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QUANTITATIVE AND QUALITATIVE DIAGNOSTIC METHODS FOR MEASURING THE EFFECTS OF FOREIGN DIRECT INVESTMENT IN TERMS OF THE WOOD-PROCESSING INDUSTRY IN THE SLOVAK REPUBLIC

The paper deals with the issue of increasing the potential of the wood-processing sector and increasing its efficiency and competitiveness through the impact of foreign direct investment within the specific conditions of the wood-processing industry in the Slovak Republic. The aim of this paper is the analysis and evaluation of the quantitative and qualitative effects of foreign direct investment in the Slovak Republic and other V4 countries with a specific focus on the wood-processing industry in the Slovak Republic.

Keywords: business performance, investment, foreign direct investment (FDI), effects of FDI, wood-processing industry (WPI)

Introduction

Investment is a means of increasing the efficiency and competitiveness of each economy. In the process of transformation and in the absence of domestic capital, it is necessary to focus on foreign investment, which may become the basis for creating new jobs, modernizing production equipment, transferring new technologies, know-how and healthy competition [Vidová 2002]. The inflow of foreign capital plays a role in improving the quality of products and services provided, growth of value added or competitiveness [Hošková 2001]. In the last decade the Slovak Republic has been included in the group of countries that are attractive to foreign investors. This is reflected in various sectors, most significantly in the

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automotive industry, the Slovak Republic becoming the largest producer of cars per capita in the world. Up until now, the Slovak Republic has had a number of comparative advantages such as the size of the local market and the growth of that market, cheap and skilled labour, low transfer costs, and the quality of its infrastructure [Ferenčíková et al. 2010].

The flow of foreign direct investment is conditional on the existence of market imperfections that arise in connection with bad equilibrium between supply and demand in the domestic market. As demand creates supply, in the event that this demand is not sufficiently satisfied by domestic producers or providers of services, the possibility arises for an international corporation, interested in the expansion of their markets and an increase in their extensive revenues from scale, to provide investment [Táncošová, Slaný 2004]. Firms which are active worldwide come from one industry and often from one country, resulting in the knowledge that firms in some sectors have particularly good conditions in certain domestic countries, allowing them to be internationally active and gain competitive advantage [Sršňová 2002].

This common knowledge was used in an analysis of the effects of foreign direct investment (FDI) in terms of the wood-processing industry in the Slovak republic (WPI SR), with the purpose of confirming its general relevance within the specific conditions of the wood-processing industry (WPI).

Research methodology

The objective of the research was based on an analysis of the past and present state of the area of foreign direct investment in the Slovak Republic, with specific focus on the wood-processing industry, in order to identify significant quantitative and qualitative effects of the impact of foreign direct investment on the development of the wood-processing sector in terms of the Slovak Republic.

Scientific research hypotheses

For the purposes of the research, the following hypotheses were identified and tested:

- foreign direct investment has a positive impact on the GDP growth in the Slovak Republic,
- foreign direct investment in the wood-processing industry of the Slovak Republic influences the growth in performance and competitiveness of this sector,
- investment in the wood-processing industry of the Slovak Republic has a positive impact on selected economic indicators in the aforementioned sector,
- foreign direct investment in the wood-processing industry of the Slovak Republic also includes significant qualitative effects.

Quantitative methods used in the research

Correlation analysis is the primary research, describing the dependence between two quantitative variables. This analysis does not imply a cause and effect relationship between the two variables. Linear regression allows the examination of the cause and effect relationships between the two variables x and y. Correlation and regression analysis was aimed at detecting the dependence between the two variables, the accent placed on FDI in the Slovak Republic, the GDP growth of the Slovak Republic, investment and other selected variables in the wood-processing industry of the Slovak Republic. These are indicators that characterize the economic situation in the sector, focusing on indicators that positively affect the economic development of the WPI. All the correlations were examined over a ten year period (1999–2008).

Indirect methods used in the research

Based on an analysis of FDI stock and inflows as well as other economic indicators, a method of the evaluation the effects of FDI in certain phases is used, which phase the Slovak Republic passed or in which phase is integrated and uses the resulting effects. Quantification of the effects is performed according to the potential effects of FDI in phases as described in literature [Dunning 1981]. The result of evaluation is to define and compare the effects at different stages, their impact on the development of the Slovak Republic or the WPI under specific conditions. Based on data analysis, method of the evaluation of spillovers as the indirect effects of FDI is also used. Quantification of the effects is performed according to the potential effects of FDI, as described in literature [Fifeková 2008]. Technological spillovers represent the effects of the impact of multinational corporations on domestic firms in the whole sector and gradually the whole economy of the host country, so these effects are therefore considered to be one of the most important impacts of FDI. Spillovers are essentially economic external effects from FDI, meaning that they exceed the direct benefits adequately expressed in market prices, they are not entirely reflected in market transactions and therefore they do not represent costs for those who benefit from them [Dutrénit, Martínez 2004].

Results and discussion

Empirical analysis of the evolution of FDI in the Slovak Republic and other V4 countries

Empirical data for foreign direct investment from a global perspective published by UNCTAD[1] broken down into economic groups, show a worldwide growth

[1] UNCTAD – United Nations Conference for Trade and Development, part of the United Nations Organisation, founded in 1964, supports the integration of developing countries into the global economy

of FDI flows, with two peaks in the years 2000 and 2007. The presented data show a declining share of FDI in developed countries (in 1980 86%, in 2008 only 57%), with an increasing share of FDI in developing and transition countries, from 14% in 1980 to 43% in 2008 (fig. 1).

FDI inflows per capita into the EU show a similar trend to the global FDI flows, recording two peaks – in 2000 and 2007, followed by a sharp decline. The average FDI inflow is worth USD 720 per capita of the countries in the European Union during the reporting period 1993–2008 (fig. 2).

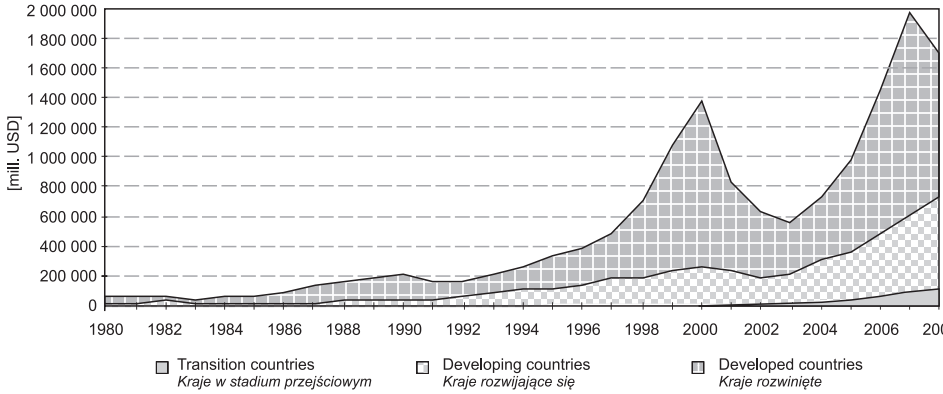

Fig. 1. Foreign direct investment flows in economic groups (mill. USD)
Rys. 1. Przepływy bezpośrednie inwestycji zagranicznych w grupach gospodarczych (mln USD)

