Analysis of employee well-being and productivity by decomposition

ILONA CSERHÁTI
Department of Statistics
Corvinus University of Budapest
8 Fővám tér, 1093 Budapest
HUNGARY
ilona.cserhati@uni-corvinus.hu

TIBOR KERESZTÉLY
Department of Statistics
Corvinus University of Budapest
8 Fővám tér, 1093 Budapest
HUNGARY
tibor.keresztely@uni-corvinus.hu

TIBOR TAKÁCS
Department of Economic Policy
Corvinus University of Budapest
8 Fővám tér, 1093 Budapest
HUNGARY
takacs.tibor@uni-corvinus.hu

Abstract: - The paper examines the relationship between the workplace well-being and productivity in the European countries. It is quantified by the Oaxaca decomposition technique, how the job-satisfaction may increase the productivity in the different regions. The developed economies are considered according to the four main social models (Anglo-Saxon, Nordic, Mediterranean and continental countries), while three groups of transition economies are distinguished (Baltic, Middle and South-Eastern European countries). It has been found that workplace well-being have a relevant impact on productivity in the European economies, but the strength of this impact positively correlates with the development level.

Key-Words: - Workplace well-being, productivity, Oaxaca decomposition

1 Introduction

The future of work is one of the main research areas of economics of our days: it has several quantitative and qualitative aspects. On the one hand, the Industry 4.0, i.e. the trend of digitalization may decrease the number of human jobs in several industries or may lead to job shifts (see e.g. a recent analysis for OECD countries [1]). On the other hand, the quality of workplaces, the well-being of employees will be an important factor of development. There are several studies and papers that prove positive relationship between business outcomes and employees' well-being (see e.g. [5-8], [11-13], [19-20], [23] and the references therein). However, paper [21] emphasizes that several results are based on questionable laboratory experiments, when only a small, typically non-representative group of people solves highly stylized tasks. The main purpose of the present paper is to show a statistical relationship between workplace well-being and productivity in Europe based on real-life data. The input data set has been taken from the Eurostat; all these data were surveyed on statistically representative samples of households of European countries. The Oaxaca decomposition technique has been applied similarly to the approach of [8], which focused only on Hungary. In our best knowledge, this was the first application of this technique to this problem. Furthermore, we also wished to examine if the strength of the statistical relationship is different by region within Europe. Although even a significant statistical relationship itself cannot be considered as a proof of causality

(see [21]), we think that such researches may have lessons for decision-makers.

2 Literature review

There are several human factors – individual and environmental factors of the work-related well-being – that significantly influence the economic performance both on macroeconomic and microeconomic level, although these factors were not in the focus of economic analysis earlier and correspondingly, the statistics did not provide enough information on these factors. In the 21st century, there have been several initiatives to develop alternative measurements of economic performance. Among others we mention the Better Life Initiative of the OECD (see [18]), or the UN Sustainable Development Goals and the related reports (see e.g. [25]) on macroeconomic level. Several papers emphasize that the work-related well-being level should be an important target variable of public policy (e.g. [16], [24]). Also a lot of microeconomic analyses have already been published on this area. For example, [9] established a composite indicator of work-related quality of life. Papers [3], [14], [10], [20] and [22] overview and analyze the factors that contribute to job satisfaction, while papers in [2] analyze how the management control may deteriorate the workplace well-being. Some recent papers, e.g. [5], [6], [15] and [19] show the positive role of human well-being in the human performance. Paper [6] analyzes the level of performance as a function of job satisfaction, job-related affect among employees and workforce characteristics by a panel model. A similar analysis is published by [5], for Finnish household budget survey panel data, where the labor productivity is explained by job satisfaction, by capital stock per hours worked and by some other control variables. Paper [15] is an ANOVA analysis of a website feedback survey data, while [19] is based on laboratory experiments.

3 Methodology

The chosen methodology of the investigation will be presented first, then the database of the research are briefly outlined in this section.

