compare estimates of average and marginal stochastic frontier production functions. The estimated parameters of these two groups of production functions clearly indicate an inefficient use of human capital in the Slovenian economy during the analysed period. The uncompleted process of sectoral labour reallocation is found as the main factor that has a negative impact on the growth of total factor productivity in the Slovenian economy.

Key Words: economic growth, sectoral reallocation of labour, total factor productivity, stochastic frontier model
JEL *Classification:* 015, 040

Introduction

Previous studies of the economic performance and growth of the Slovenian economy during the transition from a socialist to a market economy raise an interesting theoretical and empirical question regarding the role of human capital in these processes. Orazem and Vodopivec (1995) described winner and loser associations through prevalence of winners' returns to education and to a lesser extent to experience. Bojnec and Konings (1999) conducted an analysis on the magnitude and dynamics of job

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creation and job destruction at the micro-level using a sample of Slovenian firms and compared the results with some other transition countries. Bojnec et al. (2003) found that human capital plays a crucial role in the intersectoral labour mobility among agriculture, industry and services. Bojnec (2003) found that regional location with associated economic and human capital structures is an important factor that causes differences in the level of economic development by statistical regions in Slovenia. Novak (2004) found a significant contribution of human capital to the aggregate economic growth in Slovenia, but with a negative influence of human capital on the growth of total factor productivity.

In this article we present the analysis of the nature of economic growth of the Slovenian economy at the aggregate level and at the level of Slovenian municipalities for the period 1996–2002. The research was conducted on the basis of the aggregate cross-sectoral time series data. Additionally, we test the significance of labour reallocation on the nature of economic growth of the Slovenian economy using the regional cross-sectional time series data. The in-depth analysis at the municipality level was necessary to obtain a sufficient number of observations for testing statistical-significance of the parameters associated with labour reallocation.

For the period 1996–2002, each time series dataset offers only 7 observations. The disaggregated dataset offers observations for each analysed variable by 174 Slovenian municipalities. This provides an appropriate database for robust statistical estimations. The disaggregated dataset by municipalities enables us to investigate the characteristics of the economic growth in Slovenia during the second stage of transition. For this purpose we use the stochastic frontier production function and the average production function framework.

We draw the following conclusions: first, human capital brings an important contribution to the aggregate growth; second, the uncompleted process of sectoral labour reallocation is found as the main factor that limits the contribution of human capital to the growth of total factor productivity in the Slovenian economy; third, the comparison between the estimated parameters of the stochastic frontier production function and the average production function clearly indicates an inefficient use of human capital in the Slovenian economy.

The following section briefly introduces a theoretical background of the role of human capital in economic growth. We then present the methodology used for analysing the role of human capital to the nature

of economic growth in Slovenia between the years 1996 and 2002. The final section concludes with the main findings.

Theoretical Background on the Role of Human Capital in Economic Growth

Human capital is defined as a factor of economic growth, which captures the abilities, skills and knowledge of workers (Romer 1994). It plays a dual role in the process of economic growth. First, it is a factor of production, and second, it is a source of innovation (Mincer, 1989, 1). The human capital literature is dichotomised between two basic frameworks: that of Becker (1964) and that of Lucas (1988). They emphasize human capital as an alternative source of sustained growth (similar to the technological progress). Second, there is Schumpeter's growth literature, which is based on the work of Nelson and Phelps (1966). This stream of literature highlights the importance of human capital stock (and not its accumulation) for economic growth.

Regardless of which theoretical framework is used, human capital can be regarded as a production factor and can be simply built into the model of economic growth. The most popular in empirical literature on human capital and economic growth in advanced market economies are growth regressions proposed by Barro and Sala-i-Martin (1995), empirical analysis conducted by Mankiw et al. (1992), and researches by Benhabin and Spiegel (1994). There exists also a body of literature and empirical analysis on the role of human capital in transition countries. Conventional wisdom holds that transition countries are well endowed with human capital, which is consistent with the main findings by Barro and Lee (2001). They emphasised that most human capital indicators are better placed in transition countries than in OECD countries, but on the contrary Boeri (2000) argued that the skills acquired in transition economies are over specialised, lowering labour force mobility across industries and consequently impeding economic progress.

The worker's mobility across industries plays a crucial role in former transition economies. The resource allocation during the old system was not based on market principles. Under different distortions and redistributions, the great majority of workers were employed in state-owned enterprises. When the transition process began, the market forces were allowed to determine the economic activity. With economic liberalisation and deregulation of economic activities structural adjustment policies were introduced that induced structural changes and adjustments.

Different capital structures have moved from less productive industries towards more productive ones. As we present further, labour force adjustments in Slovenia seem to be slow, thus reducing the speed of productivity growth. As long as a predominant proportion of workers are employed in less productive industries and not in more productive ones, the aggregate growth of productivity will stay below the level that hinders the economic development.

Since the productivity growth is a crucial factor of international competitiveness, the hypothesis that sectoral reallocation of labour force in transition economies is the key factor of progress and economic growth, is plausible. We limit our empirical analysis to the Slovenian economy.

Methodological Framework

For estimating the impact of labour force movements between industries the McCombie's (1980) methodological framework and, alternatively, the econometric estimation approach of elasticity coefficients are the most commonly used frameworks.

McCombie's decomposition method

McCombie (1980, 104–106) developed an original framework for quantifying the impact of sectoral reallocation of workers from low towards high productivity industries on the growth of total factor productivity. The starting point of McCombie's decomposition method is the calculation of the average labour productivity growth rate at the aggregate level:

$$\rho = \sqrt[T]{\frac{P_T}{P_0}} \tag{1}$$

where ρ denotes the growth rate coefficient of labour productivity, P_T denotes the aggregate level of labour productivity in the terminal year, P_0 denotes the aggregate level of labour productivity in the base year, while T denotes the terminal year.

The level of labour productivity at time t for the whole economy is calculated as:

$$P_t = \sum_{i=1}^{n} \left[\frac{Q_{i,t}}{E_{i,t}} \cdot \frac{E_{i,t}}{E_t} \right] = \sum_{i=t}^{n} \left[P_{i,t} \cdot a_{i,t} \right] \tag{2}$$

where P, Q, E are the levels of labour productivity, output and employment, i denotes the industry and a denotes the share of industry i's employment in total employment. From definition (2) it follows that the aggregate productivity depends on two different factors. First, on

the industry's specific productivity of labour, and second, on the number of workers employed in each industry. Hence the growth of the employment-share in industries with a higher productivity level will raise the aggregate productivity, and vice versa will lower it in industries with a lower productivity level. The labour movement between industries is only one factor that influences the aggregate productivity. This impact, according to McCombie (1980), is described as the structural component. The impact of all other factors is described as the standardized component. The evaluation of these two components derives from expression (1). Taking the natural logarithm of (1) and considering (2) we get:

$$\ln(\rho) = \ln\left(\sqrt[T]{\frac{P_T}{P_0}}\right) = \frac{1}{T}\left[\ln\left(\sum_{i=1}^{n} P_{i,T}\cdot a_{i,T}\right) - \ln\left(\sum_{i=1}^{n} P_{i,0}\cdot a_{i,0}\right)\right]. \tag{3}$$

For estimating the standardized component of the aggregate productivity growth we extract from (3) the impact of the structural changes and introduce the assumption $a_{i,0} = a_{i,T}$:

$$\frac{1}{T}\left[\ln\left(\sum_{1=i}^{n} P_{i,T}\cdot a_{i,0}\right) - \ln\left(\sum_{1=i}^{n} P_{i,0}\cdot a_{i,0}\right)\right] = p^{\star}, \tag{4}$$

where $p^{\star}$ denotes the standardized component of the aggregate labour productivity.

If we subtract the standardized component of the aggregate productivity (4) from the aggregate productivity (3), we obtain the structural component (5) as follows:

$$\frac{1}{T}\left[\ln\left(\sum_{1=i}^{n} P_{i,T}\cdot a_{i,T}\right) - \ln\left(\sum_{1=i}^{n} P_{i,0}\cdot a_{i,0}\right)\right] - \frac{1}{T}\left[\ln\left(\sum_{1=i}^{n} P_{i,T}\cdot a_{i,0}\right) - \ln\left(\sum_{1=i}^{n} P_{i,0}\cdot a_{i,0}\right)\right] =$$

$$\frac{1}{T}\left[\ln\left(\sum_{1=i}^{n} P_{i,T}\cdot a_{i,T}\right) - \ln\left(\sum_{1=i}^{n} P_{i,0}\cdot a_{i,0}\right) - \ln\left(\sum_{1=i}^{n} P_{i,T}\cdot a_{i,0}\right) + \ln\left(\sum_{1=i}^{n} P_{i,0}\cdot a_{i,0}\right)\right] =$$

$$\frac{1}{T}\left[\ln\left(\sum_{1=i}^{n} P_{i,T}\cdot a_{i,T}\right)-\ln\left(\sum_{1=i}^{n} P_{i,T}\cdot a_{i,0}\right)\right]=p^{\star\star}, \tag{5}$$

where p^{**} denotes the structural component of the aggregate productivity growth.

ECONOMETRIC FRAMEWORK

Within an econometric approach, the estimates of the elasticity model are commonly used for measuring the impact of structural adjustment processes on the growth of separate economic variables. More specifically, we are trying to quantify the extent of labour movements from less productive industries towards more productive ones and their impacts on the growth of aggregate productivity in order to investigate the magnitude of a 1% increase in these movements. Novak (2004) developed a convenient framework for conducting this kind of analysis. His framework contains three separate parts: first, the correlation analysis; second, the estimation of a logit model; and third, the estimation of the elasticity model.

The basic idea is to estimate the following model:

$$y_2 = f(x_3), \tag{6}$$

where y_2 denotes the contribution of the total factor productivity to the economic growth and x_3 the extent of sectoral reallocation of labour force towards productive industries. The variable x_3 is calculated as the difference between the share size of workers employed in productive industries in the terminal year and the share size of workers employed in productive industries in the base year (see next section). The greater and more positive this difference, the greater is the process of structural adjustment in the period between the terminal and the base year. The equation (6) can be specified as an ordinary elasticity model (7):

$$y_2 = \alpha_0 x_3^{\alpha_1}\exp(e)/^{\ln} \Rightarrow \ln(y_2) = \ln(\alpha_0) + \alpha_1 \ln[x_3] + e, \tag{7}$$

or as the logit model (8):

$$L_r = \left(\frac{P(y_3 = 1|x_3)}{1 - P(y_3 = 1|x_3)}\right) = \beta_0 + \beta_1 x_3 + e. \tag{8}$$

Using the econometric framework, we are faced with a specific problem. We need a sufficient number of observations for dependent and explanatory variables. Namely, we acquire a combination of data on the

contribution of total factor productivity to the growth using the estimates of production function and those of the growth accounting framework, which are further explained. But the time period 1996–2003 provides only 7 observations. Hence, the time series data are not appropriate even for the aggregate production function estimates.

