

Cieřlik, Andrzej; Gauger, Iryna; Michałek, Jan Jakub

Article

Determinants of productivity of Ukrainian firms

Comparative Economic Research. Central and Eastern Europe

Provided in Cooperation with:

Institute of Economics, University of Łódź

Suggested Citation: Cieřlik, Andrzej; Gauger, Iryna; Michałek, Jan Jakub (2017) : Determinants of productivity of Ukrainian firms, Comparative Economic Research. Central and Eastern Europe, ISSN 2082-6737, De Gruyter, Warsaw, Vol. 20, Iss. 1, pp. 5-19, <https://doi.org/10.1515/cer-2017-0001>

This Version is available at:

<https://hdl.handle.net/10419/184422>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



<https://creativecommons.org/licenses/by-nc-nd/3.0>



ANDRZEJ CIEŚLIK*, IRYNA GAUGER**
JAN JAKUB MICHAŁEK***

Determinants Of Productivity Of Ukrainian Firms

Abstract

This paper examines the determinants of total factor productivity (TFP) of Ukrainian firms in manufacturing and services, using micro-level data for the years 2005 and 2013. We first estimate regressions for the pooled dataset for the manufacturing and service sectors jointly, and then separately for each sector. Our empirical results show a positive link between the total factor productivity, intangible assets, capital intensity, firm size, competition in the industry, ownership status, and firm internationalization (exports and imports). In addition, we find that the determinants of productivity differ among the sectors and years of our sample.

Keywords: *productivity, firms, Ukraine*

1. Introduction

Following the collapse of the Soviet Union in 1991, Ukraine emerged as an independent country and followed its own path of economic transition from a centrally-planned to a market economy. This way was different from the path followed by Central and Eastern European (CEE) countries, which radically

* University of Warsaw, Faculty of Economic Sciences, e-mail: cieslik@wne.uw.edu.pl

** Hamburg School of Business Administration, Germany, e-mail: irynaugauer@gmail.com

*** University of Warsaw, Faculty of Economic Sciences, e-mail: michalek@wne.uw.edu.pl

liberalized their multilateral and regional trade and integrated successfully with the European Union. The Ukrainian transformation resulted in a relatively poor economic performance. The scope of economic and trade liberalization was significantly lower and structural and social reforms were less radical. The transformation eventually ended up with the market economy status that Ukraine had attained prior to joining the WTO on May 16, 2008. Nevertheless, the macroeconomic situation in Ukraine is still characterized by instability, a low level of financial development, and considerable financial risk. The prospects for growth are also not optimistic, as shown by the recent think-tank reports such as CASE and Vienna Institute of International Studies.¹ According to the World Bank, Ukraine is classified as a lower-middle-income economy with a post-communist past, related to region of Commonwealth of Independent States.

The change in the political leadership and declarations of deeper economic reforms, together with the signing of the free trade agreement with the EU, create new opportunities and prospects for economic recovery. In particular, increased integration with the EU facilitates the access of firms from Ukraine to foreign markets. The main goal of this paper is to empirically study the determinants of productivity of Ukrainian firms. Therefore, in this paper we empirically examine the nexus between total factor productivity and intangible assets, capital intensity, firm size, competition in the industry, ownership status, and firm internationalization (exports and imports) in Ukrainian firms, controlling for sectoral and regional effects.

The structure of this paper is as follows. The following section 2 summarizes the relevant literature. In section 3 we present the empirical methodology and discuss the properties of the dataset. Then we present our empirical results in section 4. In the final section we summarize and conclude.

2. Literature review

Until now there is a limited literature on Ukrainian enterprises based on firm-level data to study determinants of productivity. For example, Pivovarsky (2003) analyzed the impact of ownership concentration on firms' performance in Ukraine.

Brown D. et al. (2006) studied the effect of privatization on total productivity using comprehensive panel data on initially state-owned manufacturing firms in four economies – Hungary, Romania, Ukraine and Russia. They employed random growth estimates and found positive total factor productivity effects of 15% in Romania, 8%

¹ Both institutions produced a negative economic forecast for the war-torn country since the start of world financial crisis in 2008 (<http://www.case-research.eu/en/node/58857> and <http://wiiw.ac.at/how-to-stabilise-the-economy-of-ukraine-n-83.html>).

in Hungary, and 2% in Ukraine, but a –3% effect in Russia, as well as a positive influence of privatization at the level of 18–35% higher than TFP in all countries.