3.1 The Oaxaca decomposition

The Oaxaca decomposition technique was originally developed to quantify the wage discrimination of women ([17], see also a recent application in [4]). This method can be applied in general when the observed units can be divided characteristically into two groups having typically different values for a certain observed variable. If other observed variables are available that can be considered explanatory variables, the method can determine the shares of the explained and non-explained part. In case of the wage discrimination, the two groups consist of male and female employees, respectively, where male employees have typically higher wages not explained by such explanatory variables like education level, position in the hierarchy, work experience, etc. In our case, the two characteristic groups consist of employees with higher and lower level of well-being and their productivity is explained by different explanatory variables. It is expected that the share of the non-explained part, i.e. the impact of well-being on productivity is determined for each of the chosen groups of countries.

Denote by subscripts A and B the groups of high and low workplace wellbeing, respectively. The basic idea of the Oaxaca decomposition is to assess the regression for both groups separately as

$$Y_A = \beta_A X_A + \varepsilon_A \,, \tag{1}$$
$$Y_B = \beta_B X_B + \varepsilon_B \,, \tag{2}$$

where productivity is the endogenous variable Y and X is the set of explanatory variables. Since it is assumed that $E(\varepsilon_A) = 0$ and $E(\varepsilon_B) = 0$, one obtains from (1) and (2) that

$$E(Y_A) = \beta_A * E(X_A), \tag{3}$$
$$E(Y_B) = \beta_B * E(X_B). \tag{4}$$

Taking into consideration (3) and (4), equation

$$E(Y_A) - E(Y_B) = \beta_A * \big(E(X_A) - E(X_B)\big) + \\ + E(X_B) * (\beta_A - \beta_B) \tag{5}$$

obviously holds true. The left hand side of (5) expresses the total difference between the group means. The first term of the right hand side is the share of this difference that is explained by the exogenous (explanatory) variables. Consequently, the second term – the rest – can be considered as the share of the non-explained part, or, in other words, it can be explained only by the group effect. If the share of this group effect is considerable, it means that that the workplace well-being has a significant impact on productivity. However, we remark that there may be other explanatory variables that should contribute to the explained part, thus they should be taken into the regressions (1) and (2). Typically, the available information determines what one can take into account (data driven analysis). We think that

the method is suitable for comparisons, if the same variables are available for each observation unit.

3.2 The input data

The data of the European Union Statistics on Income and Living Conditions (EU-SILC) have been used for the examination. This annual survey contains microdata on income, poverty, social exclusion and living conditions from the EU member countries, from some EU candidates and also from EFTA countries. Although the EU-SILC is rather only a common framework than a common survey, it produces comparable data; the survey is based on common guidelines, procedures, concepts and classifications. A representative sample of private households are surveyed in each country based typically on a stratified two stage sample design. About 130,000 households and 270,000 persons aged 16 and more are interviewed in the EU countries for cross-sectional data, while about 100,000 households and 200,000 persons are interviewed for longitudinal data. The latter set of data are based on sample rotation. The anonymized microdata are available for scientific purposes (under specific conditions).

The primary dataset of the EU-SILC is collected each year containing characteristics of the household and of every household members. The secondary dataset of the EU-SILC is related with the annually changing ad-hoc modules. The special topics of subjective well-being was addressed in 2013, therefore the data of 2013 were used in our research.