The problem can be resolved by introducing another dimension in our analysis, i. e. the observation at the municipality level. If we combine the sectoral dimension (about 30 industries according to NACE classification) with the period of seven years, the panel data framework can be established to estimate production functions at the municipality level. This procedure can assure a sufficient number of observations for the dependent variable (the contribution of the total factor productivity to the economic growth) and the explanatory variable (the amount of sectoral reallocation of labour force towards more productive industries).

Data Used

We employ the proposed econometric framework as well as McCombie's framework. The methodological details and belonging empirical estimates are discussed in the following section.

Within the econometric framework we use a three-stage procedure. First, we estimate production functions at the level of municipalities. Real value added expressed in 1996 constant prices is used as the dependent variable, while the producer price index (*PPI*) acts as a deflator, where $PPI_{1996} = 100$. As the first explanatory variable we use the variable of the effective labour force that was calculated according to Barro in Lee's (1994) methodological framework:

$$x_1 = HKI \cdot L, \text{ where} \tag{9}$$

$$HKI = \sum_{j=1}^{k} W_j \cdot K_j. \tag{10}$$

where the symbols mean:

x_1 – variable that measures the amount of human capital expressed in terms of effective labour force used for production,
HKI – human capital index,
L – labour force expressed as number of employees,
w_j – coefficient of relative real wage for j-th level of acquired education,
K_j – share of employed people (labour force) with j-th level of acquired education.

As the second explanatory variable we use the amount of capital as a production factor. This variable is expressed in terms of tangible fixed assets, and is also expressed in 1996 constant prices.

At the second stage we estimate the contribution of each separate production factor (physical capital, human capital and total factor productivity) to past growth.

At the third stage we estimate the elasticity model and logit model. In the case of the elasticity model the dependent variable measures the contribution of total factor productivity to economic growth (we have 147 estimates on this variable since we provide estimates of the production function for 147 municipalities). The explanatory variable measures the amount of sectoral reallocation of labour force from less productive industries towards more productive ones and was calculated as follows:

$$x_3 = \Omega_{2002} - \Omega_{1996}, \text{ where} \tag{11}$$

$$\Omega_{1996} = \frac{LP_{1996}}{LD_{1996}} \text{ and} \tag{12}$$

$$\Omega_{2002} = \frac{LP_{2002}}{LD_{2002}}. \tag{13}$$

Symbols:
x_3 – variable that measures the sectoral labour reallocation expressed as the change in the share of labour force employed in the propulsive industries with respect to labour force employed in the digressive industries,
Ω_{2002} – variable that measures the share of labour force employed in the propulsive industries with respect to labour force employed in the digressive industries in the year 2002,
Ω_{1996} – variable that measures the share of labour force employed in the propulsive industries with respect to labour force employed in the digressive industries in the year 1996,
LP_{1996} – variable that measures labour force employed in the propulsive industries in the year 1996,
LD_{1996} – variable that measures labour force employed in the digressive industries in the year 1996,
LP_{2002} – variable that measures labour force employed in the digressive industries in the year 2002,
LD_{1996} – variable that measures labour force employed in the propulsive industries in the year 2002.

For estimating the logit model we take the same explanatory variable

as in the case of the ordinary elasticity model, while the dependent variable takes value 1 if the contribution of total factor productivity to economic growth was more than 50% and 0 if it was less than 50%.

All needed data for conducting the empirical estimates were acquired from the Statistical Office of the Republic of Slovenia.

Empirical Framework

ESTIMATION OF AVERAGE AND STOCHASTIC FRONTIER PRODUCTION FUNCTIONS

The role of human capital and the nature of economic growth are derived from the comparison of the estimated production function coefficients, particularly the elasticity of output pertaining to human capital. However, there exist two different production function frameworks, which are used for economic analysis: first, the average production function framework and second, the marginal stochastic frontier production function framework. The advantage of the stochastic frontier model is that it considers inefficiency and random disturbances and can therefore explain why production at a certain moment in time is not at the technological frontier. On the other hand, the average production function approach assumes that production is at the technological frontier. Hence, this approach does not distinguish between technological progress and efficiency gains to explain why total factor productivity is changing. This difference can be used for detecting possible inefficiency in production. Namely, if there exists a large difference between estimated coefficients of the stochastic frontier production function and aggregate production function, this means that production factors are not used efficiently. To answer this question we estimate the aggregate production function as defined in equation (9). First, we estimate it as the average production function using the convenient ordinary least square (OLS) estimator for panel data. Second, we estimate the same model as the marginal stochastic frontier production function.

$$y = \left[\left(\beta_0 x_1^{\beta_1} x_2^{\beta_2}\right) \exp(\varepsilon)\right]. \tag{14}$$

where the symbols mean:

y – variable that measures the amount of produced output,
β_0 – constant term that expresses the level of total factor productivity,
x_1 – variable that measures the amount of used production factor human capital,

β_1 – coefficient of elasticity,
x_2 – variable that measures the amount of used production factor physical capital,
β_2 – coefficient of elasticity,
ε – error term.

The stochastic production frontier models were first introduced by Aigner et al. (1977) and Meeusen and van den Broeck (1977). The nature of the stochastic frontier production function can be best derived from the average production function model (such as in equation 14) that is appropriate only for economies without inefficiency. A fundamental element of the stochastic frontier production function is that an economy produces less than it might due to inefficiency. The production function that considers this standpoint is specified as follows:

$$y = \left[\left(\beta_0 x_1^{\beta_1} x_2^{\beta_2}\right) \exp(\varepsilon)\right] \delta, \tag{15}$$

where the symbols mean:

y – variable that measures the amount of produced output,
β_0 – constant term that expresses the level of total factor productivity,
x_1 – variable that measures the amount of used production factor human capital,
β_1 – coefficient of elasticity,
x_2 – variable that measures the amount of used production factor physical capital,
β_2 – coefficient of elasticity,
ε – error term.
δ – term of technical inefficiency.

The value for δ must be in an interval $(0, 1]$. If $\delta = 1$, then the economy is achieving the maximum output with the technology embodied in the production function (see equation (15)). Since output is assumed to be strictly positive, the degree of technical efficiency is also assumed to be strictly positive.

Taking the natural logarithms of equation (15) and defining we get:

$$\ln(y) = \left[\ln(\beta_0) + \beta_1 \ln(x_1) + \beta_2 \ln(x_2) + \varepsilon\right] - u. \tag{16}$$

Note: Definitions of symbols are reported in equation (15).

Since u is subtracted from $\ln(y)$ the restriction $0 < \delta \leq 1$ implies that $u \geq 0$. For estimating the parameters of the stochastic frontier production model (and also the average production function with the OLS estimator) the statistical package Stata 8 is used in calculations that provide

TABLE 1 Econometric estimates of aggregate average and aggregate marginal stochastic frontier production functions

	(1)	(2)	(3)
ε_{y_1,x_1}	0.507	0.321	0.662
ε_{y_1,x_2}	0.312	0.501	0.149
β_0	3.876	4.232	2.661
$\varepsilon_{y_1,x_1} + \varepsilon_{y_1,x_2}$	0.819	0.822	0.811

Note: Column headings as follows: (1) aggregate average production function, (2) aggregate marginal stochastic frontier production function, (3) aggregate average production function.

ε_{y_1,x_1} – coefficient of elasticity of output pertaining to human capital,
ε_{y_1,x_2} – coefficient of elasticity of output pertaining to physical capital,
β_0 – constant term.

Source: Novak 2003.

a Maximum-likelihood estimator for a time-invariant, time-varying decay stochastic frontier production function model, and for a truncated-normal random variable $u \overset{\text{iid}}{\sim} N^+(\mu, \sigma_\mu^2)$.

The estimates are presented in table 1. The first column shows estimates of the average production function using the OLS estimator while the second column gives estimates of the marginal stochastic frontier production function using the Maximum-likelihood estimator for the time invariant model.

The comparison of results of the estimated average and stochastic frontier production function does not indicate any large differences. We could make an assertion that persistent differences are due to different estimators used. But of special interest are ratios of estimated parameters. In the average production function, the estimated parameters pertaining to human capital are in both cases higher than the estimated parameters pertaining to physical capital. Yet, the estimated parameters of the marginal stochastic frontier aggregate production function exhibit opposite values. The estimated parameter pertaining to physical capital is greater than the estimated parameter pertaining to human capital.

The differences detected between the two estimates are quite important from an economic point of view. We are faced with two different measures of economic policy, the objective of which is to achieve a faster economic growth. If our starting points are estimates of the average production function we will support the growth of human capital. The increase of human capital by 1% is associated with the increase of output by

0.507%, whereby the increase of physical capital by 1% is associated with the increase of output by only 0.312%. But if our starting points are estimates of the aggregate stochastic frontier production function the advice for policy makers will be the opposite. In this case the increase of physical capital will be more appropriate as it would produce a higher economic growth. The increase of physical capital by 1% is associated with the increase of output by 0.501%, whereby the increase of human capital by 1% is associated with the increase of output by only 0.321%. An interesting feature of the results is also decreasing returns to scale in both production function models (in the average and in the marginal stochastic frontier).

This swap of estimated coefficients that is conditional on the selected framework of the production function suggests an inefficient use of one or both production factors. Foundations for this statement arise from the methodological features of the marginal stochastic frontier model compared with the average production function. As we have highlighted, there is no distinction between technological progress and technical efficiency within the average production function framework. It is assumed that production factors are used efficiently. As we know, this is not the case within the framework of the stochastic frontier production function that permits also inefficiency.

The existence of inefficiency is demonstrated by the distance of the actual production from the production frontier. The increasing inefficiency reduces the value of the estimated elasticity coefficients of output pertaining to the production factor that is used inefficiently. In our case the highest value of the coefficient of elasticity of human capital is significant in the average production function framework that postulates its efficient use. This coefficient is lower than is the relevant coefficient of elasticity, which is estimated within the stochastic frontier framework suggesting the existence of inefficiency. Therefore, we confirm that human capital is the production factor that is used inefficiently in the Slovenian economy. We therefore conduct the growth accounting analytical framework, which is based on the estimated parameters of the average aggregate production function and the stochastic frontier aggregate production function. Results are summarised in table 2.

As we can see from the results, the contribution of physical capital to economic growth (approximately 56%) remains constant regardless of the production function framework used. This is obviously not the case for the contribution of human capital to economic growth, which is significantly lower than within the stochastic frontier framework. This

TABLE 2 Estimates of growth accounting model

	(1)	(2)	(3)
δ	25.27	25.52	28.87
γ	56.67	56.72	56.04
y_2	18.06	19.76	15.09

Note: Column headings as follows: (1) aggregate average production function, (2) aggregate average production function, (3) aggregate average production function.

δ – contribution of human capital to economic growth in %,
γ – contribution of physical capital to economic growth in %,
y_2 – contribution of total factor productivity to economic growth in %.

Source: Novak 2003.

indicates that there exists a potential for a more efficient use of human capital that can increase its contribution to economic growth.

Structural and Standardised Component of Aggregate Productivity Growth

From the comparison of the estimated parameters of the average and the stochastic frontier production functions, and the related results from the growth accounting equations we can conclude that during the period 1996–2002 human capital (as a production factor) was used inefficiently. That was the main reason for the decreasing returns to scale at the aggregate level.

