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THE EFFECT OF HUMAN CAPITAL ON LABOUR PRODUCTIVITY: A CASE STUDY OF HILDING ANDERS Ltd.

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ABSTRACT

In this paper, the effect of selected human capital variables on labour productivity is examined. The term human capital refers to the education and on the job training. In a broader sense, human capital refers to health and values and attitudes (Becker 1994). According to the definition of Samuelson and Nordhaus (2007), productivity is a ratio of a measure of output and some input index, i.e. productivity is an arithmetic ratio of a produced quantity of goods and the quantity of resources that are used in the production. Such concept of productivity implies that it can be seen as output per unit of input or efficiency of the resources that are used in the production. According to Porter (2003), productivity is the best measure of competitiveness. The research is conducted in Hilding Anders Ltd. company. Hilding Anders is the lead producer of beds and mattresses for markets of Europe and Asia with headquarters in Sweden. They entered the Croatian market in 2005 by purchasing domestic company Hespo. On a sample of 101 employees in production, the effect of education, work experience and health on labour productivity has been researched.

Keywords: *human capital; education; labour productivity; Hilding Anders Ltd.*

1. INTRODUCTION

Productivity is a term that is used very often in economic literature and research. Samuelson and Nordhaus (2007) define productivity as the ratio of some measure of output by an index of inputs. In other words, productivity is the arithmetical relationship between the produced quantity and the quantity of resources used in production. The most commonly used measure of productivity is labour productivity. Labour productivity is used to determine the efficiency with which an economic system transforms labour into output. Productivity is also considered to be a true measure of competitiveness (Porter, 2003).

This particular study investigates human capital in the form of work experience. There is a great number of literature regarding the connection between age and productivity. Some authors (Mincer, 1974; Jovanović, 1979; Johnson, 1978 and Author et al. 2003) expect an increase of efficiency of older workers while others (Grund i Westergaard-Nielsen, 2005; Lallemand i Rycx, 2009) expect younger workers to be more productive. This paper consists of 5 chapters. The first chapter is the introduction. Production process of the Hilding Anders company is introduced in second chapter. The third chapter gives a short literature review on the connection between work experience and productivity. In the fourth chapter the empirical research conducted for this study is presented. The paper ends with a conclusion.

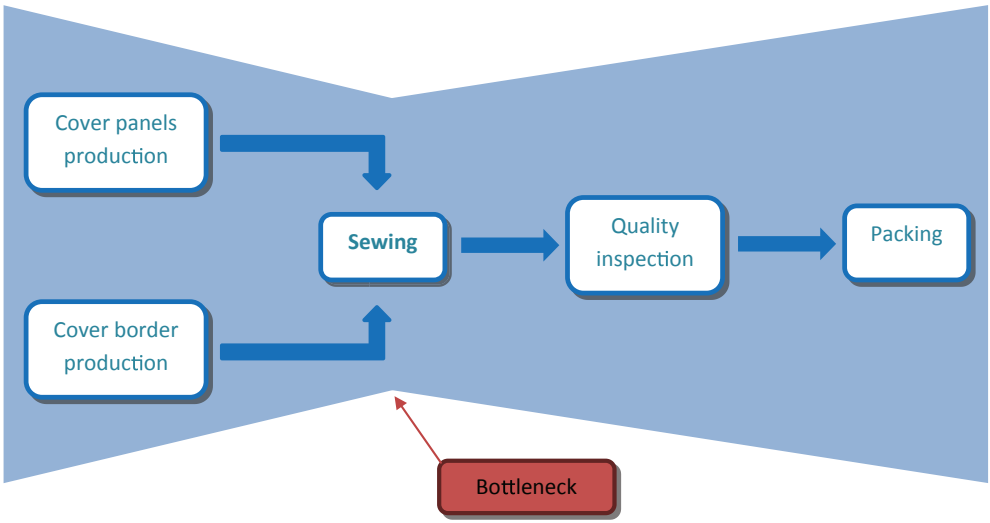
2. PRODUCTIVITY OF SEWING PROCESS AT HILDING ANDERS