Gorodnichenko and Grygorenko (2008) used data of 2000 Ukrainian joint stock enterprises and found that vertically integrated financial groups ('oligarchs') in Ukraine tend to have higher productivity growth than firms not owned by oligarchs.

Earle et al. (2014), using a panel of 7000 manufacturing enterprises, demonstrated that political favoritism, in the context of weak institutions, can have a substantial redistributive impact on economic productivity. Kostenko (2014) confirmed that innovation activity had a positive impact on the labor productivity of Ukrainian firms.

Yemelyanova (2011) analyzed the impact of particular capital structures of companies and certain types of owners in CEE countries on their economic performance, proxied by the fact of revenues and fixed assets growth of stock companies in the CEE countries. According to the results of this research, foreign investors and family ownership have a positive influence on the economic activity of stock companies in the CEE countries, while the influence of state ownership is, with some exceptions, negative.

Shepotylo and Vakhitov (2015) employed a large database of Ukrainian firms in 2001–07 to identify the effect of the liberalization of services on the total factor productivity (TFP) of manufacturing firms. The results indicated that an increase in services' liberalization was associated with an increase in TFP. The effect was stronger for firms with high productivity, bringing about a reallocation of resources within an industry. Industry-level results showed that the effect of such reallocation on industry productivity was almost as strong as the within-firm effect. The dynamic interaction between the liberalization of services and TFP through the investment channel reinforced the effect of reallocation. In particular, it is more pronounced for domestic and small firms.

Most recently, Kim et al. (2016) documented a variation across observed firms' characteristics, and the accompanying macroeconomic volatility, often related to political turmoil for Ukrainian manufacturing firms. They used annual firm-level data for the period from 2001 to 2009 and employed a functional principal component analysis. The overall improvements in firm productivity in Ukraine's manufacturing between 2001–2009 were found to vary substantially by industry, trade status, and with firm turnover, while regional effects were less important.

However, so far no attempts were made to study the systematic relationship between productivity and a relatively large set of firm characteristics for Ukrainian enterprises. Therefore, we aim to fill at least a part of this existing gap in the literature. Our study is based on the Ukrainian firm-level data for the transition period for two years: 2005 and 2013. This allows us to evaluate whether the determinants of productivity in the manufacturing and service sectors are

significantly different in both sectors, and whether they are changing over time with the progress of economic transition in Ukraine.

In contrast to other studies based on labour productivity, we use TFP as a measure of overall productivity, calculated by the Levinsohn-Petrin method. We report estimation results separately for manufacturing and service firms, having controlled for industry and region-specific effects. We devoted special attention to the role of intangible assets and factor intensity in determining firm productivity. We also studied the role of other firm characteristics, such as internationalization, measured by foreign capital participation, exports and imported inputs. Finally, we controlled for firm size, private ownership, and the level of market concentration in the industry.

3. Ukrainian economic reforms

Since the beginning of the 1990s Ukraine began pursuing policies to transform its economy into a market-oriented and open one. In terms of economic growth the lost decade of the 1990s was followed by eight years of economic recovery in the 2001–2008 period, which was then disrupted by the economic and financial crisis. The further recovery did not materialize because of the unfavorable business policies of the Yanukovich government, political instability, and the military conflict which followed in 2014–2015.

In 2014 Ukraine's GNI per capita amounted to USD 3560, which was one of the lowest indicators in Europe (World Bank, 2015). At the same time it had one of the highest shares of a shadow economy and tax evasion (IMF, 2015). The rate of inflation (46% in 2015) is characteristic of the country and has not been brought back down to low levels during the period of transition (IMF, 2015). Today Ukraine is a service-based economy, as the share of services in GDP amounts to 63%, compared to 25% for manufacturing and 12% for agriculture (World Bank, 2015). However, accumulated human capital and the presence of high value-added industries (like aircraft-building) provide an opportunity to achieve better economic results.