This fact raises a question about the main reasons leading to the inefficient use of human capital in the Slovenian economy. Some results from our earlier analysis (Novak 2003) indicated that this could be related to the uncompleted process of sectoral labour reallocation towards more propulsive industries with a greater labour productivity in terms of value-added per employee. As we found, one of the key characteristics of structural adjustments that occurred in the Slovenian economy between the years 1996 and 2002 was only a marginal change in the labour reallocation from less productive industries (decreasing industries) towards more productive and propulsive ones. In 1996 about 61% of labour was employed in industries with an average productivity that was lower than the average productivity in the Slovenian economy as a whole. By 2002 this share fell to approximately 60%. The required deeper structural changes of labour reallocation and a sufficient adjustment were obviously not made during the analysed period.

McCombie (1991, 70–85) argued that the uncompleted process of sec-

toral reallocation of labour could negatively affect the growth of aggregate productivity, which is the main source of the intensive nature of economic growth. We follow his methodology to decompose the growth rate of aggregate productivity in the Slovenian economy during the period 1996–2002 into a structural component that measures the contribution of sectoral reallocation of labour to the growth of aggregate productivity, and into the standardised component that measures the contribution of other factors to the growth of aggregate productivity using the following fundamental equation (McCombie 1991, 74):

$$p = \left(\frac{1}{T}\right) \cdot \left\{ \left[\ln\left(\sum_i P_{i,T} \cdot a_{i,0} \right) - \ln\left(\sum_i P_{i,0} \cdot a_{i,0} \right) \right] + \left[\ln\left(\sum_i P_{i,T} \cdot a_{i,T} \right) - \ln\left(\sum_i P_{i,T} \cdot a_{i,0} \right) \right] \right\}. \quad (17)$$

The standardised growth component is defined as the aggregate productivity growth that would have occurred if all sectors had experienced the same growth rate of employment, i. e. if their employment had grown at the same rate as that of the total employment. This standardised component is expressed in the first square brackets. The structural component of the aggregate productivity growth is caused by the labour reallocation from less productive industries towards more propulsive ones, which is leading to changes in the sectoral structure of employment in the national economy.

According to NACE propulsive sectors, i. e. industries with labour productivity that is greater than the average labour productivity in the whole economy, are: CA Mining and quarrying of energy materials, CB Mining and quarrying of non energy materials, DE Manufacturing of paper, publishing and printing, DG Manufacturing of chemicals products and man-made fibres, E Electricity, gas and water supply, I Transport, storage and communication, J Financial intermediation, K Real estate, renting and business activities, L Public administration and defence, M Education, N Health and social work, and O Other social and personal services. Note that the results can be biased to government policies and associated policy transfers that had been in place at a time prior to Slovenia's accession to the European Union (EU).

Digressive (or declining, lagging behind) industries are those experiencing a labour productivity which is lower than the average productivity of the whole economy.

TABLE 3 Calculation of the standardized and structural components of the aggregate productivity growth in the Slovenian economy between the years 1996 and 2002

$\ln \sum_i P_{i,T} \cdot a_{i,0}$	$\ln \sum_i P_{i,0} \cdot a_{i,0}$	$\ln \sum_i P_{i,T} \cdot a_{i,T}$	T
8.12595	7.44173	8.10703	7

Data needed for calculating the standardized and structural components of the aggregate productivity growth in the Slovenian economy are summarised in table 3.

The first column shows the natural log of aggregate productivity in 2002 (terminal year) under the assumption that the sectoral structure of labour is the same as in 1996 (base year); the second column gives the natural log of aggregate productivity in the base year, while the third column shows the natural log of aggregate productivity in the terminal year. The last column represents the value of the terminal year. Using these data we calculate the structural and standardized components of the aggregate productivity growth as follows:

$$p = p^{st} + p^{s} \tag{18}$$

$$= \frac{1}{T} \cdot \left[\ln \left(\sum_i P_{i,T} \cdot a_{i,0} \right) - \ln \left(\sum_i P_{i,0} \cdot a_{i,0} \right) \right] + \frac{1}{T} \cdot \left[\ln \left(\sum_i P_{i,T} \cdot a_{i,T} \right) - \ln \left(\sum_i P_{i,T} \cdot a_{i,0} \right) \right] \tag{19}$$

$$= \frac{1}{7} \cdot [8.\,12595 - 7.\,44173] + \frac{1}{7}[8.\,10703 - 8.\,12595]$$

$$= 1.\,09971,$$

where the symbols mean:

p^{st} – the structural component of the aggregate productivity growth,

p^{s} – the standardised component of the aggregate productivity growth.

Source: Own calculations.

The results support our hypothesis on the deterioration in the sectoral structure of labour in the Slovenian economy during the period 1996–2002. This is revealed in particular by the negative contribution of the structural change of labour to the aggregate factor productivity growth.

On the basis of the empirical results of the estimated average and stochastic frontier production functions, extended by the growth accounting framework and the standardised and structural component of the aggregate productivity growth, we can now explain the nature and

causes of the economic growth of the Slovenian economy between the years 1996 and 2002. Extensive economic growth was characterised by decreasing returns to scale, which caused an inefficient use of human capital. The main reason for this inefficient use was the uncompleted process of sectoral labour reallocations. We can clearly confirm that the labour force with the embodied technological knowledge (i. e. human capital) remains inefficiently allocated across industries.

Impact of Sectoral Labour Reallocation on the Nature of Economic Growth

We finally discuss the significance of the impact of sectoral labour reallocation on the nature of economic growth. For conducting this test we need a sufficient number of observations for the variable expressing the nature of economic growth and for the variable expressing labour reallocation towards propulsive industries. For satisfying this criterion we extended our empirical analysis from the cross-sectoral time series analysis to the regional cross-sectoral time series analysis. Hence we estimated the stochastic frontier production functions together with the related growth accounting equations for 147 Slovenian municipalities. On this basis we calculated a coefficient of the sectoral labour reallocation for each Slovenian municipality.

Our objective is to explain the nature of the Slovenian economic growth during the analysed period. We are trying to find out if there exists any significant impact of labour reallocation across industries on the extensive nature of economic growth in the Slovenian economy. We use estimates of the correlation coefficient, the coefficient of elasticity, and odds ratios from the logit model. The theoretical specifications used in the empirical investigation are presented below.

Coefficient of correlation

$$r = \frac{\sum[(x_3 - \bar{x}_3)(y_2 - \bar{y}_2)]}{(n-1)\sigma_{x_3}\sigma_{y_2}} \tag{20}$$

Elasticity model

$$y_2 = \alpha_0 x_3^{\alpha_1} \exp(e) /^{\ln} \Rightarrow \ln(y_2) = \ln(\alpha_0) + \alpha_1 \ln[x_3] + e \tag{21}$$

Logit model

$$L_r = \left(\frac{P(y_3 = 1|x_3)}{1 - P(y_3 = 1|x_3)} \right) = \beta_0 + \beta_1 x_3 + e \tag{22}$$

TABLE 4 Theoretical specifications of the coefficient of correlation, elasticity model and logit model

Coefficient of correlation	$r = 0.45$
Coefficient of elasticity	$\alpha_1 = 0.54$ [$p = 0.0000$]
Odds ratio	$\vartheta = 2.287$

Source: Own calculations.

Symbols:
r – coefficient of correlation,
x_3 – variable that measures the sectoral reallocation of labour,
$\bar{x}_3$ – average value of the variable x_3,
y_2 – variable that measures the nature of economic growth in terms of the contribution of the total factor productivity to economic growth,
$\bar{y}_2$ – average value of the variable y_2,
n – number of observations,
σ_{x_3} – standard deviation for variable x_3,
σ_{y_2} – standard deviation for variable y_2,
α_0 – regression constant,
α_1 – coefficient of elasticity,
e – error term,
L – logit (logarithm of odds ratio),
y_3 – binary dependent variable with value 1 if the nature of the observed municipality's economic growth was intensive (i. e. the contribution of total factor productivity exceeded 50%) or value 0 if the nature of economic growth of the selected municipality was extensive (i. e. the contribution of physical and human capital to economic growth together exceeded 50%),
P – probability that the nature of economic growth is intensive.

The estimates of the correlation coefficient, the coefficient of elasticity, the logit and odds ratio are reported in table 4.

The coefficient of correlation indicates the medium linear relationship between the contribution of total factor productivity and labour reallocation towards propulsive industries (both variables are expressed in natural logarithms). The high statistically significant coefficient of elasticity indicates that the percentage increase of labour reallocation towards propulsive industries induces an increase of the contribution of total factor productivity by 0.542% (a relatively substantial influence). Statistically significant is also the estimated parameter of the logit model. The

odds ratio indicates the increase of the odds intensive growth by 2.287 times if the share of the labour force employed in propulsive industries compared to the share of the labour force employed in the digressive industries rises by one percentage point.

Conclusions and Policy Implications

During transition to a market economy and the process of Slovenian adjustments to EU membership, the majority of the Slovenian economic growth was determined by an extensive growth of labour and capital. We have more specifically analysed the nature of economic growth in the Slovenian economy in the period 1996–2002 in order to determine the reasons for decreasing returns to scale. We have applied the average production function and the stochastic frontier production function and estimated the parameters of the municipality production functions on the basis of cross-sectional and time series data. Using these pooled econometric approaches and the results obtained we developed growth accounting equations for 147 Slovenian municipalities and thus estimated the contributions of each particular production factor (physical capital, human capital and total factor productivity) to the municipality output growth. We have analysed the main factors that are important for the economic growth and development of municipalities. The in-depth econometric analysis at the municipality level was also necessary to obtain a sufficient number of observations for testing statistical significance of the parameters associated with labour reallocation.

We have econometrically tested the significance of the labour reallocation process to the nature of economic growth in the Slovenian economy using the municipality cross-sectional time series data. We found that the main reason for decreasing returns to scale in the Slovenian economy in the period 1996–2002 was an inefficient use of human capital in the production process. One of the main constraints responsible for this inefficiency was the uncompleted structural labour reallocation from decreasing industries towards more propulsive ones. Empirical results of the coefficient of correlation, the coefficient of elasticity and the odds ratio of the estimated logit model clearly indicate that the reallocation of labour towards propulsive industries has statistically significantly influenced the rise of total factor productivity. The labour force with the embodied technological knowledge (i. e. human capital) remains inefficiently allocated across industries.

It is obvious that the uncompleted process of sectoral reallocation of

the labour force impedes the growth of total factor productivity. Hence, to accelerate the economic growth those measures of economic policy should be pursued that would accelerate the process of sectoral reallocation of labour from low productive industries towards high productive ones. Following the classical economic theory, differences in relative wages between industries should be the appropriate force to provide incentives for labour transfer from less productive industries (with lower wages) towards more productive ones (with higher wages). This is an issue for future research, which is also concerned with some other factors. First, it should be emphasized that the migration between industries is more likely to be concerned with the expected earnings over the working life than with current wage differences. Second, migration of a worker from one industry to another can be connected with the regional migration that raises the costs of migration. If expected costs exceeded the expected benefits from higher wage, the labour reallocation would be hindered and less likely to occur.

