



ECONOMIC ANNALS-XXI

ISSN 1728-6239 (Online)
ISSN 1728-6220 (Print)
<https://doi.org/10.21003/ea>
<http://www.soskin.info/ea/>

Volume 182 Issue (3-4)'2020

Citation information: Oliynyk-Dunn, O., Wasilewski, M., Wasilewska, N., Okhrimenko, I., & Adamenko, V. (2020). Transformation of the financing patterns of agricultural enterprises in the conditions of the financial system crisis: a case of Ukraine and the USA. *Economic Annals-XXI*, 182(3-4), 77-89. doi: <https://doi.org/10.21003/ea.V182-09>

UDC 336.7:336.64



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Transformation of the financing patterns of agricultural enterprises in the conditions of the financial system crisis: a case of Ukraine and the USA

Abstract. The authors study how the financing patterns of agricultural enterprises have changed under the influence of the financial system crisis in Ukraine and the United States (US, USA). The indicators of financing patterns, which are traditionally employed in financial management, were used. However, the main financial indicator which is the financial leverage indicator provides distorted results because agricultural lands are not objects of sale in Ukraine, therefore, they are not considered as assets and are not reflected in the balance sheet of enterprises at fair value. The agricultural lands, which are leased by the agricultural enterprises, were evaluated and the financial leverage indicator was recalculated. After the recalculation, the financial leverage indicator was reduced from 1.081 to 0.128 in 2017 (the latest data available by the beginning of 2020 has been applied). The obtained adjusted value of the financial leverage indicator in Ukraine was even lower than the actual value of 0.149 in the USA in 2017. In addition, the integral indicator of debt capital quality was built to characterize the debt capital of the agricultural enterprises. The analysis showed that the financial system crisis in Ukraine influenced negatively on the financing patterns of the agricultural enterprises. Ukraine lagged far behind in terms of key indicators of the financing patterns of the agricultural enterprises compared with the USA. The study showed the significant statistical relationship between the integral indicator of debt capital quality of the agricultural enterprises and the integral indicator of the banking sector component of the financial system in Ukraine, which allowed building the reliable regression model. It means that the financial crisis

influences negatively on the quality of debt capital of the agricultural enterprises. One of the main reasons for improper compensation of the negative effects of the financial system crisis on the agricultural enterprises is the absence of a specialized financial system for agriculture in Ukraine (contrary to the USA), which needs to be confirmed in the course of further research.

Keywords: Agricultural Enterprise; Debt Capital Quality; Financial System Development; Financial Leverage; Agricultural Lands; American Agriculture; Ukrainian Agriculture; Regression Model

JEL Classification: G10; G21; Q14

Acknowledgements and Funding: The authors would like to thank the participants and organizers of the International Scientific Conference «Tendencies on the agricultural land market - structural and financial effects», organized on April 20, 2018, at the Department of Finance of Faculty of Economic Sciences, Warsaw University of Life Sciences, Poland, where the premise of this paper was presented, and several valuable inputs were gained. The paper is a revised, updated and extended version of the report presented at the conference.

Contribution: The authors contributed equally to this work.

DOI: <https://doi.org/10.21003/ea.V182-09>

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Трансформація моделі фінансування сільськогосподарських підприємств в умовах кризи фінансової системи: досвід України й США

Анотація. У статті розглянуто зміни моделі фінансування сільськогосподарських підприємств в умовах кризи фінансової системи в Україні та США. У процесі аналізу показників, що характеризують модель фінансування, значну увагу приділено усуненню проблеми відсутності в звітах про фінансовий стан (балансах) цих підприємств справедливої оцінки вартості сільськогосподарських земель. Додаткове врахування вартості землі дозволило помітно покращити ключові показники й забезпечити їхнє порівняння з аналогічними показниками провідних сільськогосподарських країн світу (зокрема США). Фактичне значення коефіцієнта фінансового важеля сільськогосподарських підприємств в Україні, яке було досить високим за підсумками 2017 року і становило 1.081, після врахування вартості землі підлягає зниженню до 0.128, що нижче фактичного значення 0.149 у США за цей рік.

Виявлено статистичний взаємозв'язок між якістю позикового капіталу українських сільськогосподарських підприємств і рівнем розвитку банківської складової фінансової системи в країні, який описано за допомогою регресійної моделі. Побудована модель свідчить, що із зростанням рівня розвитку банківської складової фінансової системи якість позикового капіталу українських сільськогосподарських підприємств зростає логарифмічно.

Однією з основних причин неналежного компенсування негативних впливів кризових явищ у фінансовій системі на сільськогосподарські підприємства в Україні є відсутність спеціалізованої фінансової системи сільського господарства (подібної до тієї, яка успішно функціонує в США), що потребує підтвердження в процесі подальших наукових досліджень.

Ключові слова: сільськогосподарське підприємство; якість позикового капіталу; розвиток фінансової системи; фінансовий важіль; сільськогосподарська земля; американське сільське господарство; українське сільське господарство; регресійна модель.

