EMPLOYMENT ABSORPTION IN MANUFACTURING INDUSTRY: YOGYAKARTA CASE

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Abstract

Unemployment has been a main problem in economic development, especially in developing countries. Unemployment stems from the inability of the economy to absorb the growing labor force. This paper investigates factors influencing absorbtion of labor in Yogyakarta manufacturing industries. Variables hypothesized to affect the absorbtion are wage, labor productivity, non-wage spending, and output of production. It collects data from Indonesia Centre Bureau of Statistics, and uses panel data regression, namely common effect approach, to estimate the model. Employing Eviews software package, it finds that wage, labor productivity, and output production significantly influence labor absorption. However, non-wage spending does not significantly influence the absorption.

Keywords: Labor absorption, wage, labor productivity, non-wage spending
JEL classification numbers: J01, J23, J24

Abstrak

Pengangguran telah menjadi masalah utama dalam pembangunan ekonomi, terutama di negara berkembang. Makalah ini mengkaji berbagai faktor yang mempengaruhi penyerapan tenaga kerja di industri manufaktur Yogyakarta. Variabel yang dihipotesiskan mempengaruhi penyerapan tenaga kerja tersebut adalah upah, produktivitas tenaga kerja, pengeluaran non-upah, dan jumlah produksi. Penelitian ini mengumpulkan data dari Badan Pusat Statistik Indonesia, dan menggunakan regresi panel data dengan pendekatan *common effect* untuk menaksir model yang dibangun. Dengan menggunakan paket perangkat lunak Eviews, penelitian ini menemukan bahwa upah, produktivitas tenaga kerja, dan produksi output secara signifikan mempengaruhi penyerapan tenaga kerja. Penelitian ini juga menemukan bahwa belanja non-upah tidak berpengaruh secara signifikan terhadap penyerapan tenaga kerja.

Keywords: Penyerapan tenaga kerja, upah, produktivitas tenaga kerja, belanja non-upah
JEL classification numbers: J01, J23, J24

INTRODUCTION

Employment has been a big problem in Indonesia. This stems from the imbalance between the population growth and job opportunity growth. It also comes from the lack of skill of the labor force, compared to the requirement asked by the industries. If they are trained well, they can help the process of production, otherwise, they become the burden of the economy.

Micro industry have an important role in economic growth, labor absorbtion, as well as providing cheap goods and services and overcoming poverty problems. It also significantly contribute to national economy through local economic development. In 2003, labor force absorbed by this micro industries worth 59 percent of total labor force (Anonim, 2004).

Table 1: Growth of Industries in Special Territory of Yogyakarta

Year	Companies (units)	Labor	Investment Value (Rp Billion)
2002	78.609	259.812	845.569
2003	78.100	259.102	859.007
2004	78.609	264.217	1,031
Growth	0.65%	1.97%	20%

Source: Special Territory of Yogyakarta, Regional Government.

The success of economic development can be achieved only by accumulation of capital and appropriate industrialization. The growth of unemployment and labor force motivates the growth of industry. The importance of industrial development is stressed specially because of employment possibility and multiplicative effects which development of this sector can have on other sectors (further discussion on the importance of industrial development can be found in Obadic, 2001).

Labor force absorbtion through output enhancement takes time. The fact is that, amid the economic stress through out the world, the job creation has been proven to be insignificant in absorbing all labor available in the economy. The industrial expansion performs just the same thing, namely unable to provide jobs to all job seekers.

The development of industrial sectors in Yogyakarta is volatile, stems from the impact of economic recession, especially manufacturing industries. The number of manufacturing industries in Yogyakarta was 367 companies in 2005, which was 10.71% lower than that of 2004, which was 411 companies. During 2005, 30 middle and big companies stopped their operation, and 29 middle and big companies turned out to be small companies, with employess of less than 20 people.

Among various types of manufacturing industries in Yogyakarta, furniture industries are of the highest proportion. There are 96 furniture companies, or 26.16%, in 2005. It follows by companies producing products made of stones, namely 19 companies.

This manufacture industries absorb 41.391 percent of the total labor force in Yogyakarta in 2005, or on average of 113 labors per year. Two manufacturing sectors absorb the most, namely furniture and textile industries, namely absorb 6.783 and 7.404 people, respectively.