Structural changes in the economy are a constituent part of the economic growth process, where labour movements across industries aim to maximize lifetime incomes over the expected costs of movements.

The decision to migrate is likely to depend on an individual's confidence in own abilities to respond to changes in the labour market. This can depend on the number of different factors that are inherent to each individual worker. The level of acquired education with embodied human, social and some other pertaining capitals are variables that express the worker's confirmation and ability to move subject to the lifetime income maximization. Additionally, there is the nature and the level of acquired education. Overly specialized skills may impede an individual from finding a job in other industries or may require additional efforts and investments. He/she can improve his/her abilities and competitiveness in the labour market by participating in lifelong learning which is becoming a common practice today. While in the short run economic policy measures seem to persuade the worker to change the industry and also migrate into another region, on the long run the education policy is the key factor that improves knowledge and skills allowing each individual to respond quickly to structural changes. Successful reallocation of labour among industries as well as among regions is closely connected with the individual's skills acquired during the period of active education and permanent formal and informal lifelong learning.

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Where is the Border Between an Information System and a Knowledge Management System?

Imandra Galandere-Zile
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Both information systems and knowledge management systems are important in an organisation and often fulfil the same task. The aim of this paper is to identify the border between these two systems. The approach of the research is to analyse both systems in order to identify their role in an organisation, determine the problems, advantages, and opportunities, and discover common and uncommon features between them to find out when an information system becomes a knowledge management system and when it is useful to implement the latter.

Key words: information system, knowledge management system, information, knowledge and knowledge management
JEL *Classification:* M1, L86 in C88

1 Introduction

Nowadays information systems play a very important role in improving an organisation's performance and its increased competitive capacity. Therefore, it is essential for organisations to decide what are the most important business processes and core competencies that have to be supported by an information system, and what kind of information system has to be implemented and conforms to the organisation's requirements.

While the latest trends in organisational development have demonstrated the importance of knowledge management, there is no universal definition of knowledge management or a knowledge management system. Knowledge management systems are mostly built over existing information systems, thus it is difficult to determine when an information system becomes a knowledge management system or what kind of fea-

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tures are encompassed in a knowledge management system and not in an information system.

The goal of the paper is to identify the border between information systems and knowledge management systems, and discover common and uncommon features between them in order to find out when an information system becomes a knowledge management system and when it is useful to implement the latter.

The paper is organised as follows. In section 2 data, information and knowledge are analysed since they play an essential role in both systems. Considerations regarding information systems and their role in an organisation are discussed in section 3. Section 4 outlines the area of knowledge management and its role in an organisation. Section 5 focuses on the relationship between both systems, and discusses the contribution of information technology and systems to knowledge management. Common and uncommon features between these two systems are identified and analysed in section 6. Finally, some brief conclusions and directions for intended future work are provided.

2 Data, Information and Knowledge

Since data, information and knowledge play an essential role in both an information system and a knowledge management system, they were analysed first.

In practice, the terms data, information and knowledge are often used interchangeably. First of all, the differentiation is generally difficult because both data and information are located in an information management system. Secondly, users interpret data only when they use them. Users' contexts and the information manufacturing process make it difficult for users to determine precisely whether a piece is considered as data, information, or even knowledge. Although it might take a decade just to determine what these three words mean, we all agree that the transformation of data for clear and more meaningful information to users is important. Structuring and managing knowledge assets in an organisation are also critical for all organisations (Huang et al. 1999).

Data represent facts that are created when business processes are performed. They form a set of particular and objective facts about an event or simply the structured record of a transaction (Tiwana 2000). They are also the lowest level of known facts. Data can be stored in a structured relational database system or in an unstructured document management system, and includes non-text information, such as voice and image.

Data are collected, stored, grouped, analysed, and interpreted (Huang et al. 1999).

The terms data and information are often used synonymously (like information and knowledge). In practice, managers differentiate between information and data intuitively and describe information as data that has been processed. Information contains substance and purpose. There are different ways in which meaning can be added to data in order to transform it into information. Data becomes information through condensation, contextualisation, calculation, categorisation and/or correction processes (Tiwana 2000). What qualifies as useful information is a subjective judgment. Information moves around in both electronic and hard format, through electronic and social networks.

The key link between knowledge and information is probably best expressed in the commonly accepted idea that knowledge in the business context is nothing but actionable information. Knowledge is generated when information is combined with context and experience. Knowledge is a fluid mix of framed experience, values, contextual information, expert insight and grounded intuition that provides an environment and framework for evaluating and incorporating new experience and information. It originates and is applied in the minds of those in possession of the relevant knowledge. In organisations it often becomes embedded not only in documents or repositories but also in organisational routines, processes, practices and norms (Tiwana 2000). We strongly agree with Tiwana who states that data and information are essential, but it is the knowledge that can be applied, experience that comes into context, and skills that are used at that moment that make the difference between a good and a bad decision.

3 Considerations on the Information System and its Role in an Organisation

This section presents a short overview of information systems and the benefits that can be acquired by implementing and applying such systems.

Information systems are widely used in organisations. They provide information and thus help improve an organization's operation and management. An information system can be defined as a group of components working together. These components include equipment (or hardware), instructions (or software), data stored in the system, the people to operate the system, and procedures for the people to follow (Nick-

erson 1998). Because information processing can be done using manual instructions, a wider view on information systems is also possible. Thus a computerised information system is just one of the information systems. In this paper we consider only computerised information systems.

An information system supports one or more work systems using information technology to capture, transmit, store, retrieve, manipulate or display information (Alter 1999).

A work system is a system in which human participants perform business processes using information, technology, and other resources to produce products for internal or external customers. The core of the work system (and thus the information system) is a business process consisting of steps related in time and place, having a beginning and an end, inputs and outputs.

There are a wide variety of different information systems that can be classified by:

- The number of users – individual, workgroup, organisational and inter-organisational.
- Ways users are connected to information technology – directly, through a network, through the Internet.
- Supported business functions – accounting, transaction, manufacturing etc.

Business processes are at the core of every information system. Information systems support business processes for one or more business functions. The simplest information system supports only one business function (for e. g. inventory systems, payroll systems etc.), in other cases information systems support a number of business functions. In these cases the information is transmitted automatically, thus saving time and work that would be necessary to maintain the integrity of these functions in an organisation. These information systems can thus be called *integrated.*

Information systems provide several benefits to the organisation (Nickerson 1998). One of the main benefits is *better information.* Information systems not only store and process data, they also produce information, which is the basis for good decision-making. Better information is available if data are properly managed in the information system, i. e. the data are available for processing, and are current, accurate, and secure (Alter 1999). Another benefit is *better information.* Information systems operate at any time of the day or night and process data faster than humans.

The third benefit is *increased productivity.* Information systems make the work more productive in a shorter period of time.

4 Knowledge Management and its Role in an Organisation

While recent trends in organisational development have demonstrated the importance of knowledge management, there is no universal definition of it. Besides, Wilson (2002) considers knowledge management (like Business Process Reengineering) as a utopian ideal that cannot be successfully implemented. Knowledge management addresses various fields related to the organisation, people, motivation, and technology. The goal of knowledge management is to increase the efficiency of activities related to knowledge as well as the benefits acquired from it. In order to transform knowledge into a valuable organisational asset, knowledge, experience, and expertise must be formalised, distributed, shared, and applied (Galandere-Zile 2002).

The knowledge management cycle reflects the life cycle of corporate knowledge. This dynamic process often starts with finding and collecting internal knowledge and best practices. The second step is sharing and understanding those practices so that they can be used. Finally, the process includes adapting and applying such knowledge and practices to new situations and bringing them up to the best practice performance level. Knowledge management is concerned with supporting and optimising these processes. Surrounding the process, and helping or hiding it, are what we call the enablers. These are: leadership, culture, technology and measurement. These aspects of an organisation's environment and infrastructure must be addressed in order to transfer a business process and develop knowledge management in an organisation (Zaharova and Galandere-Zile 2002).

Knowledge management has come to be regarded as the driving force behind some of the world's largest and most successful organisations. It is seen as the next evolutionary step that goes beyond the 'Learning Organisation' or 'Business Process Reengineering' and even beyond 'GroupWare' and the 'World Wide Web'. It is meant to integrate them all into an even higher level, enterprise-wide framework with its new work roles, responsibilities, reward systems, methods and tools, because an effective knowledge management depends not merely on information technology platforms but primarily on the social structure of an organization (Phillips et al. 2004). In other words, true knowledge management concerns radical and fundamentally new ways of creating, retaining, shar-

ing and leveraging knowledge about people and organisations; ways that were simply not possible before.

5 State of the Art Concerning Knowledge Management Systems and Information Systems for Knowledge Management

This section focuses on the relationship between knowledge management systems and information systems and discusses the contribution of information technology and systems to knowledge management.

AN INFORMATION SYSTEM AND A KNOWLEDGE MANAGEMENT SYSTEM

Even though there is considerable disagreement in the literature and business practice about what exactly knowledge management is, some researchers and practitioners stress the importance and usefulness of information and communication technologies as enablers or vehicles for the implementation of these approaches. Knowledge management systems should particularly help to overcome the shortcomings of current practices of business engineering in regard to organisational performance (Maier 2002).

Technology by itself does not constitute a knowledge management program it rather facilitates one, especially in large, geographically dispersed organisations. Knowledge management represents an opportunity to derive additional benefits from an organisation's existing investment in computers, databases and networks by integrating them to support knowledge management in many ways (Zaharova and Galandere-Zile 2002). Technology's most valuable role in knowledge management is broadening the reach and enhancing the speed of knowledge transfer (Tiwana 2000).

Past management information systems basically used the computer as a means of providing information to solve recurring operational problems. Today, there is a need for new types of systems that would focus on discovering knowledge that responds to the changing environment. By increasing the capabilities of decision makers, information systems that support knowledge management initiatives help an organisation to achieve its goals. Information systems that support information flow are an essential component in a knowledge management system. Information systems create a good virtual environment for knowledge management (Galandere-Zile 2004).

Examples of information and communication technologies related to knowledge management are (Maier 2002):

- *Intranet infrastructures* that provide basic functionality for communication (e-mail, teleconferencing) as well as storage, exchange, search and retrieval of data and documents.
  Document and content management systems that handle electronic documents or Web content.
- *Workflow management systems* that support well-structured organisational processes and handle the execution of workflows.
- *Artificial intelligence technologies* that support, for example, search and retrieval, user profiling and matching of profiles, text and Web mining.
- *Business intelligence tools* that support the analytic process which transforms fragmented organisational and competitive data into goal-oriented 'knowledge' and require an integrated data base that is usually provided by a data warehouse.
- *Visualisation tools* that help to organise relationships between knowledge, people and processes.
- *Groupware* that supports, for example, time management, discussions, meetings or creative workshops of workgroups and teams.
- *E-learning systems* that offer specified learning content to employees in an interactive way and thus support the teaching and/or learning process.