The ad-hoc module of 2013 contains information on general feeling, on relationships with others and on trust in certain state institutions. There are also information regarding the workplace, namely on job satisfaction and satisfaction with commuting time. The job satisfaction has been chosen as a proxy of workplace well-being (see e.g. [11] about the positive impact of employee satisfaction on meaningful business outcomes). This indicator was measured on the ordinal scale 0-10 in the EU-SILC: in our research, group *A* consists of employees with evaluation at least 8. The endogenous variable, i.e. of the labor productivity is measured by the wage per hour worked; this information was taken from the primary dataset. The explanatory variables are either categorical or ordinal as follows:

- *Age*; respondents aged 15 and more are divided into 7 groups (15-24, 25-34, 35-44, 45-54, 55-64, 65-74, 75-)
- *Marital status*: 5 groups (Never married, Married, Separated, Widowed, Divorced)
- *Educational level*: 6 groups (Pre-primary, Primary, Lower secondary, Secondary, Post-secondary, Tertiary)
- *Employment status*: 4 groups (Self-employed with employees, Self-employed without employees, Employee, Family worker)
- *Managerial position*: 2 groups (Supervisory, Non-supervisory)
- *Occupation categories*: 10 groups (Armed forces, Managers, Professionals, Technicians and associate professionals, Clerical support workers, Services and Sales Workers, Skilled agricultural, forestry and fishery workers, Craft and related trades workers, Plant and machine operators and assemblers, Elementary occupations)
- *Gender of the respondent*
- *General health status*: 5 groups (Very good, Good, Fair, Bad, Very bad)
- *Overall life satisfaction* (0-10)
- *Satisfaction with personal relationships* (0-10)
- *Feeling downhearted or depressed* (1-5)
- *Number of persons working at the local unit*
- *Satisfaction with commuting time*
- *Branch of the economy in which the respondent is employed* (according to ISIC/NACE sections with aggregate groups B-E and R-U)

Recently, [8] has presented the results of a study for Hungary, which showed that the job satisfaction itself explains about one third of higher productivity. The present paper aims to extend this investigation to the European countries comparing the characteristic groups of European countries. The developed economies have been divided into four groups, namely the Anglo-Saxon, Nordic, Mediterranean and continental countries. Every group includes countries with similar social models, but there are apparent differences among these groups. Regarding the labor market, the Nordic model can be characterized by strong trade unions and extended social transfers but by relatively less stringent rules of job protection. There are stricter rules on removal of employees in the continental and especially in the Mediterranean models: although in the latter case the level of transfers is definitely lower. The trade unions are weaker in the Anglo-Saxon countries and consequently the protection of jobs is weaker, while the transfers are provided on a selective basis with guaranteed minimums. The investigation aimed to examine whether or not these characteristics influence the weight of well-being in the economic outcome and productivity. It is still not unambiguous if the different transitional economies of Europe can be labelled by any of these models. For example,

Hungary is close to the continental model regarding the relatively high share of income redistribution, the job protection is low similarly to the Nordic model but without its extended social security system. The transitional economies therefore are grouped rather according to geographical regions.

Correspondingly, seven groups of European countries are considered as follows. The groups of non-transitional economies are

- Nordic (Denmark, Finland, Iceland, Norway, Sweden)
- Anglo-Saxon (Ireland, United Kingdom)
- Continental (Austria, Belgium, France, Germany, Luxembourg, The Netherlands)
- Mediterranean (Cyprus, Greece, Italy, Malta, Portugal, Spain)

The transitional economies are grouped as

- Baltic (Estonia, Latvia, Lithuania)
- Middle European (Czech Republic, Hungary, Poland, Slovakia, Slovenia)
- South-Eastern European (Bulgaria, Croatia, Romania, Serbia)

We remark that Slovenia is considered together with the Middle European group because of its relatively high level of development.

4 Main results

First the statistical relationship between job satisfaction and productivity was tested for the whole dataset. The first six categorical explanatory variables listed in subsection 3.2 were considered then, for which some descriptive statistics were calculated including the determination of their explanatory power. Finally, the Oaxaca-decomposition was implemented by the defined groups of European countries.

4.1 Descriptive statistical analysis

Each of the Wilks' Lambda, the Pillai's Trace and the Lawley-Hotelling Trace tests affirms a significant statistical relationship between job satisfaction and productivity justifying the application of the Oaxaca decomposition.