The opening of the economy was one of the major reforms in the country. The liberal export and import regime of the 1990s allowed foreign competition. Increased competition in the internal market swept away many food, textile, durables, and heavy industry enterprises, and restricted the export capacities of Ukrainian companies. The export activity of the enterprises during the 1990s was determined by its traditional comparative advantage sectors. This allowed for an increase in exports of agricultural and raw materials of the newly opened

Ukrainian economy. The exports of more advanced products have not been a strong component of Ukraine's economy.

The new wave of liberalization of Ukraine's external trade was marked by the accession of the country into the WTO in 2008. However, the effect of this liberalization was blurred by the subsequent economic and financial crisis of 2008–2009, which brought the Ukrainian economy – dependent on exports of agricultural goods and raw materials and vulnerable to international price movements – into stagnation. At the same time, Shepotylo and Vakhitov (2015) argue that the liberalization of the services market caused by country's entry into WTO greatly contributed to the rise of manufacturing sector productivity. They stress the importance of the role of liberalization of services in an economy's efficiency, while arguing that the direct liberalization of trade in goods probably had only a minor impact. The recent EU-Ukraine Association Agreement may offer new opportunities for Ukrainian companies to expand their manufacturing exports into European markets

The liberalization of the economy did not bring about substantial inflows of foreign direct investment into the country. As of the beginning of 2016 the accumulated FDI stock in the Ukraine's economy amounted to 43.371 bln USD, or only USD 956 per capita. The inflow of FDI in the financial sector followed a similar trend to that of other countries in the Central and Eastern Europe.

4. Methodology of the research and statistical data

In this study we empirically analyse the firm-level determinants of productivity. We take into account firm and industry characteristics that may affect firm productivity, such as a firm's intangible assets, capital intensity, size, ownership status, internationalization (exports and imports), as well as competition in the industry.

In order to empirically investigate the relationship between firm productivity, measured by its TFP, and its determinants we estimated the following regression:

$$\ln TFP_{ijr} = \alpha_0 + \alpha_1 \ln intan_{ijr} + \alpha_2 \ln size_{ijr} + \alpha_3 \ln KLratio_{ijr} + \alpha_4 import_{ijr} + \alpha_5 export_{ijr} + \alpha_6 private_{ijr} + \alpha_7 foreign_{ijr} + \alpha_8 \ln HHI_j + v_j + u_r + \varepsilon_{ijr} \quad (1)$$

where TFP_{ijr} is the productivity level of firm i in industry j in region r , $intan_{ijr}$ is the ratio of intangible assets to fixed assets of the firm, $size_{ijr}$ is the firm size measured in terms of full-time employees, $KLratio_{ijr}$ is the stock of fixed assets per full time employee, $imports_{ijr}$ is a dummy variable indicating whether the firm is importing or not, $export_{ijr}$ is a dummy variable indicating whether the

firm is exporting or not, $private_{ijr}$ is a dummy variable indicating whether the firm is privately owned, $foreign_{ijr}$ is a dummy variable indicating whether the firm has foreign ownership or not, HHI_j is the Herfindahl-Hirschman index calculated for the NACE 2-digit industry, v_j is a dummy variable measuring the industry-specific fixed effect, u_r is a dummy variable measuring the region-specific fixed effect, ε_{ijr} is the error term which is assumed to be independent of explanatory variables, and α s are parameters to be estimated.

The data for the empirical study comes from several statistical sources and covers two years: 2005 and 2013. The main source of data is the State Committee of Statistics of Ukraine (<http://www.ukrstat.gov.ua>). The statistical information can be accessed for the purpose of scientific research. This data reflects the balance and income statement indicators related to fixed assets, total revenues, total labor cost, cost of materials, etc. Data on employment (total number of full-time workers) is received from employment authorities. Data on export and import operations comes from External Economic Activity Database of the State Committee of Statistics of Ukraine. Data on domestic and foreign ownership comes from the State Committee of Statistics of Ukraine.

The data is classified according to the KVED statistics, which include both manufacturing and services. KVED is Ukraine's national classification, developed by the agency State Committee for Technical Regulation and Consumer Policy to collect information on economic activity. There is KVED-2005 and KVED-2010 classification. Both of them are the equivalents of international industry classification standards. In the KVED-2010 classification, at the 2-digit level KVED is comparable to (ISIC Rev. 4 – 2008), and at the 4 digit level – to EU classification (NACE, Rev. 2 – 2006). In the KVED-2010, active from 1 January 2012, the number of service industries has been increased (a higher level of disaggregation) in comparison to KVED-2005. Before 2012 the KVED-2005 classification was used (<http://www.dkrp.gov.ua/info/842>). In our analysis we converted all data to the KVED-2005 classification in order to have a comparable set of data for 2005 and 2013.