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Трансформация модели финансирования сельскохозяйственных предприятий в условиях кризиса финансовой системы: опыт Украины и США

Аннотация. В статье рассмотрены изменения модели финансирования сельскохозяйственных предприятий в условиях кризиса финансовой системы в Украине и США. В процессе анализа показателей, характеризующих модель финансирования, значительное внимание уделено устранению проблемы отсутствия в отчетах о финансовом состоянии (балансах) этих предприятий справедливой оценки стоимости сельскохозяйственных земель.

Дополнительный учет стоимости земли позволил заметно улучшить ключевые показатели и обеспечить их сравнение с аналогичными показателями ведущих сельскохозяйственных стран мира (в частности США). Фактическое значение коэффициента финансового рычага сельскохозяйственных предприятий в Украине, которое было достаточно высоким по итогам 2017 года и составляло 1.081, после учета стоимости земли подлежит снижению до 0.128, что ниже фактического значения 0.149 в США за этот год.

Выявлена статистическая взаимосвязь между качеством заемного капитала украинских сельскохозяйственных предприятий и уровнем развития банковской составляющей финансовой системы в стране, которая описана с помощью регрессионной модели. Из этой модели вытекает, что с ростом уровня развития банковской составляющей финансовой системы качество заемного капитала украинских сельскохозяйственных предприятий возрастает логарифмически.

Одной из основных причин ненадлежащей компенсации негативных влияний кризисных явлений в финансовой системе на сельскохозяйственные предприятия в Украине является отсутствие специализированной финансовой системы сельского хозяйства (по аналогии с той, которая успешно функционирует в США), что требует подтверждения в процессе дальнейших научных исследований.

Ключевые слова: сельскохозяйственное предприятие; качество заемного капитала; развитие финансовой системы; финансовый рычаг; сельскохозяйственная земля; американское сельское хозяйство; украинское сельское хозяйство; регрессионная модель.

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Transformacja modelu finansowania przedsiębiorstw rolniczych w kontekście kryzysu systemu finansowego: doświadczenia Ukrainy i USA

Streszczenie. W artykule przedstawiono zmiany modeli finansowania przedsiębiorstw rolniczych w okresie kryzysu systemu finansowego w Ukrainie i USA. W trakcie analizy wskaźników, które charakteryzują model finansowania, zasadniczą uwagę poświęcono problemowi braku w raportach finansowych (bilansach) tych przedsiębiorstw wartości godziwej ziemi rolniczej.

Dodatkowe uwzględnienie wartości ziemi umożliwiło zasadniczą poprawę kluczowych wskaźników oraz ich porównanie z analogicznymi wskaźnikami w innych krajach świata (m.in. z USA). Faktyczne znaczenie dźwigni finansowej w przedsiębiorstwach rolniczych w Ukrainie, które było stosunkowo wysokie w 2017 roku i wynosiło 1,081, po włączeniu wartości ziemi uległo obniżeniu do 0,128, co jest wielkością niższą od poziomu tego wskaźnika w USA w tym roku (0,149).

Stwierdzono statystyczną zależność między jakością kapitału dłużnego ukraińskich przedsiębiorstw rolniczych z poziomem rozwoju systemu bankowego jako części systemu finansowego, która została określona z wykorzystaniem modelu regresji. Zbudowany model świadczy o tym, że wraz ze wzrostem

poziomu rozwoju systemu bankowego, jakość kapitału dłużnego ukraińskich przedsiębiorstw rolniczych rośnie w sposób logarytmiczny.

Jedną z zasadniczych przyczyn nienależytego kompensowania negatywnego wpływu zjawisk kryzysowych w systemie finansowym na przedsiębiorstwa rolnicze w Ukrainie jest brak wyspecjalizowanego systemu finansowego w rolnictwie (podobnego do tego, jaki bardzo dobrze funkcjonuje w USA), co wymaga potwierdzenia w dalszych badaniach naukowych.

Słowa kluczowe: przedsiębiorstwo rolnicze; jakość kapitału dłużnego; rozwój systemu finansowego; dźwignia finansowa; grunty rolne; rolnictwo amerykańskie; rolnictwo ukraińskie; model regresji.

1. Introduction

The analysis of financing patterns is considerable value since it allows evaluating how enterprises finance their assets and finding out the changes happened in the financing structure, which can carry significant financial risks. It is especially important to analyze financing patterns of Ukrainian agricultural enterprises in the conditions of the financial system crisis, since the agriculture has always and especially recently played a significant role in the country's economy. In particular, the share of agriculture in gross domestic product (GDP) of Ukraine was about 10% in recent years. The United States, a leading world agricultural producer, was selected for comparative analysis. It is important not only to analyze the changes in financing patterns, but also to find out what institutional factors influence their changes.

2. Brief Literature Review

Modern scientific literature ambiguously interprets the definition of «financing patterns». Booth et al. (2002); Beck et al. (2008); Kwenda et al. (2013); Daskalakis et al. (2013); Gungoraydinoglu et al. (2017) associate the financing pattern with financial structure or capital structure or external financing. Beck, Demirgüç-Kunt, and Maksimovic (2008) identify the financing pattern with external financing and they mean equity and external debt, and do not take into account the government or financing supplier credit or informal finance. Singh and Luthra (2013) refer the financial structure to only long-term sources such as equity shares, reserves and surpluses, debentures, long-term debt from outside sources and preference share capital. Moritz, Block, and Heinz (2016) interpret the financing pattern as the combination of financing instruments.