Hilding Anders is one of the world leaders in production of beds and mattresses. This paper analyses the impact of operator experience and health on the sewing process, as a part of mattress cover manufacturing process in production plant in Prelog, Croatia. Complete production process of mattress covers is described in Figure 1. It consists of the following processes:

- Manufacturing of cover panels
- Manufacturing of cover border
- Sewing together panels and border
- Quality inspection
- Packing

Manufacturing process is designed in a way that sewing process is a bottleneck of complete production. This gives an advantage of production capacity flexibility via control of quantity of sewing operators. However, having a bottleneck on sewing operators has drawbacks also, as the complete production output depends on unpredictable human capital variables such as health, experience and motivation. Therefore, it is of crucial importance to understand the fine connections between sewing operators productivity and human labour factors.

Figure 1: Mattress Cover Production Flow



Besides the productivity, the sewing quality also has a major impact on total production output. Each mattress cover is inspected in detail, and has to be repaired if it does not conform to company quality standards. Covers are repaired by sewing operators, meaning that repairing process is directly reducing the capacity of sewing process, and therefore the capacity of total production.

In order to develop a better understanding of sewing productivity, the impact of health, education and experience on the productivity and quality of the sewing process is analysed (Internal Hilding Anders data).

3. LITERATURE REVIEW

Productivity is a term that is used very often in economic literature and research. Samuelson and Nordhaus (2007) define productivity as the ratio of some measure of output by an index of inputs. In other words, productivity is an arithmetical relationship between the quantity produced and the quantity of resources used in production. This means that productivity can be seen as a measure of efficiency by which resources are used i.e. as output per unit of input.

Diewert & Lawrence (1999) emphasize its role as a key determinant of economic growth and prosperity of an economy. The meaning of the term, however, is interpreted diversely. Some of the interpretations associated with the term are:

efficiency, effectiveness, rate of fluctuation and absenteeism, measure of output, measure of customer satisfaction and also intangible measures such as disruption of the work process, morale, loyalty and work satisfaction (Oyeranti, 2000).

According to Sharp (2000), labour productivity is the most commonly used measure of productivity. Labour productivity is a key factor that determines the potential for living standard growth because the higher level of per capita income is directly linked to more produced output per worker. As already mentioned, labour productivity is used to determine the efficiency with which an economic system transforms labour into output, and as such presents probably the most important economic indicator on macro, as well as on the micro level of economic activity. This particular study investigates human capital in the form of work experience.

Income growth model based on productivity was first developed by Yoram (1967) in his article regarding the human labour production. The main component of productivity growth is formal or non-formal training at work, after finishing one's education. Yoram's model shows some implications of differences in investing in human capital. There are following phenomena (Yoram, 1967):

1. more educated people invest more in training at work,
2. people that are significantly involved in training in one period are more likely to be involved in training in future,
3. more skillful and more educated people are more engaged in training at work than the people with equal education level,
4. when the demand for human capital increases, work education and training increases also – at least in short term. Consequently, the frequency of courses and training at work is increased.

All listed implications are checked and empirically verified (Mincer, 1994).

There is a great number of literature regarding the connection between age and productivity. Mincer (1974) for example, states that older workers have more experience and knowledge which increases their efficiency. Also, there is a great possibility that they have reached their highest position at the company (Jovanović, 1979). And there is also a greater possibility that they have conformed their job preferences to employer requirements (Johnson, 1978). Author et al. (2003) also expects increase of efficiency of older workers. Reason for that is that the demand for communication skills in U.S.A. labour market (skills that usually do not vary with aging) increased in the last decade more than the demand for problem-solving and mathematical skills (skills that should decrease with aging).

However, there are various factors which show that younger employees are more productive. One of the most common factors is that health of employees weakens with aging (illness, sick-leaves, physical strength, depression etc.). Additional argument is that cognitive capabilities also decrease with aging. This can result in lower productivity of older workers, except when work experience and specific

knowledge can compensate for cognitive skills. Besides this, it is considered that young people are more motivated for investing more effort because they want to prove themselves to their employer (Grund i Westergaard-Nielsen, 2005).