Knowledge management systems promise to significantly enhance functionality through an integrated combination of the aforementioned information systems from the perspective of knowledge management. A knowledge management system should not be seen as a voluminous centralised database. It can rather be imagined as a large networked collection of contextualised data and documents linked to directories of people and skills and providing intelligence to analyse these documents, links, employees' interests and behaviour, as well as advanced functions for knowledge sharing and collaboration (Maier 2002).

The term knowledge management system has become a strong metaphor or vision for the development of a new breed of information and communication technology systems. In this vision, the knowledge management system creates a corporate information and communication technologies environment, a contextualised base, an infrastructure that

takes into account the complex nature of knowledge and thus supports the handling of knowledge in organisations. In order to achieve this, a number of heterogeneous information and communication technologies have to be integrated, improved, recombined, and repacked. The development of a knowledge management system is a complex undertaking (Maier 2002).

Knowledge management has to handle and improve complex relationships and networks rather than individual knowledge elements or just one location, for e. g. a knowledge base. In the implementation process of a knowledge management system the content to be managed is very important. Companies that put organisational knowledge at the centre of consideration implement knowledge management. Typically, the organisation's knowledge structure is determined in workshops or reflects sources that already exist in the organisation but are handled by a number of incompatible information and communication technology systems. In many cases, explicit knowledge is predominant. It is also a lot harder to describe implicit knowledge that is an equally important part of the organisational memory content (Maier 2002), though an important factor behind the implementation of knowledge management systems is the ability of organisational personnel to share knowledge through some type of online forum.

Knowledge management systems organise and make available an important know-how wherever and whenever it is needed. This centres on 'best practices' or guiding principles, projected forecasts, reference sources, proven processes and procedures, patent information, established formulas, corrective fixes, and similar items. Data warehouses, computer networks, company intranets, extranets, groupware, bulletin boards, and video conferencing are the technological tools for storing and distributing appropriate knowledge. Major components of knowledge management systems are considered to be the best practices, communication enablers, and system road maps. The main purpose of these components is to provide users with the right information at the right time and place. Experience has shown that successful knowledge management system developers are those with a well-developed collaboration between all these tools (Maier 2002).

Knowledge management systems might also be viewed as important organisational assets that provide core competencies for the organisation. In particular, highly knowledge-intensive organisations might view the systematic handling of knowledge in general, and especially their in-

formation and communication technology systems supporting knowledge management, as their core competence and fear that they might lose a strategic advantage if they implement a standard software solution available on the market (Thierauf 1999).

FROM AN INFORMATION SYSTEM TOWARD A KNOWLEDGE MANAGEMENT SYSTEM

The task of implementing a successful knowledge management system may seem insurmountable. But in reality there are different views and approaches to implementation of a knowledge management system. Some experts have stated that up to 90 percent of the infrastructure required for knowledge management is already in place. In most organisations this refers to their existing structure of computer networks and servers. Hence, only a small shift in the total computer technology budget is required to make the change to a knowledge management system (Lasker and Norton 1996). The success of an organisation is more dependent on its capability to create an effective environment for knowledge generation and application, and on the knowledge and talent it can recruit, develop and retain in order to provide the innovation (Kim and Mauborgne 1999). Knowledge work processes drive a successful knowledge management system, not the technological issues. The rationale is that these newer systems are helping decision makers make better decisions in terms of their work activities. The technology is incidental to this critical issue.

Redesign may be necessary for changing knowledge work processes (Thierauf 1999):

- *The content of knowledge should be changed* by expanding or contracting what it encompasses in order to better meet desirable objectives.
- *The composition of work should be reordered* (so that company personnel may change the focus of their jobs from information to knowledge).
- *Change can be focused* on the employment of new networking technology that lends itself to groupware.

Thierauf (1999) proposes a summary of those critical factors that determine the appropriate software useful for providing knowledge for decision makers and managing the software. For example:

- Is the software easy to use and does it enable the development and use of knowledge?
- Does the software provide an in-depth analysis of patterns and trends?
- Does the software actually do what decision makers want here and now?
- Does the software allow decision makers to access and analyse a large amount of information in order to get at pertinent knowledge?
- Is the software generally a combination of packages designed for the organisation's size or will it be outgrown in a few years?
- Does the software provide flexibility in the development of pertinent knowledge to meet decision makers' needs?

Knowledge management systems of today often integrate a variety of off-the-shelf software products such as groupware, document management systems, e-mail, relational databases, and workflow, with knowledge extraction tools, knowledge management intranet search engines, and knowledge discovery or the data mining software. In addition, a knowledge management system can employ OLAP software, the statistical analysis software to assist decision makers in getting the knowledge at hand. Depending on the nature and purpose of a knowledge management system, there can be still other software products and hardware needed to form a complete knowledge management system package to gather, organise, collaborate, refine, and distribute knowledge (Thierauf 1999). Most organisations that had actually implemented knowledge management system solutions have combined several tools and implemented additional functions on their own rather than simply buying specialised knowledge management system software on the market.

A classification of knowledge management systems can only be considered as preliminary due to the considerable dynamics of the market for knowledge management. At this stage, the analysis of a knowledge management system is a great challenge. This is already visible in the difficulties of defining the term and continues in the trial to present a typical architecture of such systems or to give a comprehensive list of functions. The same is true for a classification of knowledge management systems. The pragmatic perspective that knowledge management systems are just document management systems with some added functionality which seems to dominate the market is unsatisfying. The information and com-

munication technologies support for knowledge management is not restricted to the handling of documented knowledge (Maier 2002).

Information and communication technologies infrastructure needs a strategy to define knowledge goals and subsequently implement organisational instruments, roles and processes, and an organisational culture supportive of knowledge sharing in order to create benefits for the organisation. There has been a shift in the perspective of knowledge management system vendors as well as organisations applying those systems. The focus is now placed on the explicit side of knowledge management rather than on a combination and integration of its implicit side.

6 Common and Uncommon Features of Information Systems and Knowledge Management Systems

During the analysis of information systems and knowledge management systems, common and uncommon features of both areas were ascertained.

Overview of common and uncommon features of both systems

Knowledge management systems are operated on the basis of an (organisation-wide) information and communication infrastructure, and in most cases an Intranet platform of Lotus Notes environment on which information sharing between (virtual) teams both within the organisation and across the organisational boundaries, and allies, suppliers and customer is possible. Most organisations have installed a large number of application systems and information and communication technology platforms that provide functionality for knowledge management. The basic functionality of such an information and communication technologies platform designed 'with knowledge management in mind' would comprise an integrated set of the following functions:

- *Communication:* as well as coordination and cooperation, e. g. e-mail, workflow management, newsgroup or list server.
- *Document management:* handling documents throughout their life cycle.
- *Access:* to various data sources, e. g. relational data bases, document bases, file servers or Web servers.
- *Search:* basic search functionality.
- *Visualisation.*

In a somewhat narrower sense, knowledge management systems provide functionality that goes well beyond these basic functions. Nevertheless there is no single hardware or software product or a combination of the two that can provide a comprehensive approach to knowledge work. Building a corporate-wide knowledge management infrastructure requires the integration of many different technologies. It is necessary not only to implement an integrated hardware or software technology but also to integrate the company's personnel and their related business processes with this knowledge management technology. If the company's personnel are not working in a collaborative environment or if no procedures and processes are in place to share the *knowledge,* no amount of knowledge management system technology can change that (Thierauf 1999). In other words, a knowledge management system requires a systemic knowledge management initiative in order to be used effectively and efficiently. This includes a knowledge management system strategy and the development of knowledge management system goals, an appropriate organisational design describing roles responsible for knowledge-related tasks and processes that use the knowledge management system, a supportive organisational culture and a corresponding knowledge management system supervision that evaluates whether the goals of using these systems have been achieved (Maier 2002).

The main differences between a knowledge management system and more traditional information and communication technology systems, such as document management systems, Intranet solutions or Groupware can be characterised as follows (Maier 2002):

- A contextualised combination and integration of functionality.
- An organisation-wide focus.
- An integration of intelligent functions.
- Matching with knowledge management initiatives.
- Dynamics of organisational learning.

ANALYSIS OF COMMON AND UNCOMMON FEATURES OF BOTH SYSTEMS

The aim of this section is to provide a detailed analysis of an information system and a knowledge management system.

As described in previous sections, information systems and knowledge management systems have many common features. However, the differences between them cannot be declared only by the system's name

or goals. We applied the Enterprise Knowledge Development (EKD) methodology in order to analyse the features in which knowledge management systems differ from information systems.

Figure 1 describes the concepts that are essential for information and knowledge management systems. Boxes that are in white colour denote concepts that are related to both systems, boxes tinted in light grey represent concepts that are unique for knowledge management systems, while dark grey boxes refer only to information systems.

Figure 1 shows that most of the concepts are common to both systems. Although there are information systems that are implemented and maintained to support only one business process, knowledge management systems support many integrated business processes as well as specific knowledge related processes. Besides, the concept of knowledge is clearly defined in knowledge management systems. It denotes that in the implementation process of a knowledge management system the content to be managed is very important. Moreover, an efficient knowledge management system requires knowledge management initiatives, namely, leadership, measurement, and organisation culture.

Figure 2 describes the business processes of both systems. Boxes with rounded corners that are shadowed denote external processes that are performed by users themselves; other boxes are system processes accomplished by a computerised system, whether it is an information system or a knowledge management system.

Specific processes of knowledge management are only concerned with knowledge (creation, identification, sharing, formalisation, collection, organisation, transfer, and, finally, application of knowledge). However, it is essential to stress that internal processes of a knowledge management system (processes 4, 5 and 6) use general information system processes (1, 2 and 3). Thereby, during the performance of the knowledge management system's processes, explicit knowledge is transformed in some kind of data or information that can be stored and processed by the information system. That confirms that a knowledge management system is always supported by an information system.