The industries in 2005 differ from the industries in 2013 due to the change in the KVED classification, which follows changes in the international NACE classification. In 2005 Ukrainian enterprises were classified into three agricultural industries, five mining industries, 23 manufacturing industries and 28 services industries sectors. In 2013 in accordance with the new system – KVED-2010 – three agricultural industries, five mining industries, 25 manufacturing industries, and 56 services industries were identified.

The definitions of variables used in our empirical study and their summary statistics are reported in Table 1.

Table 1. Definitions of variables and summary statistics

Variable	Definition	Obs	Mean	Std. Dev.	Min	Max
TFP	Total factor productivity calculated based on Levinsohn-Petrin input shares	122494	390.33	9478.39	0	1815234
Intan	Ratio of intangible assets to fixed assets of an enterprise	18096	0.00	0.01	0	0.1
Size	Total number of full-time employees	119596	49.25	631.67	0	96477
KLratio	Capital to labor ratio calculated as the ratio of fixed assets at the end of a period	118930	4876.60	75269.97	0	7842810
Import	Dummy variable indicating if an enterprise imports or not	198405	0.04	0.19	0	1
export	Dummy variable indicating if an enterprise exports or not	198405	0.02	0.14	0	1
private	Dummy variable indicating private ownership of an enterprise	189214	0.96	0.19	0	1
foreign	Dummy variable indicating foreign ownership of an enterprise	189214	0.00	0.05	0	1
HHI	Herfindahl-Hirschman index for NACE 2-digit industry	198405	326.01	740.49	17.29	10000

Note: the values in the Table are reported in absolute terms.

Source: own estimations.

The level of firm productivity was measured by TFP calculated on the basis of the Levinsohn-Petrin (2003) methodology. Some industries were omitted from the analysis due to problems with calculating factor input shares.² The degree of competition within the sector was measured by the Herfindahl-Hirschman Index (HHI). This is a commonly used measure of market concentration in the empirical industrial organization literature. It is calculated for each of the available KVED-2005 industries, so that

$$HHI_j = \sum_{i=1}^N \left(\frac{TR_i}{\text{sec}TR} * 100 \right)_j^2, \text{ where } N - \text{number of enterprises in industry } j,$$

TR – total revenues of the enterprise i, secTR – sum of total revenues of all enterprises in industry j. Industries range from 15 to 95 (manufactures and services) according to KVED-2005. A higher value of the Herfindahl-Hirschman index indicates a greater level of industry concentration.

The correlations between our explanatory variables are reported in Table 2.

Table 2. Correlations between variables

	TFP	intan	KLratio	import	export	private	foreign	HHI
TFP	1.0000							
Intan	-0.0017	1.0000						
KLratio	0.0870	-0.0182	1.0000					
Import	0.0066	0.0060	-0.0179	1.0000				
Export	0.0020	-0.0092	-0.0145	0.4350	1.0000			
Private	0.0148	-0.0691	0.0057	0.1446	0.1281	1.0000		
Foreign	-0.0020	-0.0068	-0.0048	0.0908	0.0522	0.0370	1.0000	
HHI	-0.0155	0.0692	-0.0097	-0.0813	-0.0543	-0.1700	0.0148	1.0000

Source: own calculations.

² For manufacturing the following sectors were not included into the regression analysis, as it was impossible to calculate the Levinsohn-Petrin input shares: production of ready-made garments, manufacture of leather, production of paper, manufacture of other mineral products, manufacture of transport equipment.

With respect to services, the following sectors that are not available in the data set as it was not possible to calculate the TFP on the basis of Levinsohn-Petrin input shares: information sector, publication, education, and customized services.

The industries in the manufacturing and services sectors omitted in 2005 were: tobacco industry, coke industry, recycled metals, production of vehicles, production of other transport equipment, collection and purification of waste, legal services.

The industries in the manufacturing and services sectors omitted in 2005 were: tobacco industry, coke industry, wholesale trade.