On the other hand, older people are less likely to invest in education as they are closer to retirement and they learn new skills harder. Also, employers are less likely to invest in education of older employees because there is a shorter period in which they can have an advantage of their education. However, the opposed argument would be that younger employees change their job more often, which reduces the returned benefits from job education (Lallemand i Rycx, 2009).

4. EMPIRICAL RESEARCH AND RESULTS

A regression model is conceptualized to investigate the labour productivity and to describe the existing relationships between variables in the Hilding Anders company.

4.1. Data and Model

Productivity data had been collected during 20 working days of production, on 101 sewing operators. Productivity for each operator was measured on every single sewed cover as a ratio:

$$Y = \frac{\text{Standard Minute Value}}{\text{Actual Measured Minute Value}} \times 100\%$$

The variable *Standard Minute Value* is a company norm time for sewing the cover, and it is defined for every single cover model. *Actual Measured Minute Value* is actual time that was spent by the sewing operator sewing the cover.

From the collected data it is visible that average productivity of all of the operators is 75,7 %, with standard deviation of 26,8.

The variable *EXP_HA* is the sewing operator's experience in company Hilding Anders, while the variable *EXP_TOTAL* is the total experience of the sewing operator. We can see that the average experience in Hilding Anders is 4,16 years with standard deviation of 3,77 years, while average total experience is 19,55 years with standard deviation of 8,53 years.

The variable *ABS* is absenteeism, represented as average sickleave days per month, from January 1st 2016 to August 1st 2016. It's average value is 1,14 days with standard deviation of 1,93 days.

Table 1. Descriptive Statistics

	Mean	Std. Deviation	N
Y_L	75,7213	26,79950	101
EXP_HA	4,1561	3,76525	101
EXP_TOTAL	19,5497	8,52733	101
ABS	1,1364	1,92925	101

Source: output of the statistical programme SPSS

Education level was also taken as a variable in the model, as well as the education field of study. 30,7% of sewing operators have elementary school education, 66,3% have high school education, while 3% have higher education.

Education field of study was taken into account as a binary variable, i.e. textile related education and non-textile related education. The data shows that 48,5% of sewing operators have textile related education, while 51,5% have non-textile related education.

Table 2. Education level of employees

EDU_LEVEL

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Elementary school	31	30,7	30,7	30,7
	High school	67	66,3	66,3	97,0
	Higher education	3	3,0	3,0	100,0
	Total	101	100,0	100,0	