Source: UNCTAD data
Źródło:dane UNCTAD

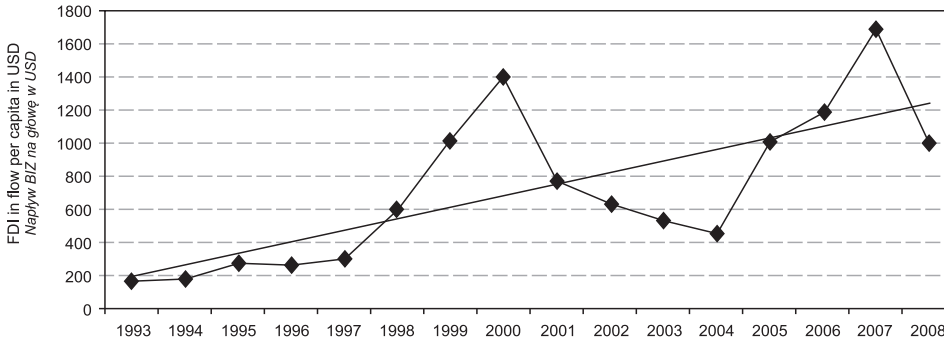

Fig. 2. Foreign direct investment inflow in the EU per capita (USD)
Rys. 2. Napływ bezpośrednich inwestycji zagranicznych do UE, na głowę (USD)

Source: UNCTAD data
Źródło: dane UNCTAD

In fig. 3 and 4 the development of FDI in the V4 countries is shown. The analysis shows several important facts. In total, FDI inflows dominate Poland, in contrast the Slovak Republic has the lowest amount of FDI in the long-term.

However, in assessing the volume of FDI per capita, it is in a better position ranking the highest in 2003, 2004 and 2006, and this indicator shows an upward trend. Contrary to this, the indicator per capita for Poland is ranked the lowest. Over the years 1993–2008 the Czech Republic leads (with an average of USD 496 per capita per year), while in the reporting period, the Slovak Republic has an average of USD 365 per capita per year.

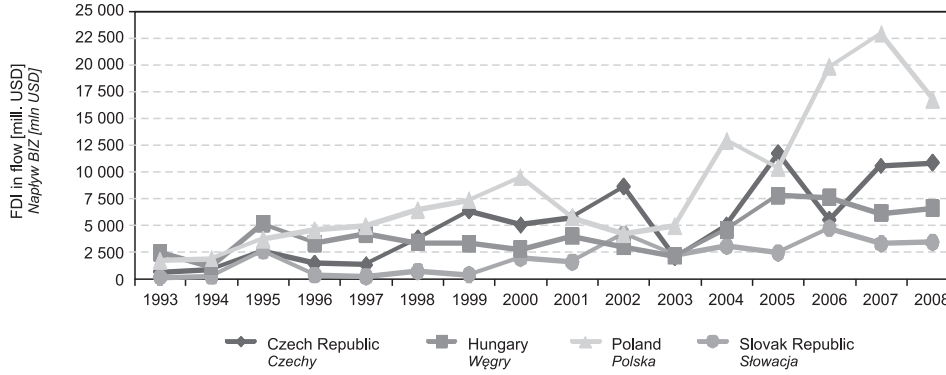

Fig. 3. Foreign direct investment inflow in the V4 countries (mill. USD)
Rys. 3. Napływ bezpośrednich inwestycji zagranicznych do krajów V4 (mln USD)

Source: UNCTAD data
Źródło: dane UNCTAD

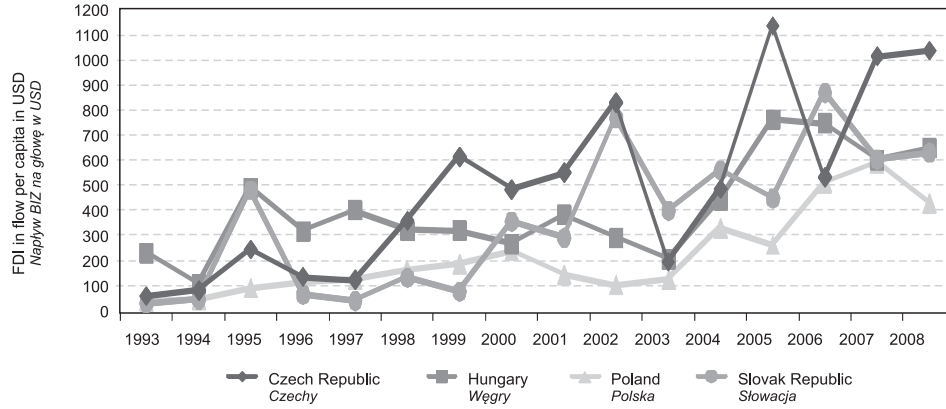

Fig. 4. Foreign direct investment inflow per capita in the V4 countries (USD)
Rys. 4. Napływ bezpośrednich inwestycji zagranicznych na głowę do krajów V4 (USD)

Source: UNCTAD data
Źródło: dane UNCTAD

Comparative analysis of investment development in all industries in the SR and in the wood-processing industry in the SR

Table 1. Investment in the wood-processing industry and industrial production in the Slovak Republic (mill. SKK[2])
Tabela 1. Inwestycje w sektorze drzewnym i produkcja przemysłowa na RS (mln SKK)

Indicator *Wskaźnik*	Detailed list *Wyszczególnienie*	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Investment (millions SKK) *Inwestycje (mln SKK)*	Wood Industry *Przemysł drzewny*	506	881	766	734	1788	1710	2564	2573	6068	2249
	Furniture Industry *Przemysł meblarski*	580	1572	1645	701	794	1687	2024	2787	4512	1644
	Pulp and Paper Industry *Przemysł celulozowo-papierniczy*	4785	1594	2205	3083	6634	5161	4744	3185	2796	3300
	Wood-Processing Industry *Sektor drzewny*	5871	4048	4616	4519	9216	8558	9331	8545	13375	7194
	Industrial production *Produkcja przemysłowa*	44489	42328	71077	56466	59152	71897	104046	105101	102993	98627

Source: data from Ministry of Economy of the SR and Statistical Office of the SR
Źródło: dane Ministerstwa Gospodarki RS oraz Urzędu Statystycznego

Table 1 shows the total investment for the whole industry of the SR, the wood industry as a whole, and its individual sectors: the wood-processing industry (WI), the furniture industry (FI), the pulp and paper industry (PPI).