Also more attention is paid to the influence of a firm's characteristics and institutional differences on financing patterns of firms (Booth et al., 2002; Giannetti, 2003; Hackethal et al., 2004; Beck et al., 2008; De Jong et al., 2008; Fan et al., 2010; Abdullah et al., 2011; Cowling et al., 2012; Kwenda et al., 2013; Dong et al., 2014; Gungoraydinoglu et al., 2017; Lemishko, 2018; Szczeponková, 2018; Pradhan et al., 2019; Zabolotnyy, et al., 2019; Fenyves, et al., 2020; Szomko, 2020).

Giannetti (2003) observes positive nexus between the firm's financing patterns and institutional environments. He asserts that the firms have a lower level of debt ratio if the domestic financial markets are underdeveloped. Also, he states that the firms have a higher share of short-term debt if the country has the low quality of legal enforcement and the insufficiency of creditor protection.

Beck, Demirgüç-Kunt, and Maksimovic (2008) realize that the variation in financing patterns is caused by firm size, financial development and property rights protection. Using the unique firm-level survey database in 48 countries (eighty percent of their data was comprised of small and medium-sized firms), they investigate that financial intermediary and stock market development play a key role for the accessibility of small and medium enterprises (SMEs) to external finance.

De Jong, Kabir, and Nguyen (2008) find that the creditor right protection, bond market development, and GDP growth rate are important factors in explaining the differences in the firm's financing patterns.

Abdullah and Manan (2011) find that the access to finance for SMEs depends on their age and assets. Also, they conclude that a large variety of financial agencies and financial institutions increases the accessibility to external finance SMEs in the country.

Cowling, Liu, and Ledger (2012) research how financial crisis influence on demand for external finance. They find that larger firms were more willing to maintain or increase their demand for external finance and they had better access to finance during the recession than smaller firms.

Kwenda and Holden (2013) explore the financing patterns of 92 firms in eight economic sectors. They determine that the inflation and interest rates effect the financing patterns of firms and their financing strategies.

Dong and Men (2014) investigate how the financing of SMEs depends on firm characteristics and economic development and institutions in emerging markets. They state that smaller firms in nonmanufacturing sectors consistently meet financing constraints. Also, they find that access to external financing for SME access is conditioned by such factors as availability of credit information, the bank concentration ratio, economic development and the institutional environment.

Szczeponková (2018) explores how the systematic banking crisis effects the financing patterns of SMEs in the selected European countries. She states that the financial crisis decreases access SMEs to external finance. Also, SMEs in regions hit by the systematic banking crisis have a lower share of long-term debt compared with firms in regions not affected by the crisis.

Fenyves, Petó, Szenderák, and Harangi-Rákos (2020) state that debt financing of the agricultural enterprises depends on their profitability, size and structure. However, the factors influencing the capital structure may differ significantly in different countries, even neighboring and located in the same region.

Szomko (2020) finds that the direction and extent of the relationship of individual factors with the debt ratio of Polish companies may differ in the long and short term. In other words, universal causation, which can explain a certain level of financial leverage, is not identified.

Although references mostly proved the statement that financing patterns of firms depends on the financial development in individual countries, it is very important to take into consideration each countries peculiarities to provide a fair picture about financing patterns. One of the main features of Ukrainian agricultural enterprises is that they are not the owners of their agricultural lands, they lease the lands and the cost of which are not reflected in the enterprises balance sheet at fair value. In this paper, this feature was taken into account and the agricultural land's lease cost was appraised. To characterize the liabilities of the agricultural enterprises, the integral indicator of debt capital quality was built. Although the nexus between the financial system development and the financing patterns of enterprises in Ukraine (Oliynyk-Dunn et al., 2018; Oliynyk-Dunn et al., 2019) have been studied, this study is new. Firstly, the value of agricultural land was considered when analyzing the financing patterns of agricultural enterprises in Ukraine. Secondly, a more correct indicator of financial leverage and a new integral indicator of the debt capital quality was used to investigate the relationship between the financial system development and financing patterns, making it possible to obtain new results and draw appropriate conclusions. This study was carried out in Ukraine in 2018.

3. Purpose

The purpose of the research is to analyze the financing patterns of agricultural enterprises in Ukraine under difficult financial conditions and the lack of fair evaluation of agricultural land. In addition, explore the relationship between changes in the financing patterns of enterprises and the financial system development.

4. Materials and Methods

The indicators of capital structure, which traditionally are employed in financial management, have been used in order to analysis the financing patterns of the enterprises. These indicators are shown in Table 1.