During the analysis of information and knowledge management systems, the goals, opportunities (or benefits) and problems characteristic of both systems were identified. One of the main goals of both systems is to support one business process, i. e. decision making. In this process the information system provides just better information, while the knowledge management system provides intelligent decision making based on

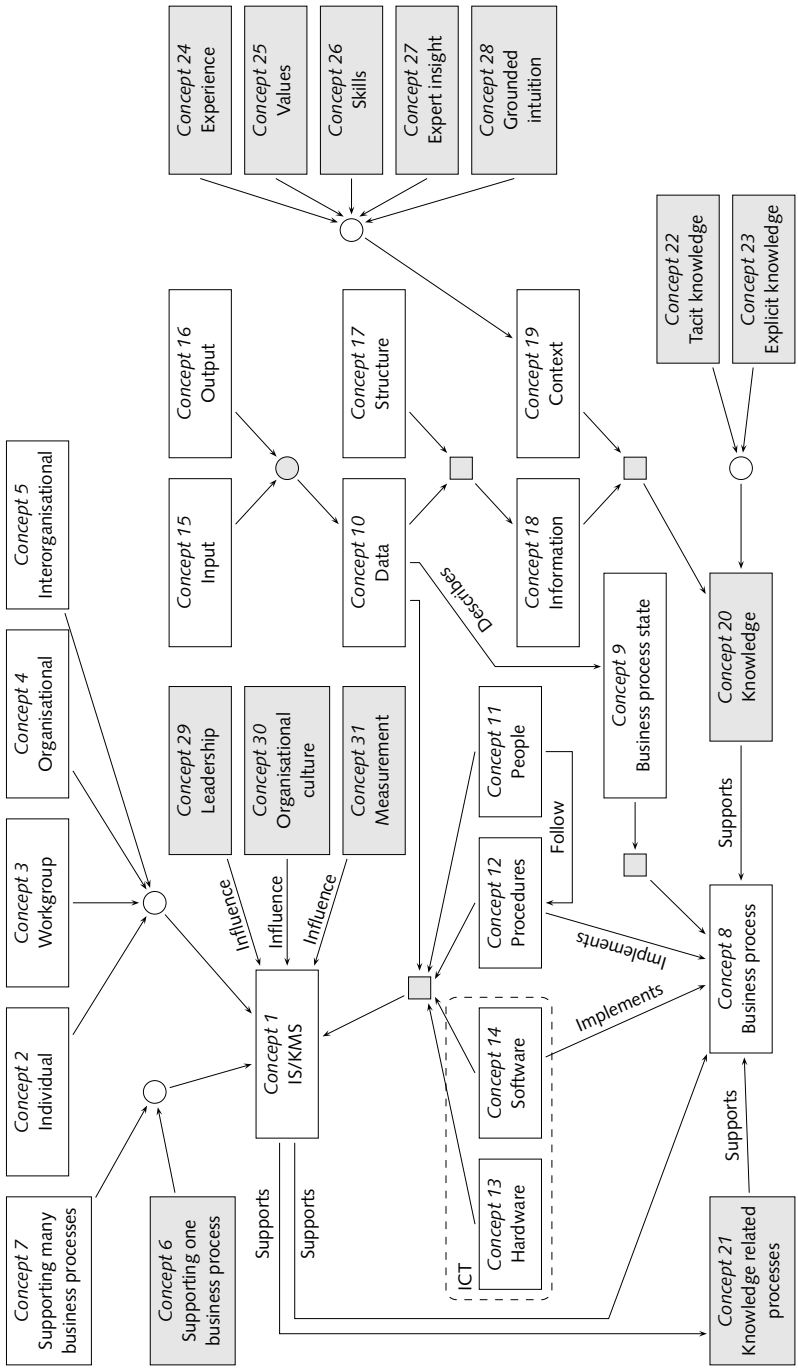

FIGURE 1 A concept model of an information system and a knowledge management system

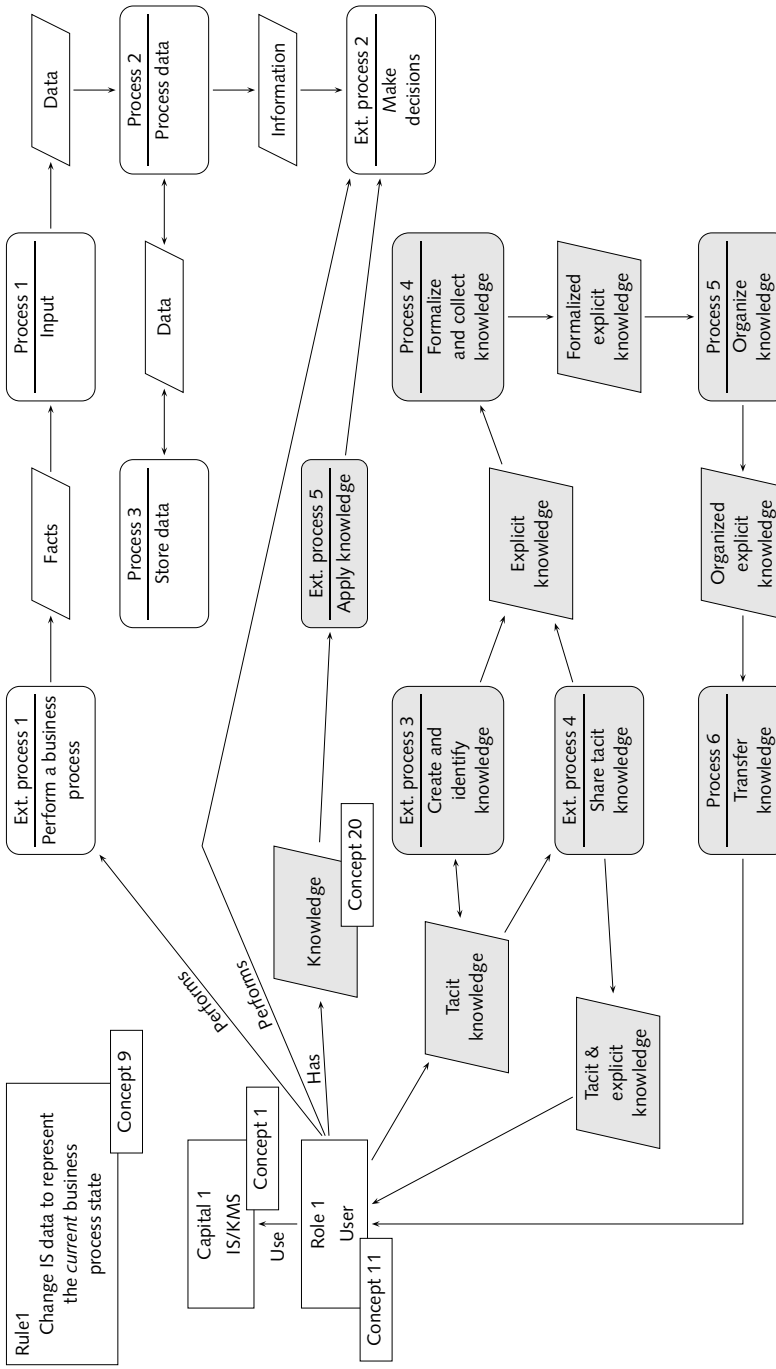

FIGURE 2 A business process model of an information system and a knowledge management system

best practices, organisational knowledge and experience that nowadays are very crucial for organisations that are confronted with increased environmental complexity and dynamics.

7 Conclusions and Further Research

The paper deals with issues concerning information systems and knowledge management systems, and tries to identify the border between both systems. The main conclusions derived from the analysis of both systems are summarized below.

Data, information, and knowledge are essentially different and play different roles in both information systems and knowledge management systems, while in practice these terms are often used interchangeably and knowledge is used as a synonym for information. As a result, knowledge management systems are often considered as information systems under another name (Wilson 2002).

Typically, the organisation's knowledge already exists within the organisation. Most of the explicit knowledge is handled by a number of incompatible information systems that can serve as a platform that provides functionality for a knowledge management system. However, there has been a shift in the perspective of organisations applying knowledge management systems. The focus is now placed on the explicit side of knowledge management rather than on a combination and integration of its implicit side.

Knowledge management is a systematic and articulated approach to managing knowledge related processes. It represents an opportunity to derive additional benefits from the organisation's existing investment in computers, databases and networks by integrating them to support knowledge management. Knowledge management has been implemented by companies that put organisational knowledge at the centre of consideration.

Knowledge management systems:

- Have become a strong metaphor or vision for the development of a new breed of information systems.
- Organise and make available an important know-how wherever and whenever it is needed.
- Require a systemic knowledge management initiative in order to be used effectively and efficiently.
- Are operated on the basis of an (organisation-wide) information

and communication infrastructure. Technologies by themselves do not constitute a knowledge management system, they rather facilitate one, and they are very important and useful as enablers for the implementation of knowledge management approaches.

Due to the considerable dynamics of the market for knowledge management there are difficulties in presenting a typical architecture of knowledge management systems or providing a comprehensive list of functions.

The border between an information system and a knowledge management system is diffused and depends on the existence of factors such as an organisation's strategy and goals concerning business and knowledge processes, culture, initiatives, information and communication technologies etc. An effective knowledge management depends not merely on information technology platforms but primarily on the social structure of an organization. The knowledge management system focuses on discovering knowledge that responds to the changing environment and takes into account an implicit knowledge that plays an essential role in an organisation's competitive advantage.

Future research is aimed at refining the architecture of knowledge management systems and organisational information systems, and providing a deeper analysis of dependency relationships between both systems.

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The Quality of Entrepreneurship Education and the Intention to Continue Education: Slovenia and Romania

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Entrepreneurship and management education is important in developing knowledge and skills of entrepreneurs. In this paper, entrepreneurship education satisfaction and quality are compared between two countries: Slovenia and Romania, and the relationship between education quality and education continuation is assessed in both countries. Multi-item measures were used, questionnaire data were obtained in both countries, measurement scales were tested, and differences between the two countries were assessed by comparing means and regression analysis coefficients. We found that education content and process quality and education satisfaction of participants tend to be the strongest predictors of a subsequent decision to continue education in both countries. Room and equipment adequacy may also be important, but our findings showed this result only for Romania. Some other findings and recommendations are also presented.

Key Words: entrepreneurship, education, quality
JEL *Classification:* M10, M13

Introduction

The development of knowledge and skills of entrepreneurs can be to a large extent dependent on entrepreneurship and management education. In our time, characterized by the processes of globalization, the rise of information and communication technology, and continuously

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changing business environments, the need for continuing education is becoming even more important than before. Entrepreneurial training significantly and positively impacts participants' perceptions of their abilities to pursue and grow new ventures (Ehrlich et al. 2000). Knowledge and skills acquired in entrepreneurship education can serve as a motivational drive for creation of new ventures (Cho 1998). Education and training can lead to development and improvement in some elements of entrepreneurship (Henry et al. 2003). Educational programs can be important for the development of entrepreneurial talent within the population (Rushing 1990). Education of entrepreneurs is becoming increasingly needed for assuring a higher probability of new venture success (Postigo et al. 2003). When deciding whether or not to continue education, entrepreneurs may make their decisions depending on the basis of their satisfaction or quality perception of past education. For entrepreneurship education success it is crucial to emphasize continuous improvement in education quality (Han and Lee 1998). In this paper, we compare entrepreneurship education satisfaction and quality between two countries: Slovenia and Romania, and assess the relationship between education quality and education continuation in both countries. Entrepreneurship education quality and continuation in countries with a shorter entrepreneurial tradition and lower levels of entrepreneurship-oriented culture, such as Slovenia and Romania, may have a stronger potential new venture creation impact than in countries with longer entrepreneurial traditions, such as the US or Western European countries, as suggested by Lee et al. (2005) in their comparative study of the impact of entrepreneurship education in Korea and the US.

The focus of the paper is, hence, entrepreneurship education, which can be defined as structured, formal conveyance of entrepreneurial knowledge; entrepreneurial knowledge meaning the concepts, skills, and mentality individual business owners use during the course of starting and developing their growth-oriented businesses; and entrepreneurial learning meaning the active and cognitive processes individuals employ as they acquire, retain and use entrepreneurial knowledge (Young 1997). Entrepreneurs, to be able to solve emerging problems and to increase business results of their enterprises, need to learn continuously through self-directed learning as well as through formal education and training. However, in order to make the decision to continue education, entrepreneurs may first rethink their past experiences with entrepreneurship education.