In fig. 5 and 6 the development of parameters is presented for labour productivity and the value added rate comparing the WPI, its separate sectors and the whole industry in terms of the Slovak Republic. It is possible to positively evaluate the development of labour productivity from turnover, the most significant being in the pulp and paper industry, where long-term growth is recorded above the average of industrial production. Positive development was also seen

[2] 1 EURO = 30,126 SKK – fixed conversion rate intended by the National Bank of Slovakia (NBS) in change-over of the Slovak Republic to the common European currency in force from 1st January 2009
1 EURO = 30,126 SKK - ustalony kurs wymiany wyznaczony przez Narodowy Bank Słowacji (NBS) przy włączeniu Republiki Słowackiej do wspólnej, europejskiej waluty od 1 stycznia 2009 roku

in the furniture industry in the years 1999–2005, where the productivity growth to the level of productivity in the whole industrial production was due to growing volume of investment. Labor productivity of added value in the PPI appears more positive, especially in the years 2006–2007, when high inflows of foreign direct investment into the mentioned sector (table 2) were recorded. The rate of value added in the whole of industrial production, as well as in the wood-processing industry, observed a slight decrease since the beginning of the studied period of 10 years. It can be judged positively that the indicator in the wood and pulp and paper sector is in the long-term higher than industrial production. In the furniture sector there is a trend for a value added rate similar to the trend of investment since 2003, while the investment growth in 2003–2006 caused a slight increase in the value added rate indicator. Higher investment in 2007 caused the growth of value added in 2008 and the furniture sector received a higher level than industrial production in that year. In 2008 the rate of value added in all 3 sectors of the WPI was above the level of industrial production. In the whole period of 10 years (apart from 2004) the value added rate in the whole of the wood-processing industry was above industrial production.

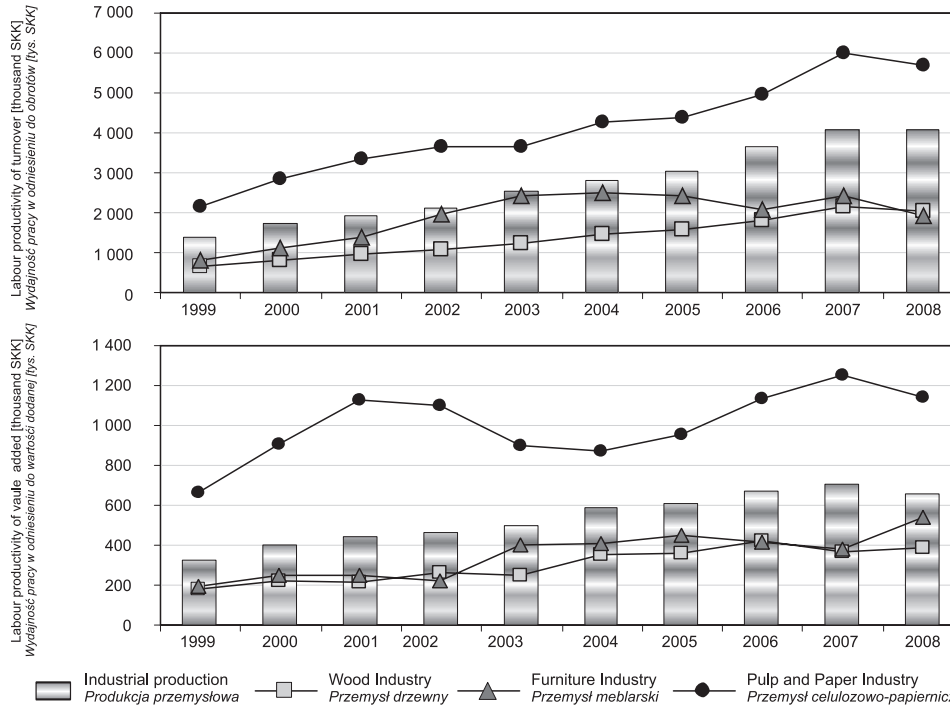

Fig. 5. Labour productivity in the WPI and industrial production (thousand SKK)
Rys. 5. Wydajność pracy w sektorze drzewnym i produkcji przemysłowej (tys. SKK)

Source: Merková 2010
Źródło: Merková 2010

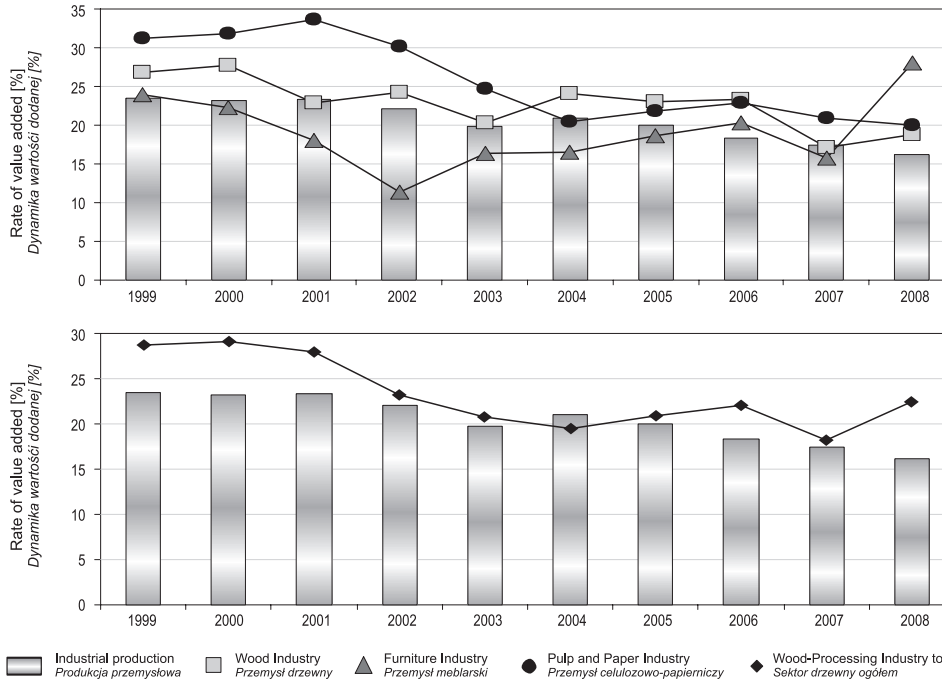

Fig. 6. Value added rate in the WPI and industrial production of the SR (%)
Rys. 6. Stopa wartości dodanej w sektorze drzewnym i produkcji przemysłowej RS (%)

Source: Merková 2010
Źródło: Merková 2010

Table 2. FDI inflow in the WPI sectors, industrial production and the SR (mill. SKK)
Tabela 2. Napływ BIZ do sektorów drzewnych, produkcji przemysłowej i RS (mln SKK)

Indicator *Wskaźnik*	Detailed list *Wyszczególnienie*	2003	2004	2005	2006	2007
Foreign direct investment inflow mill. SKK *Napływ bezpośrednich inwestycji zagranicznych mln SKK*	Wood Industry (WI) *Przemysł drzewny*	68	556	124	226	49
	Furniture Industry (FI) *Przemysł meblarski*	143	48	1 415	1	20
	Pulp and Paper Industry (PPI) *Przemysł celulozowo-papierniczy*	260	1	17	608	606
	Wood Processing Industry (WPI) *Sektor drzewny*	472	605	1 557	835	675
	Industrial production *Produckja przemysłowa*	14 269	29 603	10 901	17 179	13 658
	Slovak Republic *Republika Słowacji*	38 896	37 498	22 182	64 287	35 527

Source: data of National Bank of Slovakia
Źródło: dane Banku Narodowego Słowacji

FDI inflows into the wood-processing industry in the presented period of 5 years reached its largest volume in 2005, the sum of SKK 1.557 billion, the furniture industry absorbing 90% of this. Other years it achieves less than half this value, the second largest inflow was in 2006, which means SKK 835 million into the wood-processing industry. The pulp and paper industry dominated in 2006 and 2007 with a balanced amount of SKK 608 million and SKK 606 million of FDI inflows respectively. The smallest amount of foreign investment flowed into the sector of wood industry. The opposite trend as in the wood-processing industry is in the industrial production of the Slovak republic. The data listed in table 2 shows that FDI inflows into industrial production had in the reporting period a fluctuating direction with extremes, when in 2004 a 2-fold annual growth was recorded, but in 2005 there was an annual decrease in 2/3 of foreign direct investment inflows.