The indicator of the financial leverage, which characterizes the amount of debt per unit of equity, is considered one of main indicators listed in the Table 1. In this study the debt includes all liabilities (short-term and long-term), because the short-term liabilities are very important for

Table 1:
The key indicators which characterize the financing patterns of the enterprises

Indicators	Equations	Legend
1. Financial leverage	D/E	D – debt (total amount of liabilities) E – equity
2. Ratio working capital to current assets	WC/CA	WC – working capital CA – current assets
3. The share of long-term liabilities per total amount of debt	LTL/D	LTL – long-term liabilities D – debt (total amount of liabilities)
4. The share of bank loans per the total amount of debt	BL/D	BL – bank loans D – debt (total amount of liabilities)
5. Share of short-term bank loans in current liabilities	$STBL/CL$	STBL – short-term bank loans CL – current liabilities

Source: Authors' own development

financing of assets in countries with poor financial systems in particularly Ukraine. The calculation of the financial leverage indicator based on the data of official financial reporting of agriculture enterprises in Ukraine leads to distortion of the results. The reason is the main component of the resource potential of these enterprises is agricultural land - was not the object of sale in Ukraine during the study period and was not reflected in the balance sheet of enterprises at fair value, respectively, by lowering the amount of equity. The problem can be fixed by evaluation of agricultural lands, the owner of which are Ukrainian residents who lease the agricultural lands to agricultural enterprises. The equation of income capitalization approach for agricultural land appraisal is shown as Equation 1.

$$V = \sum_{t=1}^{\infty} \frac{NOI_t}{(1+r)^t}, \quad (1)$$

where:

V - average value of 1 hectare of agricultural land using by agricultural enterprises;

NOI - net operating income per 1 hectare of agricultural land for the t -year;

r - capitalization rate for land;

t - year (from 1 to ∞).

Net operation income was evaluated in USD because the high level of inflation in Ukraine. Additionally, the capitalization rate was equated to the external return of Ukrainian sovereign bonds denominated in USD, which was 8% at the time the study. The ratio working capital to current assets (the second indicator in Table 1) characterize the working capital adequacy and the degree of conservatism of the policy of financing the current assets of agricultural enterprises, so it is an important indicator that complements the financial leverage ratio in the process of analyzing the financing patterns. The rest of indicators (the indicators 3-5 in Table 1) characterize the structure of liabilities. From point of analyzing financing patterns, it is worth to integrate them to one indicator calculating the geometric mean, using Equation 2.

$$II_{DCQ} = \sqrt[3]{(S_3 \times S_4 \times S_5)}, \quad (2)$$

where:

II_{DCQ} - integral indicator of debt capital quality;

S_3, S_4 and S_5 - the indicators, which characterize the financing patterns of the firms (Table 1).

To taking into account the specifics of agricultural enterprises the key indicators, which characterize the financing patterns of the enterprises, were supplemented by indicators of the amount of financing (equity, liabilities and bank loans) per 1 ha of agricultural land.

The assessment of the development level of the banking sector component of the financial system was carried out using the author's model «3+3», which was presented in previous articles (Oliynyk et al., 2015; Oliynyk-Dunn et al., 2019). The integral indicator of the financial development provides an adequate comparative analysis of financial systems of individual countries. The integral indicator of level development is calculated as an area of the geometric figure with the tops in a coordinate system of 6 axes. The «3+3» model allows to analyze the development of the financial system and its components: banking sector and financial markets. This article considers only the banking sector component of the financial system. The integral indicator of the relative level of the banking sector development is calculated as the area of the triangle by the following Equation 3:

$$II_{BS} = \frac{1}{2} \times [(I_1 \times I_2) + (I_2 \times I_3) + (I_3 \times I_1) \times \sin 120^\circ], \quad (3)$$

where:

II_{BS} - the integral indicator of the banking sector component of financial system;

I_1, I_2, I_3 - relative values of banking sector indicators:

I_1 - commercial bank branches (per 100,000 adults);

I_2 - bank deposits to GDP (%);

I_3 - domestic credit to private sector by banks (% of GDP).

The information base of the article is data from the World Bank, State Statistics Service of Ukraine, National Bank of Ukraine and the United States Department of Agriculture. This data is open via the Internet. Data from World Bank (World Bank 2020a, 2020b) was used to compute the integral indicator of the relative level of the banking sector development. The data from State Statistics Service of Ukraine, National Bank of Ukraine and United States Department of Agriculture (SSSU 2020, NBU 2020, USDA 2020) was used to calculate the key indicators, which characterize the financing patterns of the agricultural enterprises. The comparative analysis of the indicators, which characterize the financing patterns of the agricultural enterprises of Ukraine and USA for their full interpretation, was conducted. The United States is the leader of a group of leading agricultural countries of the world, to which Ukraine also belongs.

5. Results and Discussion

Figure 1 illustrates the significant crisis in the financial system, in particular its banking sector component, of Ukraine in 2014-2017.