Source: output of the statistical programme SPSS

Table 3. Employees with textile industry related education

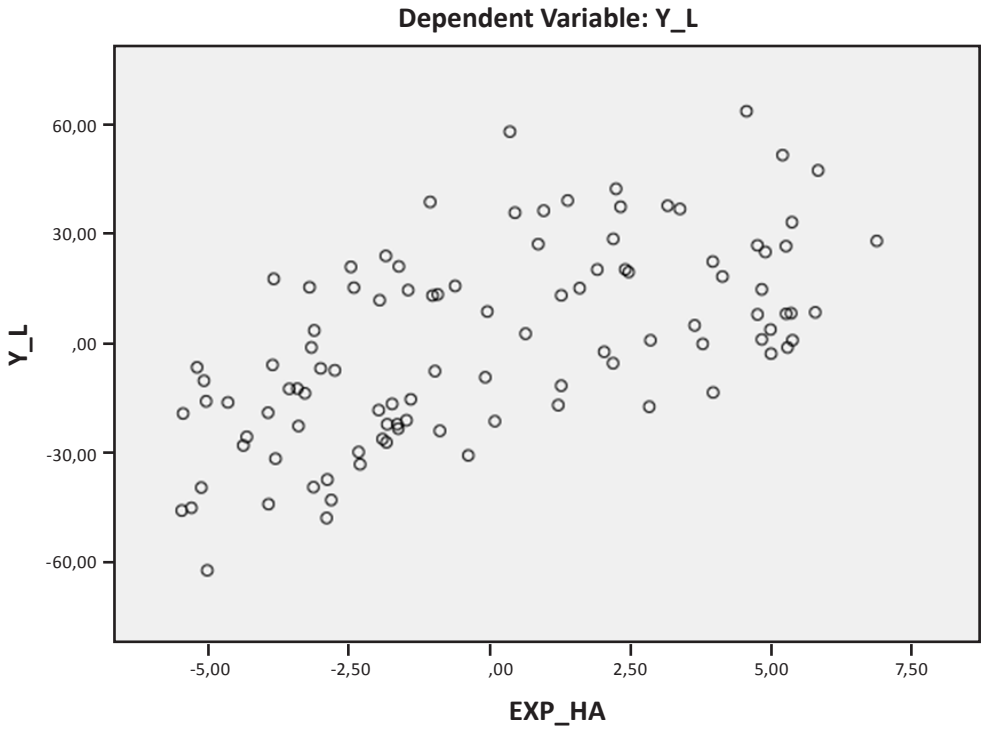
EDU_TEX

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no tex	52	51,5	51,5	51,5
	tex	49	48,5	48,5	100,0
	Total	101	100,0	100,0	

Source: output of the statistical programme SPSS

The main goal of this paper is to evaluate the effect of different human capital variables on labour productivity. The regression model, with labour productivity as dependent and human capital variables as regressors, was constructed. The results for this initial model showed that only experience working in Hilding Anders is a significant variable. The initial model was then modified to a model that has labour productivity as dependant variable, and experience working in Hilding Anders as a regressor. To determine the correct functional form between variables in the model, we also examined a scatterplot diagram (Figure 2). The diagram indicates that an exponential functional form would be the best choice to describe the relationship between variables.

Figure 2: Regression Plot



Source: output of the statistical programme SPSS

Following econometric model was constructed for this research:

$$\ln Y/L = \ln \beta_0 + \ln EXP\_HA \qquad (1)$$

Where Y/L is labour productivity, β_0 is constant and EXP_HA is experience working in Hilding Anders Company.

4.2. Results

Model summary is shown in the table 4. We can see that the R square value is 0,632 which means that 63,2% of the variations of labour productivity in company Hilding Anders can be explained by the model, i.e. by the regressor, years of experience working in the company. We can say that that this model is a good fit because it explains a very large portion in productivity variations.

Table 4. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,795[a]	,632	,628	,25193

a. Predictors: (Constant), LN(EXP)

b. Dependent Variable: LN(Y_L)

Source: output of the statistical programme SPSS

In the next table (table 5) Analyses of variance is shown. We can see that the significance for the F value is very low (0,000) which means that the regression equation is statistically significant.

Table 5. ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10,689	1	10,689	168,421	,000[b]
	Residual	6,220	98	,063		
	Total	16,909	99			

a. Dependent Variable: LN(Y_L)

b. Predictors: (Constant), LN(EXP)

Source: output of the statistical programme SPSS

Parameter estimates for the regression equation are shown in the table 6. Following the results for parameter estimates we can write the estimated equation:

$$\ln Y/L = 4{,}193 + 0{,}16 \ln EXP\_HA \qquad (2)$$

In the exponential functional form parameter estimates are elasticities. From the equation above we can see that for every 1% increase in the independent variable, i.e. years of experience working in Hilding Anders, productivity will increase by 0,16%. Also, in the table 6, the significance for the t value is shown. Because the significance is below 0,5% we can make the conclusion that the years of experience working in Hilding Anders variable is a significant variable in the model.

Table 6. Parameter estimates

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4,193	,026		163,279	,000
	LN(EXP)	,160	,012	,795	12,978	,000

a. Dependent Variable: LN(Y_L)

Source: output of the statistical programme SPSS

5. CONCLUSION

Labour productivity is one of the most important economic indicator of a company. This paper is an empirical study of labour productivity in Hilding Anders Ltd. company. Hilding Anders is the lead producer of beds and mattresses for markets of Europe and Asia with headquarters in Sweden. On a sample of 101 employees in production, the effect of work experience on labour productivity has been researched. The model used in the research is a regression model. The results of regression show that 63,2% of the variations of labour productivity in company Hilding Anders can be explained by years of experience working in the company. Significance level for F value indicates that the regression equation is statistically significant. Also, the significance for t value leads to a conclusion that the variable years of experience working in Hilding Anders is a significant variable in the model. Parameter estimates show that for every 1% increase in the independent variable productivity will increase for 0,16%. Thus, the research results indicate that a very large proportion of labour productivity in Hilding Anders company can be attributed to years of experience working in Hilding Anders.