Industries use various indicators in absorbing new employment, which can be distinguished into two groups, nemaly external and internal indicators. Among external indicators are economic growth, regional gross domestic product,and size of population. Among internal indicators are wage, labor productivity, non wage spending, and volume of production. This paper investigates only the internal indicators.

Sugiyanto (1991) investigates the relationship between labor force absorbtion, wage elasticity, labor elasticity, and labor productivity in manufacturing industries in Central Java Province using ordinary least squares. The data he employs are secondary time series and cross section data. Manufacturing industries in the region shows that in the long run, wage is an important variable to labor demand in the whole industries. He also finds hat output of production is another important variable, both in the short and long run, to labor demand in all group of industries.

Herlin (2007) investigates the growth of industry of manufacture and factors influencing absorption of labor at industry of manufacture in East Java. The data used is secondary data from 1995-2004. The technique which is used is doubled linear regression. She finds that the growth of manufacture industrial in East Java in previous year has declined, due to the drop in company production, which leads to the slower growth of industry of manufacture. As for determinant factors in

absorption of industrial labor in manufacture, she uses wage rate, investment and output. The result of regression using panel data shows that absorption of industrial energy of manufacture is influenced by wage rate, output of production, and investment.

Swasono dan Sulistyaningsih (1995) investigates labor market and national labor plan in Indonesia. They use elasticity approach using data from 1986 to 1996. Labor market in Indonesia in the era of the second long term development plan shows the imbalance between needs and supply of labo, reflected by the abundant job seekers. This means that structural and frictional unemployments still exist in Indonesia.

Riphat and Cahyono (1997) analyze Indonesian labor towards the 21st century using input-output analysis. They use secondary time series data from 1990 to 2000. In particular, they investigate the componen of final demand in motivating the creation of employment. They find that the economic structural change in Indonesi is not accompanied by labor transformation with the same speed, which becomes the obstacle in enhancing the quality of labor. As a result, the production process is dominated by low skill and low productive labors.

Lukisari (1999) analyzes regional minimum wage policy in Middle Java using qualitative technique based on cross section data 1990-1999. She finds that labor market with over supply of labor with low education level accompanied by low economic performance has caused the low level of regional minimum wage in the region.

Neni (2000) investigates the influence of capital-labor ratio, education level, stock, capital, and population growth on Indonesian gross domestic product (GDP) growth using multiple regression with Ordinary Least Squares technique. The Indonesian GDP shows that the higher the capital labor rati, the higher the capital distribution on each labor. The process tend to be mor capital intensive. This process caused the increase in spending on education and training for the labor.

Some papers have investigated the topic. Assadin and Mansoer (2001) investigate economic growth and job opportunities in East Kalimantan. They use Shift-Share analysis using cross section secondary data of 1990-1997. They suggest the importance of supervising and developing job opportunities in service and information sectors to enhance productivity in sectors which absorb labor the most, such as agriculture, manugacture, trade, restaurant and services sectors.

Setiaji (2001) studies various aspects of wage trend in Indonesia, showing the different wage determinants of production and non-production groups based on the sign and the magnitude of explanation variables and their statistical test. The concentration impact on both groups is quiet big. Under such condition, production labors are paid closer to market price whereas non-production labors receive wages that have greater rents sharing. The impact of fraction of foreign capital on production labor wage among industries is greater than that of non-production one. The different impact of size, export, and female fraction variables can be concluded as follows.

Bertola et al. (2001) applies OLS to explain unemployment in the USA. He finds that the unemployment is caused by the free market system. The low unemployment level since 1995 is accompanied by the uneven weage distribution and low wage level. This stems from the fact that the production process are mostly capital intensive.

Manuelli (2001) investigates technological change, labor market, and stock market using Mortensen and Pissarides model employing cross sectinal and time series data from 1959-1997. He finds that application of new technology in the production process increases investment value and wages.

Setiadji (2001) investigates the policy of regional minimum wage using mul-

tiple regression analysis which is transformed into Generalized Least Square method using time series data from 1982-1995. The growth in wage level is always lower than that of labor added value, which indicates the more important role of capital.

Sugiyarto (2001) investigates the impact of manufacturing industry on employment. He estimatesmultiple regression using ordiraly least squares using time series data from 1983 to 1997. He finds that the increase in the value of production and spending on labor will increase labor demand, while the increase in wage level reduces the demand of labor.