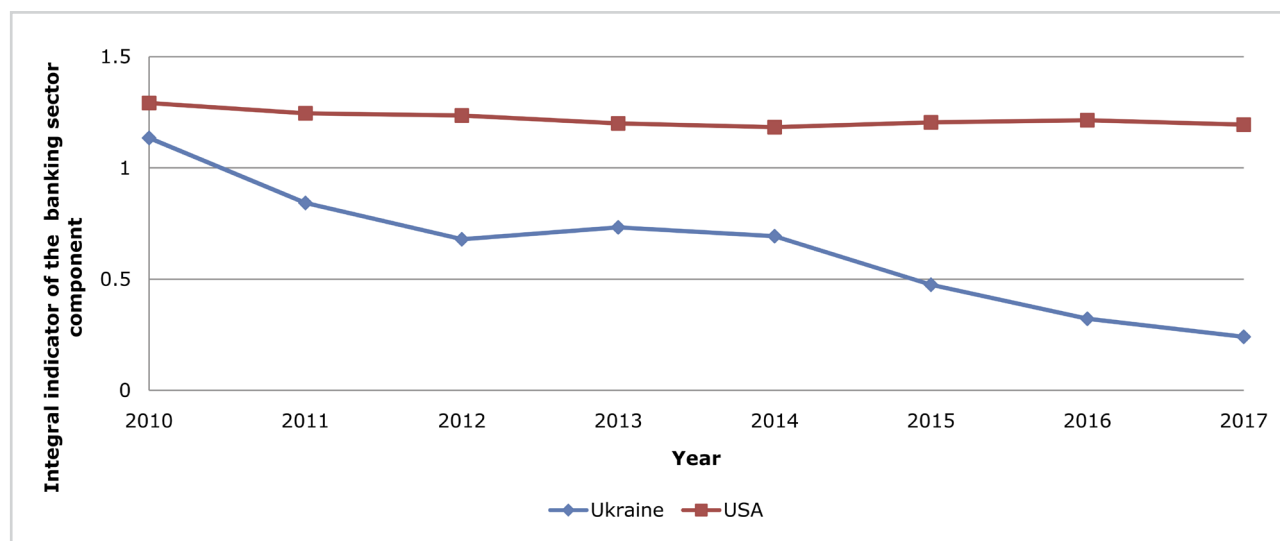


Figure 1:
Dynamics of the banking sector component of the financial system in Ukraine and USA, 2010-2017 (according to the model «3+3»)

Source: Authors' own elaboration based on data by the World Bank (2020a, 2020b)

Unlike Ukraine, in the USA the development level of the banking sector component of the financial system did not change significantly in 2014-2017. Therefore, the crisis in Ukraine is not a consequence of the global financial crisis as the one observed in 2008-2009. It is obvious that the crisis of the financial system in Ukraine is caused by well-known political events (first and foremost, military conflict with the Russian Federation) and a general deterioration of the socio-economic situation in the country. In terms of crisis of the financial system, there was a significant increase in financial leverage level of enterprises of all economic sectors of Ukraine, including agriculture, illustrating (Figure 2).

Even though agricultural enterprises in Ukraine had one of the lowest average levels of the financial leverage among the sectors of the national economy, its values were significantly higher compared to agricultural enterprises in the United States and showed accelerated growth. Such values of the financial leverage of Ukrainian agricultural enterprises are a sign of negative transformations in their financing. The financial instability and dependence on debt capital for agricultural enterprises in Ukraine is further illustrated by the dynamics of debt and equity per 1 ha of agricultural land (Table 2).

It should be noted that in 2013-2017, the debt of agricultural enterprises per hectare of agricultural land in Ukraine is not significantly different compared with the same indicator in the USA (Table 2). The significant gap between Ukraine and the USA (the leading country in the group of major agricultural producers) in terms of the equity per hectare of agricultural land is caused by the fact that the value of agricultural land is not reflected in the financial statements of Ukrainian agricultural enterprises. Agricultural land in Ukraine mostly belongs to private owners, but they don't have the right to sell it, because of the agricultural land

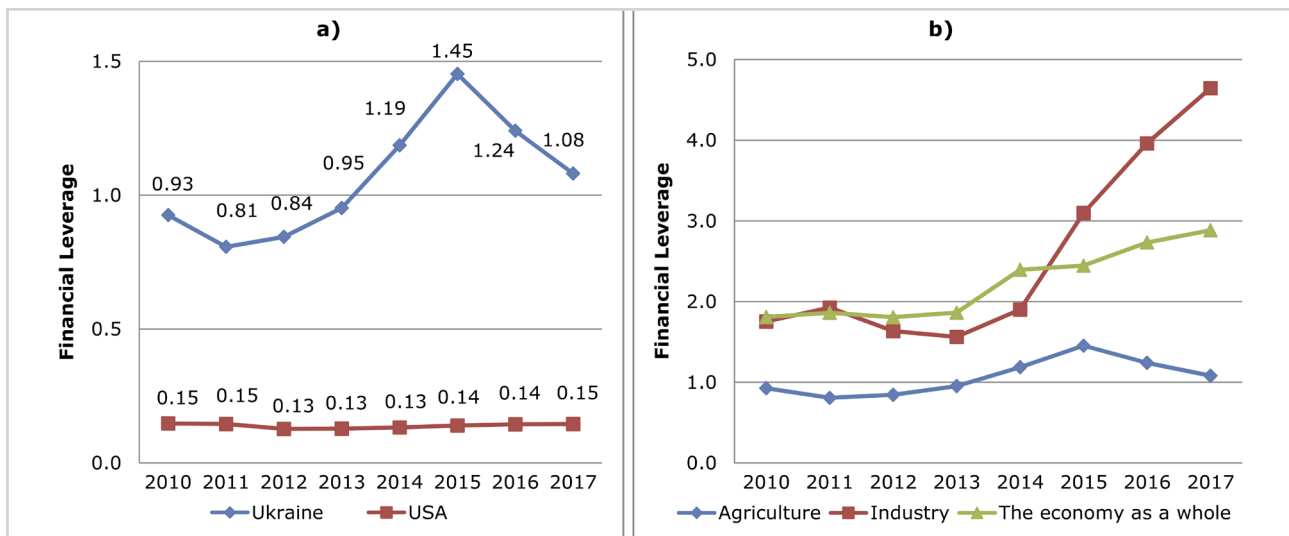


Figure 2:

a) Financial leverage of agricultural enterprises in Ukraine compared to the USA, 2010-2017;
b) Financial leverage of agricultural enterprises in Ukraine compared to the other sectors of the national economy, 2010-2017