5. Estimation results

In this section we present three sets of our empirical results. First, we present the pooled estimation results for the manufacturing and service sectors for both selected years, and then separate the results for each sector. In Table 3 we show the pooled estimation results for both sectors.

In columns (1) and (2) of Table 3 we present the baseline results for all industries (pooled service and manufacturing sectors) for 2005 and 2013 respectively, without controlling for industry and region specific effects. It turns out that the majority of explanatory variables are statistically significant already at the 1 per cent level of statistical significance and display the expected signs.

In particular it should be noted that the estimated coefficient on the intangible assets variable is positive and statistically significant in both years. Moreover, it can be observed that the estimated value was much higher in 2013 compared to 2005. In addition, we find that a firm's TFP is positively related to the firm's capital-labor ratio and statistically significant in both years. Similarly, the estimated parameter value on this variable is higher for 2013. Moreover, the estimated coefficient on the firm size variable is also statistically significant, but displays a negative sign which is not in line with the expectations.

The estimated coefficients on all the variables measuring the internationalization of firms, including exports, imports and foreign ownership, are positive and statistically significant for year 2005, but in 2013 only imports are statistically significant. In addition, we found that the private ownership firms is not statistically related to TFP, which was not in line with our expectations. Finally, we found that the market structure also matters for TFP. In particular, productivity increases with a lower value of the HHI. This means that a lower concentration in the industry (i.e. the lack of domination of large firms in the market structure) may stimulate competition and increase firm productivity.

Table 3. Estimation results for the pooled data set for manufacturing and services
(Absolute value of z-statistics in parentheses)

Year	2005	2013	2005	2013	2005	2013
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intan	1.167	9.902	0.926	9.051	0.771	7.227
	(8.50)**	(7.93)**	(9.27)**	(9.63)**	(7.96)**	(7.79)**
lnSize	-0.306	-0.198	-0.107	-0.202	-0.110	-0.199
	(36.47)**	(16.21)**	(15.99)**	(21.20)**	(16.63)**	(21.20)**
lnKLratio	0.08	0.148	0.005	0.088	0.007	0.078
	(13.21)**	(20.15)**	(1.09)	(15.61)**	(1.45)	(14.13)**
Import	0.853	0.911	0.503	0.884	0.418	0.798

Year	2005	2013	2005	2013	2005	2013
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intan	1.167	9.902	0.926	9.051	0.771	7.227
	(8.50)**	(7.93)**	(9.27)**	(9.63)**	(7.96)**	(7.79)**
lnSize	-0.306	-0.198	-0.107	-0.202	-0.110	-0.199
	(36.47)**	(16.21)**	(15.99)**	(21.20)**	(16.63)**	(21.20)**
lnKLratio	0.08	0.148	0.005	0.088	0.007	0.078
	(13.21)**	(20.15)**	(1.09)	(15.61)**	(1.45)	(14.13)**
	(22.74)**	(18.27)**	(18.15)**	(23.55)**	(15.46)**	(21.47)**
Export	0.443	-0.106	0.341	0.064	0.344	0.103
	(11.58)**	(1.94)	(11.92)**	(1.54)	(12.41)**	(2.55)*
Private	0.028	0.036	0.362	0.853	0.347	0.821
	(0.81)	(0.82)	(12.33)**	(23.05)**	(12.21)**	(22.53)**
foreign	0.343	0.139	0.355	0.304	0.173	0.144
	(3.28)**	(0.90)	(4.68)**	(2.63)**	(2.34)*	(1.27)
lnHHI	-0.222	-0.287	-0.052	0.542	-0.080	0.595
	(28.37)**	(27.53)**	(1.38)	(3.14)**	(2.18)*	(3.51)**
Constant	5.478	5.61	3.070	0.848	3.140	0.352
	(83.19)**	(57.15)**	(16.70)**	(0.77)	(17.29)**	(0.32)
Industry-specific effects	no	no	yes	yes	yes	yes
Region-specific effects	no	no	no	no	yes	yes
Observations	26258	13075	26258	13075	26258	13075
R-squared	0.13	0.14	0.54	0.53	0.57	0.55

Absolute value of t-statistics in parentheses. * significant at 5%; ** significant at 1%.

Source: own calculations.