Zamrowi (2007) analyzes labor absorbtion in small industries using multiple regression analysis by estimating primary and secondary data. He explains that wages, productivities, capital and non wage spending has significant impact on labor absorbtion in small industries in Semarang. Capital is the dominant variable. By adding more capital, labor absorbtion increases, which suggests that the government should inject more capital if it wants to reduce the unemployment level in Sem rang.

METHODS

Manufacturing industry is a unit of production in a certain place performing an economic activity in an effort to mecahnically, chemically, or manually change a good into another more valuable goods with characteristics which are more to the consumer wants (Indonesian Bureau of Central Statistics, 2005). It can be categorized into big, medium, small, and household industries, based on the size of labor they used. The size of labor they use are more than 100, 20 to 99, 5 to 19, and less than 5, respectively.

Labor or manpower are people with ages of 15 years old or moe with potential of producing goods and services (Indonesian Bureau of Central Statistics, 2000). To determine the manpower size, the paper uses a method of work burden analysis as follows (Komaruddin, 1996):

$$\sum Labor = \frac{q}{PR_L \times t} \qquad (1)$$

where:
Q is volume of production per hour,
PR_L isproductivity of labor,
t is working hour.

People in working age can be devided into labor force and non labor force. Labor force are peole in the working that own a job. Non labor force are those in the working age but do not go to work for some reasons, such as going to school to seek education (further discussion on labor forece can be found in Autor and Duggan, 2003; Mosisa and Hipple, 2006; Chinhui and Potter, 2006; and Lee and Mather, 2008, amng others).

LFPL is part of people in working age, namely 15 years age or more, go to work in the last week. Those who are jobless but seeking the jobs also included in the group of labor force (Sensus Penduduk 2000).

LFPL is a ratio between labor force and population size. The higher the LFPL, the higher the numbe of working age people involved in the productive activities producing goods and services in a certain period of time. LFPL can be calculated as follows:

$$LFPL = \frac{\sum LF}{\sum P} \times 100\% \qquad (2)$$

where LB is labor force and P is population of 15 years old and more.

Business people uses labor as inputs of production (Winardi, 1988). Therefore the demand for labor is influenced by the demand for the final goods, which is another way of saying that labor demand is a derived demand (see for example, Simanjuntak, 1985). That is why labor demand is influenced by wage labor and other factors influences the output of production (Sumarsono, 2003).

As discussed, labor demand is derived demand, while output demand is considered as genuine demand (Boediono, 1982). The basic theory of supplier behavior is that in finding maximum profit, they will produce at the rate where marginal revenue equals marginal costs. Marginal revenue can be found by multiplying the value of a product and one unit increase in the product. This means that value of marginal product of labor can be found by multiplying price of the product and marginal product of labor.

Value of marginal product of labor represents additional return by adding one more unit of labor. Sometimes valu of marginal product is approached by wge rate. This means the a company or unit business will keep adding labor so long as Marginal revenue from the labor exceeds the wage rate.

Labor absorbtion is the number of labor uses in a unit business. It influenced by both internal and external factors. External factors that are hypothezied to unfluence labor absorbtion are economic growth, inflation, unemployment level, and interest rate. Internal factors that are hypothesized to influence labor absorbtion are wage, labor productivity, output of production, capital or technology, and non wage spending.

Wage is return as the reward given by employer to the employees for a job or services provided, nominated in terms of value of money based on an agreement or rules or acts and paid based on a contract between employer and employees, including any subsidy, both for the employee and his or her family (Act No/1981, Republik Indonesia).

According to Ehrenberg (1998) an increase in wage average will be followed by a decrease in demand for labor, which might lead to unemployment. On the other hand, a decrease in wage average will be followed by an incrase in demand for labor. This suggests that there is a negative relationship between wage average and demand for labor (lembaga penelitian ekonomi UGM, 1983).

The change in wage rate influences cost of production faced by a company. If the wage rate increase will therefore increases the price of the products. This will reduce the demand for the goods by the consumers. As more goods are not sold, the supplier will reduce the good price, which in turn reduce their demand for labor. This phenomena is foamous as the scale effect.