Also the relationships of age, marital status, educational level, employment status, managerial position and occupation categories with productivity and job satisfaction have been examined. The above mentioned tests showed statistically significant impacts of these variables on productivity.

The explanatory power of *age* to productivity (based on Wilks' Lambda) is around 2%; there is a clear relationship between age and productivity, since the latter is measured by wage per hour, which typically increases during the career. Table 1 shows the distribution of job satisfaction by the chosen age categories. (In all the contingency tables below the job satisfaction is grouped as follows: 'Not satisfied' if evaluation is in the range 0-4, 'Moderately satisfied' in 5-7 and 'Very satisfied' in 8-10. The shares of these groups are 10.2%, 39.4% and 50.4%, respectively.) The most apparent changes of this distribution can be seen among elderly employees: people tend to be unsatisfied with their jobs if they still work after the usual retirement age.

Table 1: The distribution of job satisfaction by age group

Age	Not satisfied	Moderately satisfied	Very satisfied
15-24	11.3	36.6	52.1
25-34	9.7	40.2	50.1
35-44	9.7	40.4	49.9
45-54	10.3	39.6	50.0
55-64	10.7	38.1	51.1
65-74	10.5	30.2	59.3
75-	28.6	21.6	49.8

Source: own calculations based on Eurostat EU-SILC database

The *marital status* does not seem to have a strong impact on productivity, only widowed employees have significantly less average value; the explanatory power of this variable is around 0.5%. Correspondingly, the widowed have the highest share among those, who are not satisfied with their jobs, and have the lowest share in the category of 'Very satisfied' as Table 2 shows.

Table 2: The distribution of job satisfaction by marital status

Marital status	Not satisfied	Moderately satisfied	Very satisfied
Never married	10.7	40.9	48.5
Married	9.4	39.0	51.6
Separated	13.9	40.7	45.4
Widowed	14.6	38.1	47.3
Divorced	12.0	36.3	51.7

Source: own calculations based on Eurostat EU-SILC database

The *education level* has a strong impact on productivity, especially employees with tertiary education are significantly more productive than others, which is an obvious consequence that these employees have the highest average salaries in every country. The explanatory power of the variable is more than 5%. As Table 3 shows, employees with higher education level tend to be

more satisfied with their jobs. On the other hand, the share of non- satisfied employees with the lowest education is relatively high, which is also an intuitive result.

Table 3: The distribution of job satisfaction by education level

Education level	Not satisfied	Moderately satisfied	Very satisfied
Pre-primary	24.8	46.4	28.8
Primary	14.8	44.6	40.6
Lower secondary	13.1	42.4	44.5
Secondary	10.8	39.9	49.3
Post-secondary	10.3	38.0	51.7
Tertiary	7.8	37.6	54.6

Source: own calculations based on Eurostat EU-SILC database

Regarding the *job status*, employees are the most productive (their share is 96% among respondents, who have jobs). Table 4 shows that prefer to be self-employed, especially having also employees. This fact was supported also by the analysis for Hungarian data in [8].

Table 4: The distribution of job satisfaction by job status

Job status	Not satisfied	Moderately satisfied	Very satisfied
Self-empl. with employees	7.9	33.3	58.8
Self-empl. w/o employees	13.3	40.4	46.3
Employee	9.8	39.4	50.8
Family worker	19.8	44.5	35.7

Source: own calculations based on Eurostat EU-SILC database

Two outcomes of *managerial position* are considered here. Tests show that it is an important factor, having about 4.5% explanatory power. The main cause is the significantly higher average wages of employees in supervisory positions.