In the columns (3) and (4) we report the pooled results, controlling for industry-specific effects. The results are the same as in columns (1) and (2) in terms of the statistical significance of coefficients of estimators, and the values of estimators are quite similar to the ones reported in columns (1) and (2). In particular, the estimated coefficient on the intangible assets variable remains positive and statistically significant and its value for 2013 is much higher compared to 2005. The major difference between these estimates is the statistical significance of the private ownership variable in both years. This means that now there is a positive relationship between private ownership and productivity. Another important difference refers to the estimated parameter on the HHI variable, which loses its statistical significance in 2005 and displays a positive sign

in 2013 at the 1 percent level. Finally, the estimated coefficient on the capital intensity variable loses its statistical significance in 2005.

In the columns (5) and (6) we report the pooled results controlling for industry-specific and region-specific effects, which are very similar to the results reported in columns (3) and (4). The estimated coefficient on the private ownership variable remains positive and statistically significant in both years. Furthermore, the estimated parameter on the HHI variable in 2005 is negative and statistically significant, while in 2013 it changes its sign to positive. This result shows that the role of concentration in industry may be changing over time.

In Table 4 we report the results obtained for the service sector only.

Table 4. Estimation results for services only (Absolute value of z statistics in parentheses)

Year	2005	2013	2005	2013	2005	2013
Intan	1.186	9.269	0.979	9.136	0.795	7.198
	(7.58)**	(6.65)**	(8.32)**	(8.36)**	(6.97)**	(6.67)**
lnSize	-0.413	-0.275	-0.194	-0.277	-0.193	-0.276
	(40.34)**	(19.04)**	(23.32)**	(23.92)**	(23.60)**	(24.20)**
lnKLratio	0.082	0.138	0.001	0.076	0.003	0.067
	(12.10)**	(16.92)**	(0.26)	(11.76)**	(0.63)	(10.42)**
Import	1.074	1.13	0.486	0.991	0.385	0.886
	(23.49)**	(18.78)**	(13.89)**	(21.11)**	(11.25)**	(19.02)**
Export	1.055	0.2	0.432	0.081	0.417	0.124
	(20.61)**	(2.74)**	(11.06)**	(1.43)	(11.03)**	(2.21)*
Private	-0.013	0.038	0.339	0.888	0.332	0.859
	(0.32)	(0.75)	(9.73)**	(20.46)**	(9.80)**	(20.10)**
Foreign	0.31	0.14	0.365	0.423	0.194	0.234
	(2.53)*	(0.77)	(3.97)**	(3.00)**	(2.17)*	(1.69)
lnHHI	-0.14	-0.219	-0.036	-0.035	-0.065	-0.024
	(16.10)**	(18.25)**	(0.88)	(0.89)	(1.65)	(0.61)
Constant	5.543	5.738	3.334	5.099	3.436	4.901
	(72.37)**	(49.85)**	(16.99)**	(33.95)**	(17.65)**	(30.55)**
Industry-specific effects	no	no	yes	yes	yes	yes
Region-specific effects	no	no	no	no	yes	yes
Observations	19799	9871	19799	9871	19799	9871
R-squared	0.17	0.15	0.54	0.50	0.57	0.52

Absolute value of t-statistics in parentheses, * significant at 5%; ** significant at 1%

Source: own calculations.

The comparison of the results obtained for the service sector in Table 4 with the pooled results presented in Table 3 reveals no major differences, neither in terms of statistical significance nor the value of estimators. In particular, the estimated parameter on the intangible assets variable is similar to the one in the pooled specification results. This means that the positive relationship between productivity and intangible assets was present in both 2005 and 2013 for all types of estimations in the service subsample.

There are quite clear similarities between variables such as size, the capital labor ratio, import status, exports, and private and foreign ownership. The major differences exist in the estimated parameters on the Herfindahl-Hirschman index. The Herfindahl-Hirschman index is negative and statistically significant only in the baseline regressions in which we do not control for sector and industry effects, otherwise it is not statistically significant.

In Table 5 we report the results obtained for the manufacturing sector only.

The comparison of the results obtained separately for the manufacturing sector in Table 5 with the pooled results presented in Table 3 reveals some similarities as well as several important differences, both in terms of statistical significance and the value of estimators. In particular, the estimated parameter on the intangible assets variable is similar to the one in the pooled specification results. This means that the positive relationship between productivity and intangible assets is present in both 2005 and 2013 for all types of estimations in the manufacturing subsample.