The share of foreign direct investment inflows in the WPI from the whole Slovak Republic (fig. 7) shows a similar trend in absolute values, though the largest share of 7.02% was achieved in 2005. In recent years, the proportions vary from 1.21% to 1.90% of FDI inflows into the Slovak Republic.

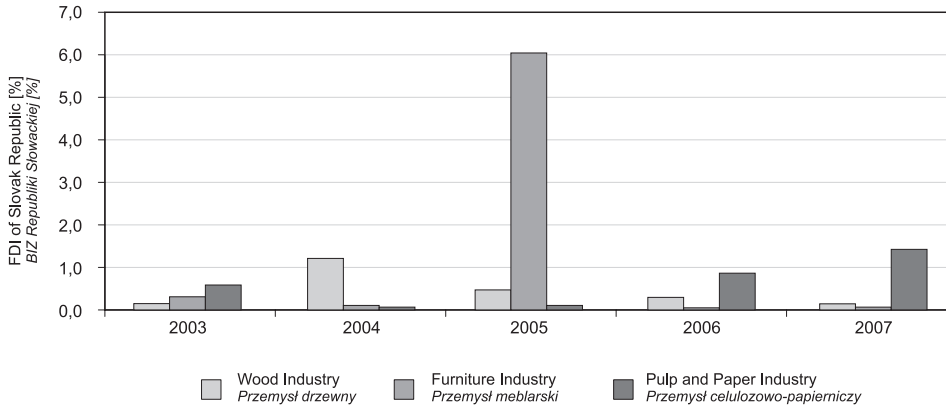

Fig. 7. Share of FDI flows in the WPI sectors from the whole of the SR (%)
Rys. 7. Udział przepływów BIZ w sektorach drzewnych z całej Republiki Słowackiej (%)

Source: data of National Bank of Slovakia
Źródło: dane Banku Narodowego Słowacji

Table 3. Share of FDI within the total investment in the WPI and industrial production (%)
Tabela 3. Udział BIZ w inwestycjach ogółem w sektorze drzewnym i produkcji przemysłowej (%)

Indicator *Wskaźnik*	Detailed list *Wyszczególnienie*	2003	2004	2005	2006	2007
Share of FDI within total investment *Udział BIZ w inwestycjach ogółem* (%)	Wood Industry (WI) *Przemysł drzewny*	3.81	32.53	4.84	8.78	0.80
	Furniture Industry (FI) *Przemysł meblarski*	18.04	2.82	69.94	0.04	0.44
	Pulp and Paper Industry (PPI) *Przemysł celulozowo-papierniczy*	3.93	0.02	0.36	19.08	21.68
	Wood Processing Industry (WPI) *Sektor drzewny*	5.12	7.07	16.68	9.77	5.05
	Industrial production *Produckja przemysłowa*	24.12	41.17	10.48	16.34	13.26

Source: Merková 2010
Źródło: Merková 2010

The share of FDI within the total investment in the WPI in 5 years (2003––2007) stood at a level between 5.05% and 16.68%, while industrial production was in the range of 10.48% to 41.17%. This means that investment in the industrial production of the Slovak Republic is to a much greater extent financed by foreign investment than in the WPI. The wood processing sector in relation to the whole of industrial production is underestimated in terms of FDI inflows.

Quantitative analysis - quantification the results of correlation and regression analysis

The results of the correlation and regression analysis in the period 1999–2008 are aimed at presenting the dependency relationships as follow:

- the results show a positive correlation (correlation coefficient in the range from 0 to 1), ie. the growth of one variable causes another variable growth,
- the results show a large dependence between two variables (the correlation coefficient reaches a value of 0.5),
- it is possible to reject the null hypothesis, whereas the probability of error is $p < 0.05$.

Selected results of the analysis are presented in table 4 and in fig. 8–10. The first significant dependence is between foreign direct investment stock in the SR and GDP growth of the SR with the correlation coefficient $r = 0.94$, which demonstrates that the growth of FDI causes GDP growth. Regression coefficient $b = 0.000009$ means that the growth of FDI in SKK 100 billion increases the GDP growth an average of 0.9% (fig. 8).

Table 4. Selected results of correlation and regression analysis
Tabela 4. Wybrane wyniki analizy korelacji i regresji

Variables *Zmienne*	Indicator *Wskaźnik*	Unit *Jednostka*	Mean *Średnia*	Standard deviation *Odchylenie standardowe*	Correlation *Korelacja* (r)	Determination *Determinacja* (r^2)	Probability of error *Prawdopodopodobieństwo błędu* (p)	Constant *Stała* (a)	Slope *Nachylenie* (b)
1	2	3	4	5	6	7	8	9	10
X	FDI stock in SR *Kapitał BIZ w RS*	mill. *mln* SKK	556 169	297 078					
Y	GDP growth in SR *Wzrost PKB w RS*	%	5.32	2.83	0.943	0.890	0.000	0.327	0.000
X	Investment in WPI *Inwestycje w sektorze drzewnym*	mill. *mln* SKK	7 527	2 885					
Y	GDP growth in SR *Wzrost PKB w RS*	%	5.32	2.83	0.843	0.710	0.002	-0.90	0.001
X	Sales in WPI *Sprzedaż w sektorze drzewnym*	mill. *mln* SKK	70 017	19 024					
Y	GDP growth in SR *Wzrost PKB w RS*	%	5.32	2.83	0.944	0.891	0.000	-4.503	0.000
X	Value added in WPI *Wartość dodana w sektorze drzewnym*	mill. *mln* SKK	15 715	2 587					
Y	GDP growth in SR *Wzrost PKB w RS*	%	5.32	2.83	0.780	0.608	0.008	-8.068	0.001
X	Investment in WPI *Inwestycje w sektorze drzewnym*	mill. *mln* SKK	7 527	2 885					
Y	Sales in WPI *Sprzedaż w sektorze drzewnym*	mill. *mln* SKK	70 017	19 024	0.792	0.628	0.006	30687.77	5.225
X	Investment in WPI *Inwestycje w sektorze drzewnym*	mill. *mln* SKK	7 527	2 885					
Y	Labour productivity of turnover in WPI *Wydajność pracy mierzona wielkością obrotów*	1000 SKK	2 321	607	0.770	0.593	0.009	1100.60	0.162
X	Fixed assets in WPI *Środki trwałe w prze -myśle drzewnym*	mill. *mln* SKK	60 313	18 677					
Y	Sales in WPI *Sprzedaż w sektorze drzewnym*	mill. *mln* SKK	70 017	19 024	0.914	0.836	0.000	13858.38	0.931