When the wage increases, a company will use technologies which is capital intasive to reduce the labor usage, mostly by adopting higher technology in the production process. This phenomenon is well understood as the substutition effect.

Productivity is the ration between output and inputs used to produce it. Productivity can also be defined as output that can be produced by using all resources in the production given a certain period of time. An increase in productivity means that a labor (one type of input of production) produces more output at the same period of time, or a given output can be done in shorter period. Sudarsono (1988) formulates productivity as follows.

$$PR_L = \frac{Q}{L} \tag{3}$$

where, PR_L is labor productivity, Q is volume of output produced by the industry, and L is number of labor employed

As the productivity of labor increases, the company will hire less workers, unless it plans to produce more outputs. Therefore the variatiy in labor productivity influences the absorbtion of labor.

Output of production is hypothesized to influence labor absorbtion as an increase in output of production needs more input of productions, including labor. Furthermore, the output of production is determined by the demand of final products.

The paper analyzes the data of Special Territory of Yogyakarta (ST of Yogya-

karta), consists of District Gunung Kidul, District Kulon Progo, District Bantul, District Sleman and City of Yogyakarta. The data are panel data from 1996 to 2005. However, due to some missing data, it uses only the period of 2001-2005. The data are from Centre for Statistical Berueau, Ministry of Labor and Transmigration, and Department of Industry and Trade.

The data are that of manufacturing industry, namely number of labor, wage level, labor productivity, non-wage spending, and output. The dependent variable is labor demand, namely number of labor work in the industry. The variable independent are wage level, labor productivity, non-wage spending, and output.

Wage is all expenses in terms of money or goods paid to labor as the reward on the service given by the labor. Labor productivity is the average value (in unit) of goods per month provided by a labor. Non wage spending is all expenses other than wage, which consists of social subsidy, tax subsidy, or insurance paid by the company to the labor evry month. Output is the value of goods and services produced by the company.

The paper uses multiple linear regression with the following model.

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + U_{it} \qquad (4)$$

where Y is labor absorbtion, X_1 is wage level, X_2 is labor productivity, X_3 is non wage spending, and X_4 is output.

The parameters in the model are estimated using panel regression technique which accommodate both cross section and time series at the same time. This technique provides higher degree of freedom, caused by the higher observations, compared to both time series or cross section in isolation. This might provide more efficient estimation (Hsio, 1995).

There are three approaches in using panel data technique available. (1) Common effect approach which combines time series and cross sectional data without considering the difference between time and individual observation. (2) Fixed effects approach to analyze longitudinal data with repeated measures on both independent and dependent variables. They have the attractive feature of controlling for all stable characteristics of the individuals, whether measured or not. This is accomplished by using only within-individual variation to estimate the regression coefficients. (3) Random effects approach assumes that the individual specific effects are uncorrelated with the independent variables.

As for non panel data regression model, this paper also apply hypothesis testing for the estimated parameters, namely individual test and overall test using t and F distribution, respectively.

Before conducting the hypothesis testing, the paper investigate potential violations of classical assumptions, namely homoscedasticity and no serial correlation.

RESULTS DISCUSSION

The paper analyze the data of period 2001–2005 using pooled data regression with OLS method. It uses Eviews 5.1 software package for the estimation process. The first step of the modelling is determine the apporpriate model by comparing common effect and fixed effect approaches.

Classical Assumptions Tests

This paper tests three of most influencial classical assumptions, namely multicollinearity, no autocorrelation, and homoscedasticity.

Multicollinearity Test

Mulicollinearity is a situation of the existence of linear relationship btween some or all independent variables (Table 2). Based on the the results of the multicollinearty test by comparing R^2 between variables and R^2 resulted in the model, it can be concluded that here is no multicollinearity ex-

ists in the model. As the tests results comprises 4 pages long table, not all of the rusults are presented in the paper. Readers who interested in the results should make a written contact the author.