There are also quite clear similarities between variables such as the capital labor ratio, import status, and private ownership. The major differences exist in the estimated parameters on size, foreign ownership and the HHI variables. The size variable is now positive and statistically significant in all estimations. This relationship may reflect the economics of scale existing in the manufacturing sector. Foreign ownership is positive and statistically significant, but only for the year 2005. Finally, the Herfindahl-Hirschman index, while negative and statistically significant in the baseline estimations without controlling for time and industry effects, becomes positive and statistically significant once these effects are accounted for in the manufacturing sector.

Table 5. Estimation results for manufacturing only (Absolute value of z statistics in parentheses)

Year	2005	2013	2005	2013	2005	2013
Intan	0.754	6.905	0.725	4.385	0.663	3.224
	(3.04)**	(2.48)*	(4.28)**	(2.62)**	(4.06)**	(1.96)
lnSize	0.13	0.111	0.135	0.069	0.127	0.076
	(9.38)**	(4.88)**	(13.96)**	(4.87)**	(13.58)**	(5.42)**
lnKLratio	0.015	0.14	0.016	0.136	0.014	0.127
	(1.25)	(8.02)**	(1.93)	(12.65)**	(1.81)	(12.02)**
Import	0.526	0.43	0.542	0.498	0.482	0.457
	(9.52)**	(5.13)**	(14.24)**	(9.78)**	(13.14)**	(9.13)**
Export	-0.136	-0.266	0.151	0.076	0.178	0.105
	(2.70)**	(3.40)**	(4.36)**	(1.60)	(5.31)**	(2.27)*
Private	0.005	0.155	0.297	0.397	0.259	0.363
	(0.08)	(1.47)	(6.19)**	(6.24)**	(5.60)**	(5.81)**
Foreign	0.371	-0.042	0.397	-0.020	0.197	-0.102
	(2.18)*	(0.15)	(3.43)**	(0.12)	(1.76)	(0.63)
lnHHI	-0.555	-0.483	0.590	0.526	0.585	0.549
	(27.33)**	(13.94)**	(13.46)**	(5.33)**	(13.87)**	(5.67)**
Constant	5.455	5.033	0.064	-0.046	-0.177	-0.382
	(37.21)**	(18.98)**	(0.30)	(0.07)	(0.83)	(0.60)
Industry-specific effects	no	no	yes	yes	yes	yes
Region-specific effects	no	no	no	no	yes	yes
Observations	6459	3204	6459	3204	6459	3204
R-squared	0.12	0.1	0.59	0.68	0.63	0.70

Absolute value of t-statistics in parentheses.

* significant at 5%; ** significant at 1%

Source: own calculations.

6. Conclusions

In this paper we investigated the determinants of productivity of Ukrainian firms, paying special attention to the role of intangible assets. The study was based on firm level data including both manufacturing and services sectors. The study covered two years – 2005 and 2013. First we estimated OLS regressions for the pooled dataset, which included both years and both sectors. Next, we distinguished between the manufacturing and service sectors.

Our estimation results indicate that firm productivity is positively related to the intangible assets in all estimated specifications, when controlled for other firm, industry and time-specific characteristics. The other significant variables affecting productivity in the majority of estimations include the capital labor ratio, ownership status, and foreign sourcing (imports) and exports. The firm size was positively related to the productivity level in case of manufacturing, but not in the case of services, in which smaller firms are more productive. Finally, the significance of Herfindahl-Hirschman for productivity was different across the sectors; being negative in case of services and positive in the case of the manufacturing sector.

These results confirm a positive impact of economic reforms and trade liberalization on the productivity of firms. We found that the internationalization of firms, measured by the presence of foreign capital and levels of imports and exports, is associated with higher levels of firms' TFP. This means that further trade liberalization in Ukraine, in particular with the EU countries, should positively contribute to an improvement in firms' productivity. Moreover, in the majority of estimated specifications we found that private companies outperformed state-owned firms in terms of productivity.