UTJECAJ LJUDSKOG KAPITALA NA PRODUKTIVNOST RADA: STUDIJA SLUČAJA TVRTKE HILDING ANDERS D. O. O.

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SAŽETAK

U ovom se radu istražuje utjecaj odabranih varijabli ljudskog kapitala na produktivnost rada. Pod pojmom ljudskog kapitala u užem smislu podrazumijeva se obrazovanje i obuka na poslu. U širem smislu ljudski kapital, osim obrazovanja i obuke na poslu, obuhvaća zdravlje te vrijednosti i stavove zaposlenih (Becker 1994). Prema definiciji Samuelsona i Nordhausa (2007), produktivnost je odnos neke mjere „outputa" po nekom indeksu „inputa", odnosno produktivnost je aritmetički odnos između količine koja se proizvodi i količine resursa koji se koriste u proizvodnji. Takav koncept produktivnosti implicira da se ona može promatrati kao „output" po jedinici „inputa" ili efikasnost kojom se koriste resursi. Prema Porteru (2003), produktivnost je najbolja mjera konkurentnosti. Istraživanje je provedeno u tvrtki Hilding Anders d. o. o. Tvrtka Hilding Anders vodeći je proizvođač madraca i kreveta za tržište Europe i Azije sa sjedištem u Švedskoj. Na hrvatsko su tržište ušli 2005. godine kupnjom domaće tvrtke Hespo. Na uzorku od 120 zaposlenih u proizvodnji istražen je utjecaj obrazovanja, radnog iskustva te zdravlja zaposlenih na produktivnost rada.

Ključne riječi: *ljudski kapital; obrazovanje; produktivnost rada; Hilding Anders d.o.o.*

LITERATURA

1. Autor, D. H., Levy, F., & Murnane, R. J. (2003). The Skill Content of Recent Technological Change: An Empirical Exploration. *Quarterly Journal of Economics, 118*(4), 1279-1333.
2. Becker, G. (1994). *Human Capital* (3rd ed.). New York: Columbia University Press.
3. Diewert, E. W. & Lawrence, D. (1999). *Measuring New Zealand´s Productivity*. NZ Treasury.
4. Grund, C. & Westergaard-Nielsen, N. (2005). Age Structure of the Workforce and Firm.
5. Internal Hilding Anders data
6. Johnson, W. R. (1978). A Theory of Job Shopping. *Quarterly Journal of Economics, 92*(2), 261-77.
7. Jovanović, B. (1979). Job Matching and the Theory of Turnover. *Journal of Political Economy, 87*(5), 972-90.
8. Lallemand, T. & Rycx, F. (2009). *Are young and Old Workers Harmful for Firm Productivity?* Bonn: IZA
9. Mincer, J. (1974). *Schooling, Experience and Earnings*. New York: NBER
10. Mincer, J. (1994). *The Production of Human Capital and the Lifecycle of Earnings: Variations on a Theme*. Cambridge: NBER
11. Oyeranti, G. A. (2000). *Concept and measurement of productivity. CBN. Performance*. Bonn: IZA
12. Porter, M. E. (2003). The economic performance of regions. *Reg. Studies 37*, 549-578.
13. Samuelson, P. A. & Nordhaus, D. W. (2007). *Ekonomija*. Zagreb: MATE
14. Sharpe, A. (2000). The Productivity Renaissance in the U.S. Service Sector. *International Productivity Monitor*, *1*(2000) 1-8.
15. Yoram, B. P. (1967). The production of human capital and the life cycle of earnings. *The Journal of Political Economy, 75*(4), 352-365.