Source: Authors' own elaboration based on data by SSSU (2020), NBU (2020), USDA (2020)

Table 2:
The amount of debt and equity of agricultural enterprises per hectare of agricultural land in Ukraine and the USA, 2010-2017, USD

Year	Ukraine		USA		Absolute deviation of Ukraine from the USA	
	debt	equity	debt	equity	debt	equity
2010	450.7	486.8	754.3	5116.0	-303.5	-4629.3
2011	542.4	672.1	780.2	5363.2	-237.8	-4691.2
2012	700.1	829.0	755.1	5940.7	-55.0	-5111.7
2013	870.0	913.7	787.6	6146.3	82.4	-5232.7
2014	764.7	644.6	847.0	6389.3	-82.3	-5744.6
2015	699.2	481.2	866.0	6197.0	-166.7	-5715.8
2016	754.4	608.0	895.1	6191.0	-140.7	-5583.0
2017	798.1	738.2	921.0	6168.1	-123.0	-5429.8
Average value	697.5	671.7	825.8	5959.7	-128.3	-5267.3
Coefficient of variation, (%)	18.5%	21.2%	7.4%	7.1%	-85.5%	-7.7%

Note: The values of indicators in Ukraine are calculated in the national currency taking into account the average annual exchange rate of UAH to USD.

Source: Authors' own calculation based on data by SSSU (2020), NBU (2020), USDA (2020)

sale moratorium¹. The agricultural enterprises can only lease the agricultural land from owners due to the existence of a moratorium and do not reflect leased land in the financial statements. Using the income capitalization approach, the average value of one hectare of the agricultural land was appraised (Table 3). The average value of the agricultural land illustrates additional consideration for equity (Figure 3).

Taking into account the value of agricultural land, according to the results of calculations in Table 3, allows to completely overcome the lag of Ukraine from the United States in terms of equity per 1 hectare of land (even slightly ahead of this indicator), which illustrates Figure 3.

After the addition of the agricultural lands value to equity, the value of financial leverage was recalculated. The value of financial leverage composed 0.128 in 2017 compared with the value of 1.081 before inclusion of the value of the land. Considering the value of land allowed to reduce only the coefficient of financial leverage of agricultural enterprises and did not affect the other key indicators that characterize the financing patterns. The values of these indicators at the beginning and end of the study period are illustrated in Table 4.

¹ According to the Law of Ukraine «On Amendments to Certain Legislative Acts of Ukraine Concerning the Conditions of Circulation of Agricultural Lands» No. 552-IX, adopted on March 31, 2020, this moratorium will be lifted from July 1, 2021 (except for state-owned lands; also unresolved until referendum remains the issue of selling land to foreign individuals and legal entities). From the beginning of 2024, it is possible to acquire the right of ownership of agricultural land for domestic legal entities subject to a number of restrictions, in particular the total area of land owned by one entity, may not exceed 10 thousand hectares.

According to the Table 4, there is a certain decrease in all the above indicators for agricultural enterprises in Ukraine. It means firstly that agricultural enterprises have moved from moderate policy to aggressive to finance their current assets. This conclusion was made based on the indicator Ratio working capital to current assets. The second, the quality of debt capital got worse as evidenced by the dynamics of indicators, which characterize the shares of individual components of liabilities. Based on changes with the key indicators of financing patterns, the financing patterns of agricultural enterprises in Ukraine indicated much higher financial risks. Adverse for the financial security of agricultural enterprises in Ukraine is the fact that an increase in the share of debt capital is accompanied by significant worsening of its quality and reducing interaction the enterprises with traditional financial institutions as banks. These conclusions can be proved by the following comparison indicators: the amount of debt capital per hectares and the amount of bank loans per hectares of agricultural land (Figure 4).

Table 3:
The average value of the agricultural land used by the agricultural enterprises in Ukraine (as of the end of 2017)

Indicator	Net profit, million UAH	The average annual exchange rate of UAH to USD	Land use of agricultural enterprises, thousands hectares	Net profit, USD / ha	Discounted net profit (with a capitalization rate of 8%), USD / ha
Actual values					
2010	17170.6	7.9356	20864.4	103.7	-
2011	25341.3	7.9676	20589.6	154.5	-
2012	26787.2	7.9910	20499.3	163.5	-
2013	14984.4	7.9930	20665.5	90.7	-
2014	21481.3	11.8867	20437.2	88.4	-
2015	102849.1	21.8447	20548.9	229.1	-
2016	90613.2	25.5513	20746.9	170.9	-
2017	68858.5	26.5966	20537.3	126.1	-
Forecast values					
2018*	71002.6	27.2005	20512.9	127.3	117.8
2019*	90692.0	25.8456	20488.4	171.3	146.8
2020	95226.6	27.0000	20463.9	172.3	136.8
Total, 2018-2020	-	-	-	-	401.5
Current cost of reversal, 2021-∞	-	-	-	6501.3**	5161.0
Average value of one hectare agricultural land, USD	-	-	-	-	5562.4

Notes:

* - There are actual data for 2018 and 2019 used as a reliable forecast for the valuation of land at the end of 2017.