References

- Brown, J. David, John S. Earle, and Ámos Telegdy (2006), *The Productivity Effects of Privatization: Longitudinal Estimates from Hungary, Romania, Russia, and Ukraine*, 'Journal of Political Economy', 114(1) (February), The University of Chicago Press, Chicago, <http://dx.doi.org/10.1086/499547>.
- Cieřlik, A., Michałek, J. & Michałek A. (2014), *The influence of Firm Characteristics and Export Performance in Central and Eastern Europe: Comparison of Visegrad, Baltic and Caucasus States*, 'Entrepreneurial Business and Economic Review', 2(1), Cracow University of Economics, Cracow.
- Derzhkomstat (2015), Derzhavniy Komitet Statystyky Ukrainy, www.ukrstat.gov.ua
- Earle J. & Gehlbach S. (2014), *The Productivity Consequences of Political Turnover: Firm-Level Evidence from Ukraine's Orange Revolution*, IZA Discussion Paper, No. 8510, September 2014, Institute for the Study of Labor, Bonn, <ftp.iza.org/dp8510.pdf>
- Gorodnichenko Yu., Grygorenko Ye. (2008), *Are Oligarchs Productive?* IZA Discussion Paper No. 3282, January 2008, Institute for the Study of Labor, Bonn, <ftp.iza.org/dp3282.pdf>
- IMF (2015). IMF World Economic Outlook Database. October 2015 www.imf.org
- Kim P. Huynh, David T. Jacho-Chavez, Oleksiy Kryvtsov, Oleksandr Shepotylo, Volodymyr Vakhitov (2016), *The Evolution of Firm-Level Distributions for Ukrainian Manufacturing Firms*, 'Journal of Comparative Economics', 44(1), Elsevier, Amsterdam, doi:10.1016/j.jce.2015.10.004.

- Kostenko T. (2014), *Assessment of the impact of innovations on labour productivity in domestic enterprises*, 'The Advanced Science Journal', 4, Mendeley, London, doi: 10.15550/asj.2014.04.024
- Levinsohn J., Petrin A. (2003), *Estimating Production Functions Using Inputs to Control for Unobservables*, 'Review of Economic Studies', 70(2), Oxford University Press, Oxford, doi: 10.1111/1467-937X.00246
- Movchan V., Guicci R. & Kutsenko K. (2010), *Trade policy of Ukraine: Strategic Aspects and Steps to Be Taken*, Policy Paper PP/02/2010, Kyiv-Berlin, April 2010, <http://www.ier.com.ua/en/projects/?pid=2182>
- Pivovarsky A. (2003), *Ownership concentration and performance in Ukraine's enterprises*, IMF Staff Papers, 50 (1), IMF, Washington D.C., <https://www.imf.org/external/pubs/.../Pivov.pdf>
- Shepotylo O., Vakhitov V. (2015), *Services liberalization and productivity of manufacturing firms*, 'Economics of Transition', Vol. 23 (1), Wiley, Hoboken.
- Yemelyanova L. (2011), *The share capital in the enterprises of Central and Eastern Europe Proceedings of the National University "Lviv Polytechnica"*, 'Management and Entrepreneurship in Ukraine: problems and stages of development', no. 14, Lviv.
- World Bank (2015), *World Bank Development Indicators*, [//data.worldbank.org/indicator](http://data.worldbank.org/indicator) Washington D.C.

Streszczenie

DETERMINANTY PRODUKTYWNOŚCI UKRAIŃSKICH FIRM

W niniejszym artykule zbadane zostały determinanty całkowitej produktywności czynników produkcji (TFP) ukraińskich przedsiębiorstw w sektorze produkcji przemysłowej oraz sektorze usług na podstawie danych mikroekonomicznych w latach 2005 i 2013. Najpierw oszacowane zostały regresje dla połączonego zbioru danych dla sektora produkcji przemysłowej i usług, a następnie odrębnie dla każdego sektora. Nasze wyniki empiryczne wykazują pozytywny związek między całkowitą produktywnością czynników produkcji, wartościami niematerialnymi i prawnymi, kapitałochłonnością, wielkością firmy, konkurencją w branży, statusem własności, oraz umiędzynarodowieniem firmy (eksport i import). Ponadto okazuje się, że determinanty produktywności różnią się między sektorami oraz latami naszej próby.

Słowa kluczowe: produktywność, firmy, Ukraina