Education Satisfaction, Quality, and Continuation

Overall satisfaction is defined as an emotional reaction to a product or service experience (Spreng et al. 1996), while quality means meeting the customer requirements (Oakland 1993). In the context of services of management or entrepreneurship education participants may evaluate the educational experience (1) in general terms, by their overall satisfaction and in terms of their assessment on how good their overall requirements have been met, and (2) in specific terms, by evaluating different elements of education quality such as the lecturer, the content, the process, and the facility.

In spite of very different traditions and structures of adult and continuing education in the world, it seems to be a common tendency that the relation between adult education and work and the labor market is becoming very important. All countries have very large adult education needs, extending to all fields of adult education – general and vocational, formal and non-formal. Although state and social partners' priority themes include education for the labor market and education related to employment and vocational training, the state should include among its priorities the study of system and policy and of educational needs, and updating of adult education (Jelenc 1996, 447).

Entrepreneurs acquire knowledge by engaging in formal education and by taking part in courses related to different fields of interest, which are important for managing the business. The success factors include perseverance (building confidence and self-esteem), commitment to the enterprise, and a positive attitude and approach. Developers of qualifications and training programs for post-secondary education and training of entrepreneurs and potential entrepreneurs should (Labuschagne et al. 2001, 17): (1) identify and integrate the outcomes from existing subjects in the field of economic and management sciences that relate to the success factors of entrepreneurs; and (2) supplement these outcomes with case studies, experiential exercises and practical activities that will enable learners to integrate the knowledge and skills obtained in such training of entrepreneurs, and to apply these skills and knowledge in an entrepreneurial environment. The content-related techniques or methodologies that influence the success of entrepreneurship training are case studies, simulations and business plan executions. Materials such as a study guide, time schedules and facilitator guidelines that could improve the evaluation are used, since they make more information available to

the evaluator. The evaluator must be knowledgeable about the field and have experience in business and training entrepreneurship (Pretorius 2001, 14).

The majority of researches have explored the contents of education – what entrepreneurs need in order to be successful – but training organizations want to know answers to questions about the quality of their training programs as perceived by their clients. If the results of such evaluations are disappointing, the training organization can modify its policy and programs. The main method for collecting the data is a closed questionnaire sent or distributed to the participants of training. Mulder (2001, 323), for example, prepares a questionnaire that consists of eight blocks of questions. Within the group of general questions one is about the general satisfaction with the training project as a whole. Questions about the objectives of the training project include some about the level to which certain objectives are of importance within the project. These objectives-related questions are aimed at: (1) attaining a learning result (knowledge, skills, attitudes); (2) improving a changed work behavior in the work situation; and (3) supporting the change of the organization; (4) other factors are personal factors, training program factors, organizational factors and transfer conditions.

Other scholars have also addressed different dimensions important for the evaluation of education quality. In the study by Hill, Lomas, and MacGregor (2003, 16–18) four themes emerged in relation to what students perceived quality education to be. In the order of importance to the student group, these themes are: (1) quality of the lecturer (delivery in the classroom, feedback to students during the session and in assignments, relationship with students in the classroom); (2) student engagement with learning (the students valued a curriculum that was related to their worlds but broadened their horizons); (3) social/emotional support systems (the students found support from college support systems, their peers and families); and (4) resources of library and IT. In the study by Louw et al. (2001, 44) the quality of MBA program loaded on five factors: (1) value of the MBA program and the personal expectations of graduates (six items); (2) coursework material (four items); (3) quality of lecturers (three items); (4) learning methods (three items); and (5) interpersonal and leadership skills (two items). In sum, education may be evaluated in terms of satisfaction and perceived quality of the lecturer, education content, environment, materials, methods, learning processes, and results (knowledge acquisition, skill training).

Loyalty means a positive evaluation as well as non-random continuous purchases, usually of product brands (Mowen 1995). Oliva et al. (1992) tried to explain why investments in a service fail. In their study they supported the predictions that the satisfaction-loyalty relationship could be linear and non-linear, depending on the customer involvement. Despite the possibility of non-linearity, in entrepreneurship education research generally positive relationships between education satisfaction and continuation (loyalty) were found (Antončič and Hvalič Erzetič 2001, 2003; Antončič et al. 2003). Besides the above mentioned findings from Slovenia, notable entrepreneurship research works were completed also in Romania, mostly on entrepreneurial education (Scarlat 2001, 2003; Scarlat and Simion 2003).

In this paper we explore similarities and differences between Slovenia and Romania in entrepreneurship education satisfaction/quality and loyalty, as well as in testing the hypothesis of the positive relationship between education satisfaction/quality and education continuation.

Methods

In this section methodology (variables and measurement, sample and data collection, and analysis) is presented.

VARIABLES AND MEASUREMENT

Independent variables are satisfaction and perceived quality of education. First, satisfaction level was not assumed to be unidimensional as proposed by Westbrook (1980), who used only one five-point Delighted–Terrible Scale. Antončič and Hvalič Erzetič (2001) discovered that measuring satisfaction with entrepreneurship education on a single six-point scale ranging from 'very satisfied' to 'very unsatisfied' results in a very skewed answer distribution, which may not be usable for analysis with continuous variables. Therefore, satisfaction was measured with eight items on seven-point semantic differential scales answering a question about the respondents' general feeling about the education they engaged in (anchors: very dissatisfied–very satisfied, terrible–delighted, very dissatisfied–not at all dissatisfied, not at all satisfied–very satisfied, unfavorable–favorable, unpleasant–pleasant, I didn't like it at all–I like it very much, frustrated–contented). Items were adapted from Crosby and Stephens (1987), Eroglu and Machleit (1990), and Spreng et al. (1996).

Quality of education was measured with a 17-item scale that was developed as an extension of a 3-item service quality scale of Taylor and

Baker (1994). Measurement items were added by taking into consideration different elements of the educational service such as overall assessment of quality and fulfillment of expectations, education content, evaluation of the lecturer, appropriateness of materials or handouts and audiovisual aids, adequacy of room and equipment, and usefulness of acquired knowledge.

Dependent variable – education continuation was measured as the respondent's intention to continue his or her education in the future in terms of his or her expressed loyalty to the educational program and provider. Five questions were adapted from Bettencourt (1997), and Zeithaml et al. (1996): (1) saying positive things, (2) recommend to people, who are thinking about education, (3) encourage friends and relatives to engage in this education, (4) consider this education provider as a first choice, and (5) engage more in education from this provider in the next years. A seven-point Likert-type scale was used with anchors from 'strongly disagree' to 'strongly agree'.

Control variables data were collected about the respondent's education type (degree, non-degree), age, gender, length of work experience, education level, and industry of the company.

DATA COLLECTION AND SAMPLE

Data were collected from Slovenian and Romanian practicing and potential entrepreneurs, as well as non-entrepreneurs, who engage in degree and non-degree management education and training. A structured questionnaire was distributed mainly in class to conveniently selected groups of participants.

Answers were received from 128 respondents from Slovenia and 135 respondents from Romania. Our sample shows that 22.8% respondents in Slovenia and 64.9% in Romania educate themselves through the postgraduate program. In Slovenia 40.2% of respondents educate themselves through the college/university program, in Romania 29.8%. Only 1.6% of respondents in Slovenia and 1.5% in Romania educate themselves through the secondary/high school program. At the non-degree education type 17.3% in Slovenia and 21.4% in Romania usually participate in workshops and seminars that last several weeks, 18.1% in Slovenia and 22.9% in Romania take one-day seminars. Percentages for Romania add up to more than 100% since some participants are enrolled in more than one type of education.

The age of respondents is mostly spread between twenty and fifty years. 58.3% of respondents in Slovenia and 72.3% in Romania are more

than 20 and up to 30 years old, 22.0% in Slovenia and 23.8% in Romania are more than 30 and up to 40 years old, and 12.6% in Slovenia and 3.1% in Romania are more than 40 and up to 50 years old. In Slovenia 4.7% of them are over 50 years old and 2.4% are up to 20 years old. In Romania only 0.8% are up to 20 years old, no one is over 50 years old.

In Slovenia, 56.8% of respondents are female and 43.2% are male. In Romania 45.4% are female and 54.6% are male. 53.5% of respondents in Slovenia and 71.5% in Romania are single. 40.2% of respondents in Slovenia and 27.7% in Romania are married, of whom 6.3% and 0.8% are divorced or widowed. Respondents have various professions but most of them are economists.

The education level of the sample is as follows: in Slovenia 50.8% of respondents have secondary or high school diploma, 31.7% have college or university degree, 15.1% have vocational school. In Romania 70.8% of respondents have college or university degree, 26.9% of respondents have post-graduate degree, and 1.5% of them have secondary or high school diploma.

The length of work experience is spread from zero to thirty years, but most of the respondents have had work experience of five years or less: Slovenia 50.4%, Romania 62.5%; more than five and up to ten years: Slovenia 12.4%, Romania 23.4%; more than ten and up to twenty years: Slovenia 21.5%, Romania 11.7%, and more than twenty and up to thirty years: Slovenia 12.4% and Romania 2.3% of respondents.

The sample consists of 16.9% practicing entrepreneurs in Slovenia and 26.3% in Romania. 18.6% of respondents in Slovenia and 36.1% in Romania will start-up their own business, 48.4% in Slovenia and 33.6% in Romania will maybe establish their own business. 15.4% of respondents in Slovenia and 4.1% in Romania do not intend to establish their own business. Most of practicing entrepreneurs in Slovenia (10.5% of respondents) have had their own business more than five and up to ten years (in Romania 3.3%), most of practicing entrepreneurs in Romania (7.4% of respondents) have had their own business more than two and up to five years (in Slovenia 0.0%), and the same percentage in Romania (7.4%) have had their own business less than one year (in Slovenia 3.2%). Most of the potential (prospective) entrepreneurs (in Slovenia 6.5% and in Romania 9.8% of respondents) will establish their own business in less than one year, 3.2% in Slovenia and 6.6% in Romania will establish their own business in one year, 8.9% in Slovenia and 19.7% in Romania in two to three years.

The respondents come from different industries, most of them (13.7%

in Slovenia and 12.2% in Romania) operate in consulting and business services; 27.8% of respondents in Romania and 11.8% in Slovenia come from customer services. As seen from this comparison of the two samples, the samples can be comparable to some degree but they do not match perfectly.

ANALYSIS

The means of all items were compared between the two countries by assessing their values and performing t-tests. Multi-item scales of satisfaction, quality and education continuation (loyalty) were checked for their convergent validity by using exploratory factor analysis and the Cronbach Alpha reliability measure. All Cronbach Alphas were very high indicating very good reliablitiy: for satisfaction (8 items) – Slovenia 0.96, Romania 0.95, for continuation (loyalty) (5 items) – Slovenia 0.92, Romania 0.94, and for quality dimensions: content/process (6 items) – Slovenia 0.89, Romania 0.94, knowledge acquisition (3 items) – Slovenia 0.83, Romania 0.80, and room/equipment adequacy (2 items) – correlations: Slovenia 0.78, Romania 0.80. The education quality construct was assessed for dimensionality by using exploratory factor analysis, resulting in three distinct quality dimensions: (1) quality of education content and process, (2) quality and usefulness of acquired knowledge, and (3) quality and adequacy of room and equipment. For satisfaction, the three quality dimensions, and education continuation construct a single item that was computed as the mean of all items. This was done in order to reduce the number of variables for subsequent analysis. The key hypothesis was tested by using regression analyses with two country-based groups of data.