** - Calculated on the basis of the average of growth rate «Net profit, USD / ha» for the period from 2010 to 2017, which is more than 5.2%, using the constant growth model (Gordon growth model): $172.3 * (1 + 0.0521) / (0.08 - 0.0521) = 6501.3$; possible uncertainty due to rounding, because the calculation performed in Excel.

Source: Calculated by the authors based on data of SSSU (2020), NBU (2020)

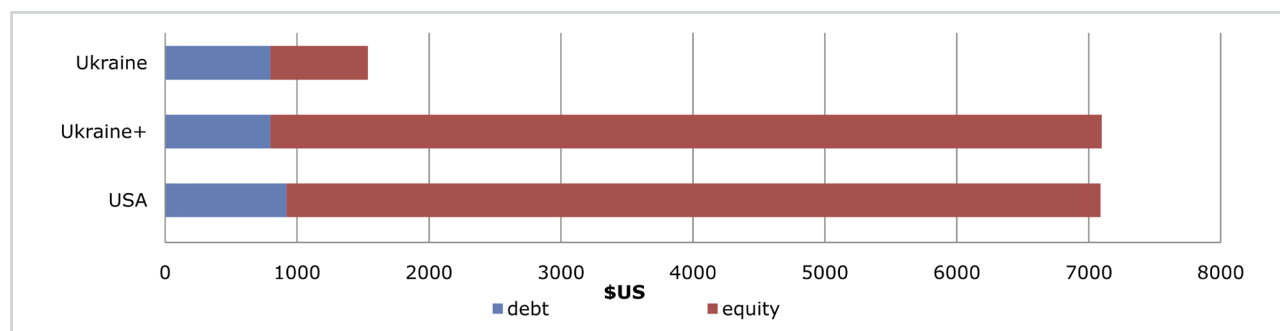


Figure 3:

The amount of debt and equity of agricultural enterprises per hectare of agricultural land in Ukraine and the USA, 2017, USD

(Ukraine+ - taking into account the value of the agricultural land used by agricultural enterprises)

Source: Authors' own calculation based on data by SSSU (2020), NBU (2020), USDA (2020)

However, despite the mentioned above negative tendency of financing patterns of the agricultural enterprises in Ukraine, the operating efficiency (which is estimated by the indicator «agriculture, forestry, and fishing, value added (constant 2010 USD) per 1 hectare of the agricultural land») of agriculture in the country is growing at about the same level as in the United States. It was found that negative changes in the quality of debt capital in Ukraine do not have a direct statistical relation with the indicator «agriculture, forestry, and fishing, value added (constant 2010 USD) per 1 hectare of the agricultural land» (Table 5). Therefore, the operating efficiency of agriculture increased despite the negative transformations in the enterprise financing patterns in Ukraine.

The data Table 5 implies that the financing decisions (in particular the decision to refocus on riskier sources of debt capital and the corresponding changes in the financing patterns) do not affect the results of operating activities of enterprises. The latter is a confirmation of one of the basic concepts of neoclassical Anglo-American financial school. Moreover, the absence of direct significant influence the financing decisions on the results of operating activities of enterprises can be mentioned both in the case of negative changes in the financing patterns (Ukraine) and in the case of positive changes (USA).

Instead, as evidenced by the data in Table 6, a significant statistical relationship is observed between the key indicators, which characterize the financing patterns of agricultural enterprises, and the integral indicator of the banking sector component of financial system in Ukraine.

The financial leverage ratio is inversely proportional statistical relationship with the integral indicator of the financial system development. While the integral indicator of debt capital quality and the ratio working capital to current assets demonstrate a directly proportional statistical relationship with the integral indicator of the financial system development (Table 6). This can be considered as an argument for claiming that the negative phenomena in the financing patterns of agricultural enterprises is caused by the crisis of the financial system in Ukraine. There were

Table 4:
Indicators, which characterize the financing patterns of agricultural enterprises in Ukraine and USA, 2010 and 2017

Indicator	Ukraine		USA		Absolute deviation of Ukraine from the USA	
	2010	2017	2010	2017	2010	2017
Ratio working capital to current assets	0.44	0.37	0.59	0.39	-0.15	-0.02
The share of long-term liabilities per total amount of debt	0.32	0.13	0.55	0.61	-0.23	-0.48
The share of bank loans per the total amount of debt	0.36	0.13	0.82	0.86	-0.47	-0.73
The share of short-term bank loans in current liabilities	0.16	0.10	0.79	0.83	-0.63	-0.73

Source: Authors' own calculation based on data by SSSU (2020), NBU (2020), USDA (2020)