Table 4. Continued
Tabela 4. Ciąg dalszy

1	2	3	4	5	6	7	8	9	10
X	Fixed assets in WPI *Środki trwałe w sektorze drzewnym*	mill. *mln* SKK	60 313	18 677					
Y	Value added in WPI *Wartość dodana w sektorze drzewnym*	mill. *mln* SKK	15 716	2 587	0.893	0.797	0.001	8255.263	0.124
X	Fixed assets in WPI *Środki trwałe w sektorze drzewnym*	mill. *mln* SKK	60 313	18 677					
Y	Labour productivity of turnover in WPI *Wydajność pracy mierzona wielkością obrotów*	1000 SKK	2 321	607	0.855	0.731	0.002	644.726	0.028
X	Fixed assets in WPI *Środki trwałe w sektorze drzewnym*	mill. *mln* SKK	60 313	18 677					
Y	Labour productivity of value added in WPI *Wydajność pracy mierzona wielkością obrotów*	1000 SKK	520	80	0.827	0.684	0.003	306.967	0.004
X	Labour productivity of turnover in WPI *Wydajność pracy mierzona wielkością obrotów*	1000 SKK	2 321	607					
Y	Average earnings per month in WPI *Średnie zarobki miesięczne w sektorze drzewnym*	SKK	15 466	3 505	0.953	0.908	0.000	2698.92	5.501
X	Labour productivity of value added in WPI *Wydajność pracy mierzona wielkością obrotów*	1000 SKK	520	80					
Y	Average earnings per month in WPI *Średnie zarobki miesięczne w sektorze drzewnym*	SKK	15 466	3 505	0.894	0.800	0.000	-4941.67	39.217

Source: Merková 2010
Źródło: Merková 2010

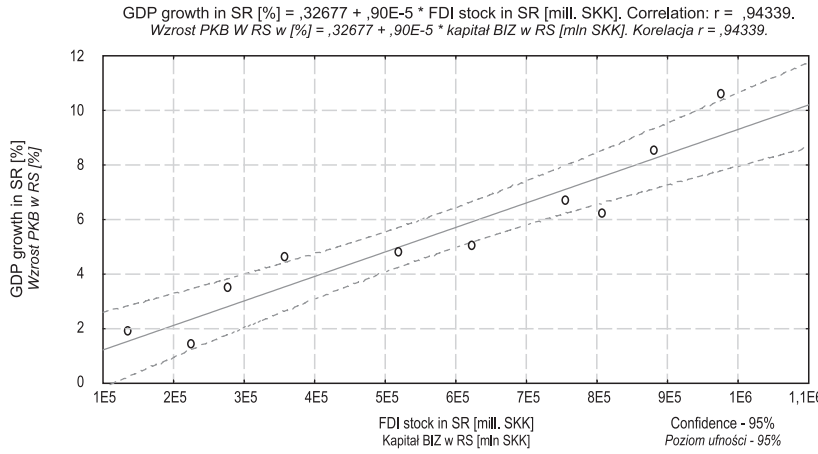

Fig. 8. Correlation: FDI stock in SR ~ GDP growth in SR (period 1999–2008)
Rys. 8. Korelacja: kapitał BIZ w RS ~ wzrost PKB w RS (okres 1999–2008)

Source: Merková 2010
Źródło: Merková 2010

Subsequent correlation and regression analysis examined the correlation between variables in the wood-processing industry of the SR, with emphasis directed on the positive impact of investment and the value of fixed assets. The dependence of investment and sales in the WPI showed a correlation coefficient of r = 0.79. The regression coefficient b = 5.22 means that growth in investment of SKK 1 billion caused sales growth in the value of SKK 5.22 billion.

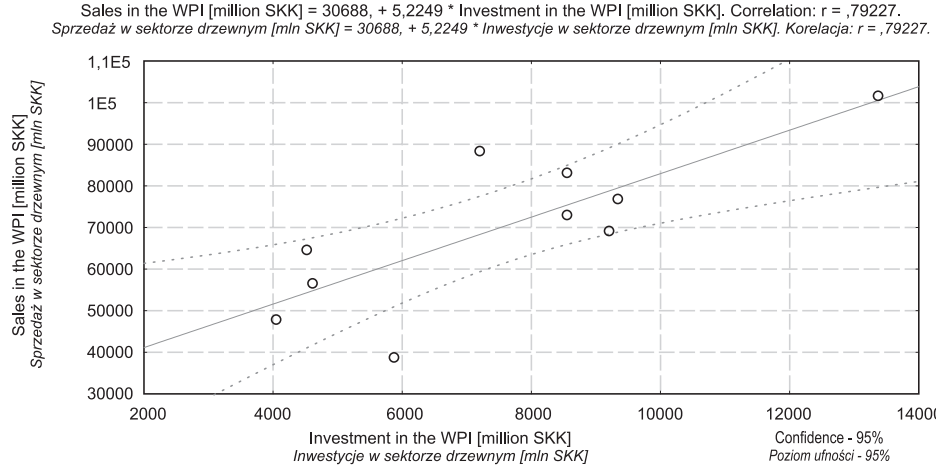

Fig. 9. Correlation in the WPI: Investment ~ Sales (period 1999–2008)
Rys. 9. Korelacja w sektorze drzewnym: Inwestycje ~ Sprzedaż (okres 1999–2008)

Source: Merková 2010
Źródło: Merková 2010

The dependence of investment and labor productivity in WPI has a similar correlation coefficient r = 0.77, the regression coefficient b = 0.162 shows growth in investment of SKK 1 billion causing a labor productivity growth of SKK 0.162 million (fig. 10).

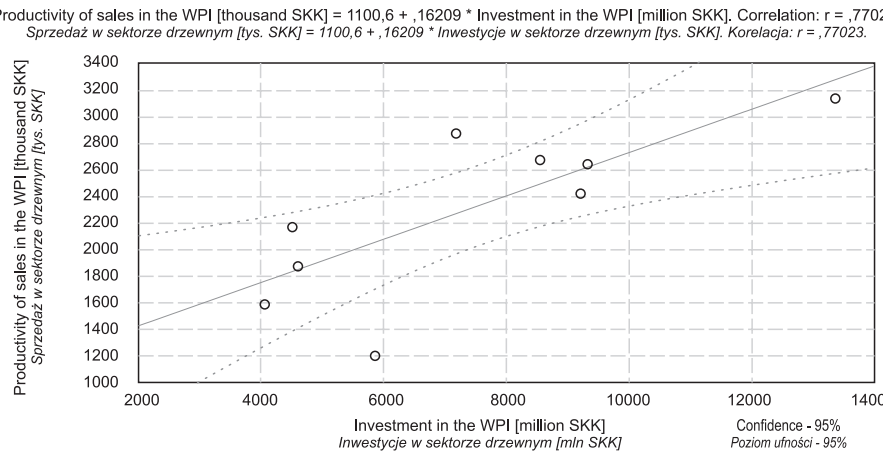

Fig. 10. Correlation in the WPI: Investment ~ Labour productivity (period 1999–2008)

Rys. 10. Korelacja w sektorze drzewnym: Inwestycje ~ Wydajność pracy (okres 1999–2008)

Source: Merková 2010

Źródło: Merková 2010

Further research results presented in table 4 also confirmed a high correlation between the studied variables. eg. the dependence of fixed assets on sales in the WPI is similarly high, with the correlation coefficient r = 0.91. Growth in fixed assets and value added in the WPI gives the dependence with the correlation coefficient r = 0.89 and regression coefficient of b = 0.123 meaning that the increase in fixed assets of SKK 1 million causes a growth of value added of SKK 0.123 million. The dependence of fixed assets and labor productivity on sales in the WPI is shown by the correlation coefficient r = 0.85, which is also a significant effect. Dependence of fixed assets and labor productivity on the value added in the WPI has a correlation coefficient r = 0.83.