Findings

EDUCATION SATISFACTION, QUALITY, AND LOYALTY LEVELS

Mean values for all education satisfaction, quality, and loyalty items were compared. Most of the item means were found not to be different between Slovenia and Romania. T-test statistical differences (at a 0.05 level) were discovered only for three quality items. The item 'knowledge, which is acquired, will be very useful in my work' was rated higher in Slovenia (4.8) than in Romania (4.2). The mean of the item 'The equipment in the room, in which education was performed, is totally adequate' was found higher in Slovenia (5.0) than in Romania (4.6). The item 'The education

TABLE 1 Regression analysis results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Slovenia (constant)	0.219	0.434		0.504	0.615		
Satisfaction	0.223	0.095	0.202	2.350	0.020	0.457	2.190
Quality							
• content and process	0.795	0.113	0.648	7.042	0.000	0.400	2.500
• acquired knowledge	–0.027	0.069	–0.026	–0.394	0.694	0.761	1.314
• room and equipment	–0.053	0.053	–0.062	–1.009	0.315	0.900	1.111
Romania (constant)	–0.504	0.389		–1.294	0.198		
Satisfaction	0.386	0.088	0.297	4.408	0.000	0.602	1.660
Quality							
• content and process	0.418	0.106	0.379	3.956	0.000	0.298	3.351
• acquired knowledge	0.096	0.068	0.095	1.416	0.159	0.612	1.634
• room and equipment	0.173	0.065	0.206	2.674	0.009	0.462	2.165

Note: Column headings are as follows: (1) B; (2) standard error [1–2 unstandardized coefficients]; (3) beta [standardized coefficient]; (4) *t*; (5) sig.; (6) tolerance; (7) VIF [6–7 collinearity statistics]. Dependent variable: loyalty.

content was adequate' also received a higher rate in Slovenia (5.3) than in Romania (5.0).

When means were compared between the two country groups at the construct and dimension level no differences were found, except one – the acquired knowledge quality dimension was found higher in Slovenia (5.0) than in Romania (4.7).

THE EDUCATION CONTINUATION PREDICTABILITY

Results of the multiple regression analysis, which tested relationships between education continuation (loyalty) and its predictors (education satisfaction, and three quality dimensions), are shown in table 1. Adjusted R-squares of the multiple regression models were found high in both countries (Slovenia 0.60, Romania 0.65) indicating that almost two thirds of variance in loyalty can be explained by satisfaction, content/process quality, acquired knowledge quality, and room and equipment adequacy. This is in support of the overall hypothesis on the relationship between satisfaction/quality and loyalty.

However, in the Slovenian sample coefficients of only half of regression elements were found significant (satisfaction: standardized coefficient 0.20, and content/process quality: st. coef. 0.65). In the Roma-

nian sample coefficients of satisfaction (st. coef. 0.30), content/process quality (0.38), and room/equipment adequacy (0.21) were significant, whereas the acquired knowledge quality coefficient was low (0.07) and non-significant. These results are also in some support of the overall hypothesis on the satisfaction/quality-loyalty relationship, with a difference between the two countries in the impact of room/equipment quality on loyalty, which was found in Romania, but not in Slovenia. In both countries, content/process quality, as the most important, and satisfaction were found the strongest predictors of education continuation (loyalty).

When unstandardized coefficients were compared between the two samples, we discovered that relative impacts of three predictors differ between the two countries (more than two standard error difference). Content and process quality seems to have a stronger impact on loyalty in Slovenia (unstandardized coefficient 0.80) than in Romania (unst. coef. 0.42), whereas the impact of satisfaction and room/equipment quality can be considered stronger in Romania than in Slovenia (unst. coef.: satisfaction – Romania 0.39, Slovenia 0.22; room/equipment – Romania 0.17, Slovenia –0.05).

OTHER FINDINGS

Other findings based on our data are summarized as follows (see also table 2):

- *Underlying reasons for engagement in education.* The first reason, why entrepreneurs decide for education, is that they want to obtain a higher degree: 54.7% in Slovenia, whereas 50.8% of the Romanian sample want to gain knowledge in a new area. The acquisition of knowledge in a new area is the second reason for Slovenian respondents (46.1%); the second reason for entrepreneurs in Romania (41.7%) is that they want to learn how to do business in a fast growing firm. This is the third reason in Slovenia (23.4%). The third reason in Romania is that entrepreneurs want to obtain a higher degree (40.2%). This difference may be somewhat sample specific – lower education levels of the Slovenian sample in comparison to the Romanian one.
- *Main areas of education.* Slovenian sample: 57.8% of entrepreneurs educate themselves in the entrepreneurship area of education, 19.5% in marketing and sales and 18.8% in finance; in Romania: 32.6% in computing, 25.8% in marketing and sales, and 19.7% in management.

TABLE 2 Other results

	Slovenia	Romania
Education satisfaction		
very satisfied	10.9%	10.1%
satisfied	67.2%	67.4%
a little satisfied	18%	15.5%
a little unsatisfied	3.1%	3.9%
unsatisfied	0.8%	3.1%
Education continuation		
yes	59.4%	61.4%
probably yes	33.6%	25.8%
maybe	7.0%	10.6%
probably no	0.0%	1.5%
no	0.0%	0.8%
Education type		
degree	68.5%	96.2%
non-degree	35.4%	44.3%
Reasons for education		
get higher degree	54.7%	40.2%
renew knowledge	6.3%	28.0%
get knowledge in new area	46.1%	50.8%
learn about fast growing firm	23.4%	41.7%
be informed about news in the world	7.0%	22.0%
Reasons for education continuation		
get higher degree	44.6%	44.3%
renew knowledge	22.3%	36.1%
get knowledge in new area	55.4%	49.2%
learn about fast growing firm	30.6%	41.8%
be informed about news in the world	35.5%	23.8%

Continued on the next page

- *Opinion about the necessity of education.* 61.9% of respondents in Slovenia and 56.5% of respondents in Romania think that entrepreneurs must educate themselves more than once a year, whereas 38.1% of respondents in Slovenia and 40.5% of respondents in Romania think that they must educate themselves at least once a year.
- *Overall satisfaction with education.* 10.9% of respondents in Slovenia and 10.1% in Romania are very satisfied with education, 67.2% of respondents in Slovenia and 67.4% in Romania are satisfied with education, 18.0% in Slovenia and 15.5% in Romania are a little satisfied with education, 3.1% in Slovenia and 3.9% in Romania are a

TABLE 2 *(continued)*

	Slovenia	Romania
Area of education		
marketing and sales	19.5%	25.8%
finance	18.8%	13.6%
entrepreneurship	57.8%	2.3%
management	5.5%	19.7%
computing	11.7%	32.6%
Area of education – future		
marketing and sales	33.6%	38.6%
finance	31.9%	21.3%
entrepreneurship	43.7%	13.4%
management	19.3%	29.1%
computing	26.1%	26.8%
Education – necessity		
more than once a year	61.9%	56.5%
at least once a year	38.1%	40.5%
not necessary	0.0%	3.1%

little unsatisfied, and only 0.8% of respondents in Slovenia are unsatisfied with education whereas in Romania this percentage is 3.1%.

- *Overall education continuation.* 59.4% of entrepreneurs in Slovenia and 61.4% of respondents in Romania say that they will definitely continue with education, 33.6% in Slovenia and 25.8% in Romania say that they will probably continue with education and 7.0% of them in Slovenia and 10.6% in Romania will maybe continue with education. In Romania 1.5% say that they will probably not continue with education.
- *Reasons for education continuation.* The first reason for education continuation is getting knowledge in a new area (55.4% of entrepreneurs in Slovenia and 49.2% in Romania think so). 44.6% of respondents in Slovenia and 44.3% in Romania will continue with education to get a higher degree, 35.5% in Slovenia will continue because they wish to be informed about news in the world and 41.8% of respondents in Romania want to learn how to do business in a fast growing firm.
- *Main areas of future education.* Slovenia: 43.7% of entrepreneurs will educate themselves in an entrepreneurship area, 33.6% in marketing and sales, and 31.9% in finance. Romania: 38.6% of entrepreneurs

will educate themselves in marketing and sales, 36.2% in an entrepreneurship area, and 29.1% in management.

Discussion and Conclusion

In this paper we provided evidence for the existence of positive relationships between education satisfaction elements and education continuation by conducting a cross-cultural study in two countries (Romania and Slovenia). We found that education content and process quality, and education satisfaction of participants tend to be the strongest predictors of the subsequent decision to continue education in both countries. Room and equipment adequacy may also be important, but our findings showed this result only for Romania. Surprisingly, we did not find support for the impact of acquired knowledge quality on education continuation. Since the calculated correlations between acquired knowledge quality and continuation were significant and not very low, both in Slovenia (0.34) and in Romania (0.55), the lower regression coefficients than expected may be due to the fact that satisfaction and quality dimensions were correlated, even though we did not encounter bigger problems of multicollinearity in regression analyses.

An interesting finding of our research is that content and process quality tends to have a stronger impact on education continuation in Slovenia than in Romania, whereas the impact of satisfaction and room/equipment quality may play in Romania a stronger role in the decision to continue education than in Slovenia. This finding leads to an important conclusion for education providers in management and entrepreneurship education. In order to maximize the retention of participants and probably improve also business results, education providers in Slovenia need to pay good attention to content/process issues such as excellence, fulfillment of expectations of participants, well prepared materials, and the selection of the lecturer, who needs to satisfy participants in general, as well as convey the subject matter in an interesting and clear way. Romanian education providers may like to consider taking a somewhat different approach, that is, they need to try to satisfy the participants in general, as well as to provide an adequate education environment in terms of the room in which education is performed and equipment that is used.

In this study we also provide some evidence on the cross-cultural validity and comparability of the measures of education satisfaction, quality, and continuation, while pointing out some differences between man-

agement and education participants in the two countries. In Romania the key reason for participants to engage in education is a will to acquire new knowledge, while in Slovenia it tends to be a decision to obtain a higher degree. In the decision to continue education, participants from both countries give the leading role to new knowledge acquisition, and also consider continuing education a necessity, which we generally consider a positive sign for both countries. An interesting difference emerged in the consideration of a future area of education. In Slovenia, the entrepreneurship area may be the most prominent (followed by marketing and sales, and finance), whereas in Romania marketing and sales may be the leading area, followed by computing and general management.

The study has some limitations. The samples used were not random and not ideally matched across the two countries. Measures were based on perceptions and intentions and not on actual behavior of participants, which would require a longitudinal study design.

The study was conducted in management and entrepreneurship education in two countries; future research may further validate the results of this study in other countries and contexts. Despite the limitations, we provided some interesting conclusions, which are important in understanding the relationship between education satisfaction and quality as predictors of education continuation, as well as in managing education contents and processes.

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