No Autocorrelation Test

To test the existence of autocorrelation, this paper uses *Durbin-Watson* test (*DW*-test). The regression results provides the *DW*-statistic of 1.277111. Based on the the following informatin, namely $n = 75$, $k = 4$, and $\alpha = 5\%$, the following critical d-values are obtained, namely $d_U = 1,73$, 4- $d_U =$ 2,27, $d_L = 1,51$, and 4- $d_L = 2,49$. It can be inferred that 1.277111 lies between 0 and d_L, indicating that there exists the problem of positive autocorrelation. However, it is understood that *DW* test is not a sufficient test, especially since it does not accommodate more than one lack of autoregressive component. As *LM* test on panel data for autoregression in EViews 5 software package is not yet available, and the fact that autocorrelation is the main problem on time series data, the paper proceeds to test the heteroscedasticity.

Table 2: Multicollinearity Test Results for Selected Variables

Variable	R^2 between variables	R^2	Conclusion
RI towards *FI*	0.859939	0.924577	No multicollinearity
RI towards *NMI*	-0.849500	0.924577	No multicollinearity
RI towards *LI*	0.812703	0.924577	No multicollinearity
RI towards *CI*	-0.837018	0.924577	No multicollinearity
RI towards *RI*	0.639614	0.924577	No multicollinearity
RI towards *TI*	0.323923	0.924577	No multicollinearity
RI towards *MI*	0.677016	0.924577	No multicollinearity
RI towards *EEI*	-0.176390	0.924577	No multicollinearity
RI towards *FBI*	-0.923895	0.924577	No multicollinearity
RI towards *MEI*	-0.877965	0.924577	No multicollinearity
RI towards *PI*	0.356297	0.924577	No multicollinearity
RI towards *GI*	0.173833	0.924577	No multicollinearity
RI towards *TOI*	0.114787	0.924577	No multicollinearity
RI towards *TEI*	-0.895950	0.924577	No multicollinearity
FI towards *NMI*	-0.671911	0.924577	No multicollinearity
FI towards *LI*	0.638841	0.924577	No multicollinearity
FI towards *CI*	-0.856560	0.924577	No multicollinearity
FI towards *RI*	0.490510	0.924577	No multicollinearity
FI towards *TI*	0.520708	0.924577	No multicollinearity
FI towards *MI*	0.508039	0.924577	No multicollinearity
FI towards *EEI*	-0.274555	0.924577	No multicollinearity
FI towards *FBI*	-0.869798	0.924577	No multicollinearity
FI towards *MEI*	-0.915782	0.924577	No multicollinearity

Notes: *RI* = Recycled Industries, *FI* = Furniture Industries, *NMI* = Non metal, Mining Industries, *LI* = Leather Industries, *CI* = Chemical Industries, *RI* = Rubber Industries, *TI* = Timber Industries, *MI* = Metal Industries, *EEI* = Electrical Engineering Industries, *FBI* = Food and Beverage Industries, *MEI* = Machinery and Equipment Industries, *PI* = Publishing Industries, *GI* = Garment Industries, *ToI* = Tobacco Industries, *TEI* = Textile Industries.
Source: Data estimation.

Heteroscedasticity Test

Heteroscedasticity exists when the variance of the disturbance is not constant. In the presence of heteroscedasticity, the model is still unbiased, but it is no longer efficient. It means the variance and standard error of the estimated coefficient is no longer the smallest. This might lead us to reject the null hypothesis, even though that we should not do it in the absence of heteroscedasticity. This paper uses White LM test and find no evidence of heteroscedasticity exists in the model.

Common Effect Regression

The estimation results are as follows.

$$\hat{Y} = 1.367 - 0.42 \log X_1 - 0.7 \log X_2$$

t (1.65) (-3.49) (-11.63)

p (0.10) (0.00) (0.00)

$$+ 0.09 \log X_3 + 0.88 \log X_4 \qquad (5)$$

t (1.59) (13.49)

p (0.11) (0.00)

$R^2 = 0.92$ $F = 214.5248$

$DW = 1.277111$ $\Pr(F) = 0.000$

It can be inferred that all variables are signifincantly influence Y, represented by the low probability (less than 0,05), except X_3 (representing non wage spending). The probability of F statistic is 0,000 (less than 0,05), suggesting that overall, the independent variables significantly influence the Y.