The impact of labour productivity on the growth of average earnings demonstrates the highest correlation coefficient of all the tested relationships in the analysis of the wood-processing industry. The correlation coefficient in the relationship between the labor productivity from sales and the average earnings in the wood-processing industry has a value of r = 0.95; the regression coefficient b = 5.50 shows that a sales productivity growth of SKK 0.1 million causes a growth of the average monthly wage of SKK 550.13. It is important to mention that the analysis has also demonstrated an underlying dependence - the growth of labor productivity is due to the growth of fixed assets. This means that increasing the

volume of fixed assets has a positive impact on labor productivity growth; subsequently labor productivity growth has a positive effect on the growth of average wages in the wood-processing industry. The relationship between labor productivity of value added and the average earnings in the wood-processing industry has the correlation coefficient r = 0.89; the regression coefficient b = 39.217 indicates that the value added productivity growth of SKK 0.01 million causes a growth in the average monthly wage of SKK 392.17.

Based on the quantitative research realized by means of correlation and regression analysis, the following facts can be stated:

- foreign direct investment has a positive impact on the GDP growth of the Slovak Republic,
- investment and the residual value of fixed assets in the wood-processing industry positively affects sales, value added and labour productivity in the sector of wood processing,
- labor productivity has a positive impact on the value of the average monthly wages in the wood-processing industry.

Qualitative analysis of the development of FDI and its impact in terms of the WPI

Direct and indirect effects of FDI in individual phases

1st phase PAST *Faza 1* *PRZESZŁOŚĆ*	1) FDI targeted quantitative: *ilościowe ukierunkowanie BIZ:* – high share of simple, less skilled work and low value added (up to 20%) *duży odsetek słabo wykwalifikowanych pracowników i mała wartość dodana (do 20%),* – sectors with large import, materials and energy, with pollution of environment (automotive industry), *sektory o charakteryzujące się znacznym importem, zużyciem materiałów i energii oraz zanieczyszczaniem środowiska (przemysł samochodowy),* 2) Positives: *Pozytywny wpływ:* – job creation, *tworzenie miejsc pracy* – increase the competitiveness of export-oriented industries *wzrost konkurencyjności przemysłów ukierunkowanych na eksport*
	1) WPI *Sektor drzewny:* – industry could react to the increasing quality of export-oriented products, *przemysł mógł zareagować na poprawiającą się jakość produktów eksportowych,* – industry was not dependent on the import of wood raw, which is enough in SR *przemysł nie był uzależniony od importu surowca drzewnego, którego wystarczające zasoby znajdują się w RS*

2nd phase PRESENT *Faza 2* *TERAŹNIEJ-SZOŚĆ*	1) FDI targeted quantitative as well as qualitative *ilościowe i jakościowe ukierunkowanie BIZ;* 2) Positives: *Pozytywny wpływ:* – capital into sectors that cause growth and higher value added processes *napływ kapitału do sektorów, które przyczyniają się do rozwoju i procesów o większej wartości dodanej*
	1) WPI: *Sektor drzewny:* – offered possibilities does not use, *ma możliwości, których nie wykorzystuje,* – exports the raw wood with a low level of value added, *eksportuje surowiec drzewny o niskiej wartości dodanej,* – due to outdated production capacities and technology does not profit from higher added value products, decreases employment *z powodu przestarzałych możliwości produkcyjnych i technologii nie czerpie zysku z produktów o większej wartości dodanej, zmniejsza zatrudnienie*
3rd phase FUTURE *Faza 3* *PRZYSZŁOŚĆ*	– Lost the comparative advantage of cheap labor *Stracona przewaga konkurencyjna wynikająca z taniej siły roboczej* – Investors motivated with another benefits such as technological development of the country *Inwestorów motywują inne korzyści takie, jak technologiczny rozwój kraju*

Fig. 11. Effects of FDI in individual phases with focus on WPI SR
Rys. 11. Efekty BIZ w poszczególnych fazach z naciskiem na sektor drzewny w RS

Source: Drábek, Merková 2010
Źródło: Drábek, Merková 2010

Based on the indirect methods used in the research (method of evaluation of the effects of FDI in separate phases, the method of evaluation of the spillovers as indirect FDI effects), it can be stated that FDI in the Slovak Republic recently passed through the first stage. In the first phase of FDI inflows, investors were mostly motivated by the cheap labor and high unemployment (fig. 11). FDI in this phase helps to stabilize the economy by providing work (not capital), which is missing in the country, and most of the production is intended for re-export. This investment does not lead to restructuralisation of the economy, nor to a significant technology transfer. FDI in the first phase focused on quantitative results, positively influencing job creation and employment growth. A significant proportion of foreign investment according to the analysis in the initial period was directed towards quick returns and less risky sectors characterized by a high share of simple, less skilled work and low value added. The positive effect of FDI inflows in the first phase is the impact on the growth of competitiveness of export-oriented industries through an increase in the volume and quality of their production.

The current FDI inflow in the Slovak Republic can be included in the second phase of impact and the following effects can be expected: FDI inflow

in the second phase is more qualitative, it affects the inflow of capital into industries that produce growth and higher value added processes. In terms of the WPI, in the second stage there is potential for application in this sector, but it is not taken advantage of. The WPI currently exports raw wood with a low level of recovery and, due to outdated and inadequate production capacity, this industry does not profit from the production and sales of value-added production. The comparative advantage of cheap labor is characteristic for both analyzed phases of FDI effects. The Slovak Republic will gradually lose this advantage over other countries such as Bulgaria and Romania, and could benefit from other advantages, in relation to a bridge to the third phase of FDI activity. It can be assumed that in the near future, the Slovak Republic will move into the third stage, where it will slowly lose the advantage of cheap labor, but FDI could continue to new benefits such as the technological development of the country.