Table 5: The distribution of job satisfaction by managerial position

Managerial position	Not satisfied	Moderately satisfied	Very satisfied
Supervisory	6.9	36.5	56.6
Non-supervisory	10.5	40.6	48.8

Source: own calculations based on Eurostat EU-SILC database

Finally, the *occupation category* was tested with outcomes listed in subsection 3.2. This variables had the strongest explanatory power of 8.5%. Since the productivity was measured by hourly wages, it is not surprising that managers have by far the highest average value. Professionals have the second highest value, while the non-profit sphere (clerical support, armed forces) is around the overall average. Table 6 presents the corresponding distribution, which reflects basically the wage differences. It is somehow surprising that there are significant differences within the government sector, where the share of the non-satisfied is twice higher in clerical support activities than in the armed forces in spite of the similar average wages. Conspicuously, the general level of satisfaction is relatively low in agricultural and related activities, although this category includes skilled workers, and agriculture is one of the main focus of EU-supports.

Table 6: The distribution of job satisfaction by occupation category

Occupation category	Not satisfied	Moderately satisfied	Very satisfied
Armed forces	4.5	33.2	62.4
Managers	7.2	33.6	59.2
Professionals	6.3	35.0	58.7
Technicians and assoc.	9.0	37.5	53.5
Clerical support	10.1	42.2	47.8
Services and sales	11.4	41.0	47.7
Agric., forestry, fishery	16.6	45.2	38.2
Craft and rel. trades	11.7	41.7	46.7
Operators, assemblers	12.1	43.7	44.3
Elementary occup.	16.5	44.0	39.6

Source: own calculations based on Eurostat EU-SILC database

4.2 The results of the decomposition

Table 7 summarizes the results of the Oaxaca decomposition. The results have several lessons.

Firstly, it is obvious that the job satisfaction, which was used in our examination as a proxy of workplace well-being, has a strong impact on productivity. According to the decomposition, this impact almost as high on average, than that of other characteristics. We remark that data of only European countries were used, but we assume that similar results could be experienced in other continents as well: this can be the focus of further studies. (The EU-SILC contains comparable data only for European countries.)

Secondly, it is a very interesting result that the share of the impact of job satisfaction is in a strong positive correlation with the economic development (the authors did not have any preliminary hypothesis about it). It is worth mentioning that the earlier cited examination for Hungary (see [8]), which belongs to the Middle European group, fits to this tendency with its 36.2% share. It suggests that this type of examination should be extended by country as well.

Thirdly, both the Anglo-Saxon and Nordic group are equally very high although these groups differ from many social and economic aspects. However,

the labor market functions on strong market bases in both groups, which may explain the similar importance and impact of workplace well-being.

Fourthly, it is somehow surprising that the role of workplace well-being is rather low in the so-called transition economies, especially in the less developed ones. It might suggest that it is not so important to deal with this aspect to increase productivity, but certainly the causality has not been examined here: authors assume that measures to enhance workplace well-being is a good tool to raise productivity, which is crucial for the catching-up process.

Table 7: The decomposition of difference in productivity by satisfaction and other characteristics of employees

Region	Impact of job satisfaction	Impact of other characteristics
Anglo-Saxon	89.2%	10.8%
Nordic	82.0%	18.0%
Continental	62.9%	37.1%
Mediterranean	41.5%	58.5%
Middle European	40.4%	59.6%
Baltic	35.8%	64.2%
South-Eastern European	22.2%	77.8%
All countries	*48.8%*	*51.2%*

Source: own calculations based on Eurostat EU-SILC database

5 Conclusion

The paper examined the effect of workplace well-being on productivity. It was determined by the Oaxaca decomposition what share of productivity difference the workplace well-being itself may explain. The examination was carried out for European economies based on comparable data of EU-SILC. It was found that impact of workplace well-being on productivity is almost as important as other factors. Furthermore, the importance of well-being is in close positive correlation with the level of economic development. Its role is high in those economies, where employment is determined primarily by market mechanisms. The results of the presented examination suggest that the enhancement of workplace well-being or of job satisfaction may be a necessary tool of increasing the productivity in the less developed economies, like in the transition economies of Europe, which is of fundamental importance for their convergence to the developed countries.

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