Fixed Effect Regression

$$\hat{Y} = -0.30 - 0.59 X_1 - 0.48 X_2$$

t (-0.16) (-3.40) (-3.84)

p (0.88) (0.00) (0.00)

$$+ 0.10 X_3 + 0.92 X_4$$

t (1.31) (6.30)

p (0.20) (0.00)

$R^2 = 0.94$

$DW = 1.277111$

$F = 50.55$

$\Pr ob(F) = 0.000$

It can be inferred that all variables are signifincantly influence Y, represented by the low probability (less than 0,05), except X_3 (representing non wage spending). The probability of F statistic is 0,000 (less than 0,05), suggesting that overall, the independent variables significantly influence the Y.

Random Effect Regression

$$\hat{Y} = 1.37 - 0.42 X_1 - 0.70 X_2$$

t (1.69) (-3.56) (-11.87)

p (0.10) (0.00) (0.00)

$$+ 0.09 X_3 + 0.88 X_4$$

t (1.63) (13.77)

                         (7)

p (0.10) (0.00)

$R^2 = 0.93$

$DW = 1.28$

$F = 214.52$

$\Pr(F) = 0.000$

It can be inferred that all variables are signifincantly influence Y, represented by the low probability (less than 0,05), except X_3 (representing non wage spending). The probability of F statistic is 0,000 (less than 0,05), suggesting that overall, the independent variables significantly influence the Y.

Significance Test of Group Effect

To compare the models of fixed effect and common effect, we test the null that common effect is better than fixed effect. The F_{test} is calculated as follows:

$$F(n-1, nT-nK) \frac{(R_u^2 - R_p^2)/(n-1)}{(1-R_u^2)/(nT-n-K)} \quad (8)$$

where: R_u^2 is R^2 from fixed effect model, R_p^2 is R^2 from common effect model, n is cross section observations, T is time series observations, K is number of variables.

Caclulating the F_{test} using the formula based on the data, we have:

$$F(14, 55) = \frac{(0.942018 - 0.924577)/14}{(1 - 0.942018)/(15x5 - 15 - 5)}$$
$$= 1,181715261. \quad (9)$$

Comparing $F_{statistics}$ of 1,181715261 ($\alpha = 5$ %) to F_{table} of 2.24 ($df= 14,55$; $\alpha = 5$ %) we do not reject H_0. It can be inferred that common effect model is better than fixed effect model.

Interpretation of Estimation Results

The first variable, X_1, explains that wage level negatively significantly influences labor absorbtion in manufacturing industries in Special Territory of Yogyakarta with the regression coefficient of -0.417898. This menas that when wage level increases by 1%, labor absorbtion reduces by 41.78%. The increase in wage level increase the cost of production. Industries might uses more capital to replace labor. This, in turn, will reduce the labor absobtion.

The second variable, X_2, represent labor productivity. The coefficient of this variable is -0.703733, indicating negative impact of the variable on the labor absorbtion. It has been showed that the impact is significant. The coefficient means that 1% increase in labor productivity increases labor absorbtion of 71.43%. This might be explained by the fact that a few productive labor will be enough to replace more less productive ones.

The third variable explain the inluence of non wage spending on the labor absorbtion. As has been discussed earlier in this paper, the t test for this variable suggests that we do not reject the null. This menas that non wage spending does not significantly influence labor absorbtion in this region. This might be caused by the fact that non wage spending such as incentive, transport expenses, food expenses, and pension funds are not big enough in influencing cost of production, compare to the spending on wage.

The fourth variable represent output produced by the industry. The coefficient of 0,884742 shows that when output increases by 1%, the labor absorbtion increases by 88%. When output increases, the industry need more input of production, including labors, to increase the capacity of the industry production.

Based on the R^2 value, the 92.45 variation in dependent variable is explained by the variation in explanatory variables. In addition, overall, based on the F test, all independent variables explain the behaviour of dependent variable.

CONCLUSION

Based on the estimation of common effect regression, it could be inferred that wage, labor productivity, and output significantly influence labor absorbtion in the industry. The impacts were negative, negative, and positive, respectively. The negative impact of wage eas easy to understand. As the wage increases, the industry would higher more capital than labor. The negative impact of labor productivity might be explained as follows. As the labor became more productive, a few labors would be sufficient to finsih the job than more labors. The impact of output on the labor absorbtion was positive, as more output produced, more labor are needed to conduct the production process.

The paper also found that non wage spending does not significantly influence labor absorbtion. This means that this component was better seen as of non significant magnitude, compared to that of expenses on wages.

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