Analysis of the qualitative effects of FDI in the SR in the form of spillovers

Based on the results of empirical studies, there is the generally-held opinion that technology from multinational corporations will be transferred to domestic enterprises and increase their productivity in the form of technological spillovers effects [Fifeková 2008]. According to literature [Blomström, Kokko 1998], when there is a realization of spillovers, domestic firms improve their efficiency by copying the technology (product design, production processes, management techniques such as supply management, production management, marketing and sales skills, research and development) of foreign companies operating in the local market. To gain competitive advantage in the market it is necessary to also consider such aspects as human resources development, knowledge transfer, and the enhancement of customer loyalty [Ratajczak, Pikul-Biniek 2009]. The presented methodology and its use in the research identifies all the theoretical effects in the form of spillovers, whereby it is possible to define which spillovers are dominant for the WPI in the SR at the present time (fig. 12).

Based on the results of qualitative research, it can be concluded that the Slovak Republic still does not take advantage of the potential of these indirect qualitative FDI effects. Our opinion is that this situation is probably conditioned by the adversely evolving factors, which according to literature [Fifeková 2008] determine the start, existence and positive effect of spillovers - the level of foreign presence, the technological gap, absorption capacity, the territorial structure of FDI, the sectoral structure of FDI as well as the entry modes of investors.

Vertical spillovers in the WPI (POSITIVE for foreign investor) *Wertykalne rozszerzone działanie w sektorze drzewnym (POZYTYWNE dla inwestorów zagranicznych)*	
Application: *Zastosowanie:*	Feedback link – productivity growth of domestic suppliers: *Powiązanie typu sprężenie zwrotne – wzrost wydajności dostawców krajowych:* – Increased demand (larger volume of production of foreign investors cause higher input supply of raw materials from domestic suppliers), *Zwiększony popyt (większa produkcja wytwórców zagranicznych skutkuje większą podażą surowca ze strony dostawców krajowych),* – Transfer of knowledge from foreign investors to domestic supplier of raw material, claims for product quality, delivery dates, cost reduction from scale *Transfer wiedzy od inwestorów zagranicznych do krajowych dostawców surowca, żądania dotyczące jakości produktów, terminów dostawy, redukcji kosztów wynikających ze skali produkcji*
Without application: *Bez zastosowania:*	Direct link – no foreign investor in the position of the products supplier for domestic customers *Powiązanie bezpośrednie – żaden inwestor zagraniczny nie jest dostawcą produktów dla konsumentów krajowych*
Horizontal spillovers in the WPI (NEGATIVE for foreign investor) *Horyzontalne rozszerzone działanie w sektorze drzewnym (NEGATYWNE dla inwestorów zagranicznych)*	
Application: *Zastosowanie:*	Human Resources – fluctuation of trained and skilled workers from foreign firms to domestic enterprises *Zasoby ludzkie – fluktuacja wyszkolonych i wykwalifikowanych pracowników z firm zagranicznych to przedsiębiorstw krajowych*
Without application: *Bez zastosowania:*	Domestic competition – domestic firms have no chance to compete with foreign companies without the financial resources and new technology *Konkurencja krajowa – przedsiębiorstwa krajowe nie mają szans konkurować z firmami zagranicznymi nie posiadając zasobów finansowych i nowej technologii*

Fig. 12. Effects of FDI as spillovers with focus on WPI SR
Rys. 12. Efekty BIZ jako ich rozszerzony wpływ z naciskiem na przemysł drzewny w RS

Source: Drábek, Merková 2010
Źródło: Drábek, Merková 2010

Empirical analysis is mostly aimed at exploring the spillovers that increase the productivity of industries or sectors, but the quantitative spillover extent, their determinants and their importance is not defined. The authors of most of these studies conclude that spillovers causing productivity growth are significant at industry level, but they cannot explain how they occur. Spillovers are very difficult to measure because the flow of knowledge is not visible and measurable in exact terms [Krugman 1991]. For example, it is not possible to determine whether a domestic firm improved productivity, because it was forced to competitive pressure, or because there were imitations [Blomström, Kokko 1998]. Thus, various studies focus on the fact that spillovers exist but we do not know how to measure and prove it statistically and quantitatively. The positive effects of spillovers may be caused by the fact that multinational corporations tend to put their foreign capital

into sectors with high productivity, and thus the increase in productivity is not the result of spillovers, but due to the natural evolution of the sector. Multinational corporations naturally try to defend the expansion of horizontal (intra-sectoral) spillovers – the release of information that would improve the performance of domestic competitors, but on the other hand, they try to exploit the expansion of vertical (inter-sectoral) spillovers – transfer of knowledge to their domestic suppliers. Therefore it can be concluded that spillovers exist to a larger extent on the vertical rather than on the horizontal level.

Analysis of the effects from FDI in the WPI in the SR and their impact into the structure of value added

Based on the results of quantitative research, confirmed by statistical correlation and regression analysis, we can conclude that investment in the sector has a positive impact on the growth of the value added of the entire sector.

From the perspective of increasing the efficiency and competitiveness of the wood-processing branch, as well as the whole of the Slovak economy, it is also important to analyze the growth of value added in terms of its individual components (depreciation of fixed assets, wages, and profit). Time series data of separate components of value added in the WPI for a period of 6 years are shown in fig. 13.

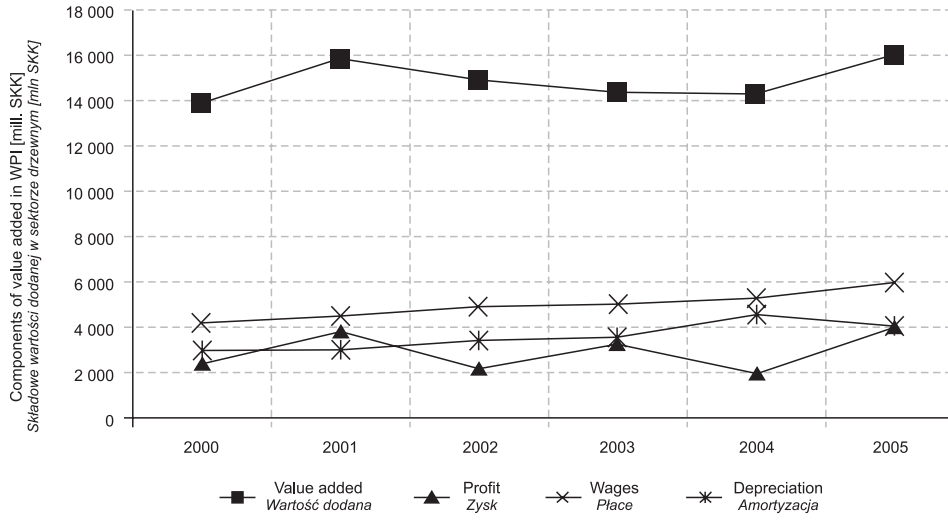

Fig. 13. Value added and individual components (mill. SKK)
Rys. 13. Wartość dodana i poszczególne składowe (mln SKK)

Table 5 shows selected results that were achieved in this part of the research. Statistical data on investment and individual components of value added (profit, wages) were studied for a period of 10 years (1999–2008), while data on the amount of depreciation are only available for a period of 6 years (2000–2005).

Table 5. Effect of investment in the WPI on the structure of value added – selected results of correlation and regression analysis of indicators in the WPI
Tabela 5. Wpływ inwestycji w sektorze drzewnym na strukturę wartości dodanej – wybrane wyniki analizy korelacji i regresji wskaźników w przemyśle drzewnym

Variables *Zmienne*	Indicator in the WPI mill. SKK *Wskaźnik w sektorze drzewnym mln SKK*	Mean *Średnia*	Standard deviation *Odchylenie standardowe*	Correlation *Korelacja* (r)	Determination *Determinacja* (r^2)	Probability of error *Prawdopodobieństwo błędu* (p)	Number *Numer* (N)	Constant *Stała* (a)	Slope *Nachylenie* (b)
X	Wages *Płace*	5611.705	1365.363						
Y	Value added *Wartość dodana*	15715.58	2587.239	0.912	0.832	0.000	10	6013.59	1.729
X	Profit (pre-tax) *Zysk (przed podatkiem)*	2983.692	863.416						
Y	Value added *Wartość dodana*	14896.87	891.286	0.771	0.595	0.073	6	12521.73	0.796
X	Depreciation *Amortyzacja*	3663.032	624.061						
Y	Value added *Wartość dodana*	14896.87	891.286	0.004	0.000	0.994	6	14876.60	0.006
X	Investment *Inwestycje*	6714.633	2562.921						
Y	Consumption *Zużycie*	42434.44	8636.359	0.920	0.847	0.009	6	21612.93	3.101

The obtained results (table 5) shows that the amount of value added in terms of the separate components is the most dependent on the amount of wages, demonstrating the highest correlation coefficient r = 0.91. The results of the correlation of wages and value added are relevant, and statistical reliability or probability of error is p = 0.0002. Less correlation is seen between profit and value added, where the correlation coefficient r = 0.77. Almost no dependence (r = 0.003) is seen between depreciation and value added, but the probability of error in this statement is p = 0.99, therefore we can neither confirm nor reject the veracity of this correlation.

The last significant correlation in table 5 is between investment and consumption: the dependence of the variables demonstrates the correlation coefficient r = 0.92 and the high statistical reliability of this argument (p = 0.009). Strong dependence (with determinant $r^2 = 0.84$) can be interpreted by the fact that firms which invested and increased their sales, also increased their production consumption in direct proportion. However, this means that the growth of consumption ideally should be lower because of the qualitative effects of FDI, contributing to a reduction in material or the energy intensity of production.

As mentioned above, based on quantitative research by means of correlation and regression analysis, the following facts can be stated:

- foreign direct investment has a positive impact on the GDP growth of the Slovak Republic,
- investment and the residual value of fixed assets in the wood- processing industry positively affects sales, value added and labour productivity in the sector of wood processing,
- labor productivity has a positive impact on the value of the average monthly wages in the wood-processing industry.

However, taking into account the results of the qualitative analysis realized through spillovers and the structural analysis of value added, it must be stated that FDI in the WPI of the Slovak Republic was not as effective as the results from quantitative analysis showed.

Conclusions

The measurable effects of FDI within the specific conditions of the Slovak Republic and the wood-processing industry of the SR are shown in the research results through correlation and regression analysis. The quantitative analysis of the effects of FDI has confirmed some important facts: at country level, there is a particularly high correlation between FDI stock and GDP growth in the Slovak Republic, whereas at WPI level, the significant impact of investment on growth of sales and productivity was found. Qualitative analysis of the effects that are difficult to measure, but affect the sector, showed some spillover effects characteristic for the WPI, and potential spillovers in the WPI were also defined but not yet applied. Part of the research results focused on the specified effects of FDI, which are visible in the country at some phase. The subsequent analysis of the structure of value added in the WPI and its individual components shows a strong correlation between wages and value added growth.

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ILOŚCIOWE I JAKOŚCIOWE METODY DIAGNOSTYCZNE SŁUŻĄCE MIERZENIU EFEKTÓW BEZPOŚREDNICH INWESTYCJI ZAGRANICZNYCH Z PUNKTU WIDZENIA PRZEMYSŁU DRZEWNEGO W REPUBLICE SŁOWACJI

Streszczenie

Przepływ bezpośrednich inwestycji zagranicznych jest uzależniony od istnienia niedoskonałości rynku, które pojawiają się w związku z nierównowagą podaży i popytu na rynku krajowym. Napływ kapitału zagranicznego jest ważny z punktu widzenia poprawy jakości produktów i usług, wzrostu wartości dodanej lub konkurencyjności.

Przedmiot niniejszych badań oparto na analizie przeszłej i obecnej sytuacji w zakresie inwestycji bezpośrednich w Republice Słowacji, kładąc szczególny nacisk na przemysł drzewny w celu zidentyfikowania znaczących efektów ilościowych i jakościowych wpływu bezpośrednich inwestycji zagranicznych na rozwój sektora drzewnego w Republice Słowacji.

Mierzalne efekty BIZ w specyficznych warunkach panujących w Republice Słowacji i w jej przemyśle drzewnym przedstawiono w wynikach z badań używając analizy korelacji i regresji. Ilościowa analiza efektów BIZ potwierdza pewne ważne fakty takie jak to, że na poziomie krajowym istnieje szczególnie silna korelacja pomiędzy kapitałem/zasobem BIZ a wzrostem PKB w Republice Słowacji, natomiast na poziomie przemysłu drzewnego odkryto znaczący wpływ inwestycji na wzrost sprzedaży i wydajność.

W oparciu o badania ilościowe zrealizowane przy wykorzystaniu analizy korelacji i regresji, można stwierdzić, co następuje:

- bezpośrednie inwestycje zagraniczne wywierają pozytywny wpływ na wzrost PKB w Republice Słowacji,
- inwestycje oraz wartość rezydualna środków trwałych w przemyśle drzewnym pozytywnie wpływa na sprzedaż, wartość dodaną i wydajność pracy w sektorze drzewnym,
- wydajność pracy pozytywnie wpływa na wartość średniego miesięcznego wynagrodzenia w przemyśle drzewnym.

Analiza jakościowa trudnych do zmierzenia efektów, które wpływają na sektor, wykazała pewne rozszerzone efekty charakterystyczne dla przemysłu drzewnego. Określono również potencjalne rozszerzone efekty w przemyśle drzewnym, które jednak nie znalazły jeszcze zastosowania. Część wyników badań dotyczy określonych efektów BIZ, które są zauważalne w kraju na pewnym etapie.

W oparciu o wyniki badań ilościowych, potwierdzone przez statystyczną analizę korelacji i regresji, można wnioskować, że inwestycje w sektorze drzewnym mają pozytywny wpływ na wzrost wartości dodanej całego sektora. Z punktu widzenia podnoszenia wydajności i konkurencyjności branży drzewnej, jak również całej gospodarki słowackiej, analiza wzrostu wartości dodanej pod względem jej poszczególnych elementów jest także ważna (amortyzacja środków trwałych, płace i zysk). Późniejsza analiza struktury wartości dodanej w przemyśle drzewnym i jej poszczególnych składowych ujawniła silną korelację pomiędzy płacami a wzrostem wartości dodanej.

Słowa kluczowe: wydajność, inwestycje, bezpośrednie inwestycje zagraniczne (BIZ), efekty BIZ, sektor drzewny