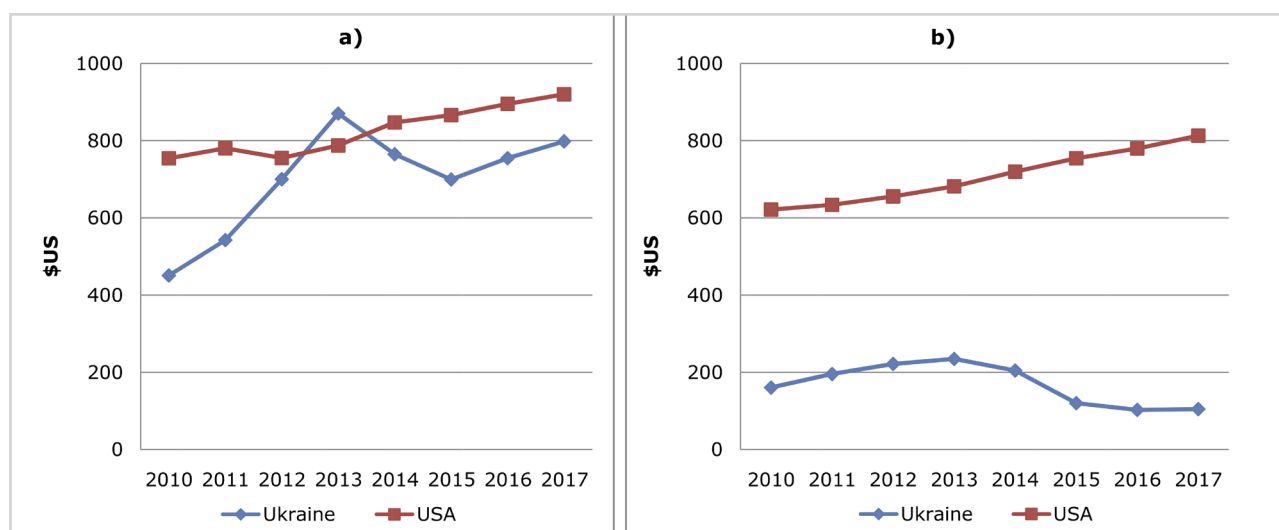


Figure 4:

Dynamics of amount of debt of agricultural enterprises per hectare of agricultural land in Ukraine and USA, 2010-2017, USD:
a) total amount of debt capital; b) bank loans

Source: Authors' own elaboration based on data by SSSU (2020), NBU (2020), USDA (2020)

no similar relationships in the USA (paired correlation coefficients of key indicators of the financing patterns of agricultural enterprises with the integral indicator of banking sector component of financial system indicated weak statistical links between them). The data of the Table 6 shows the strong statistical relationship between the integral indicator of debt capital quality of agricultural enterprises and the integral indicator of banking sector component of financial system of Ukraine. The strong statistical relationship allowed building the regression model, which is adequate and has statistically significant regression coefficients (p -value does not exceed 0.001) despite the small number of observations; adequacy models confirms the absence of heteroscedasticity and autocorrelation residues. It is impossible to build a similar model for the USA given the lack of statistical dependence (see Figure 5).

The lack of a strong statistical relationship between the key indicators, which characterize the financing patterns of the agricultural enterprises, and the integral indicator of banking sector component of financial system in the USA can be due to a number of reasons that require further study. Among these reasons, special attention should be paid to the presence of a country's powerful specialized financial system of farms (in particular, the presence of a nationwide lending network, which specializes in serving the agricultural community - Farm Credit System). The specialized financial system can maintain optimal parameters of the financing patterns of agriculture, regardless of current changes in the financial system (possibly with the exception of some extraordinary phenomena). In Ukraine, such a specialized system has not yet been established. Therefore, probably statistical dependencies are much stronger due to the direct influence of processes in the country's financial system on the financing patterns of agricultural enterprises.

Table 5:
Indicators which characterize the quality of debt capital of agricultural enterprises in Ukraine and USA compared with the indicator «Agriculture, forestry, and fishing, value added (constant 2010 USD) per 1 hectare of the agricultural land (AVA/ ha)», 2010-2017

Year	Ukraine		USA	
	AVA / ha (constant 2010 USD)	Integral indicator of debt quality	AVA/ ha (constant 2010 USD)	Integral indicator of debt quality
2010	242.56	0.267	411.95	0.712
2011	301.95	0.271	389.64	0.722
2012	294.56	0.251	349.25	0.756
2013	345.16	0.239	416.97	0.756
2014	370.92	0.237	422.10	0.736
2015	375.68	0.155	456.30	0.756
2016	397.98	0.120	507.78	0.765
2017	432.21	0.121	525.79	0.757
Pair correlation coefficient with AVA / ha (constant 2010 USD)	1	-0.857	1	0.453

Source: Authors' own calculation based on data by SSSU (2020), NBU (2020), USDA (2020)

Table 6:
The key indicators, which characterize the financing patterns of agricultural enterprises of Ukraine compared to the integral indicator of the relative level of the banking sector development, 2010-2017

Year	Financial leverage	Ratio working capital to current assets	Integral indicator of debt quality	Integral indicator of the banking sector component of financial system
2010	0.926	0.436	0.267	1.135
2011	0.807	0.502	0.271	0.843
2012	0.844	0.481	0.251	0.679
2013	0.952	0.435	0.239	0.733
2014	1.186	0.406	0.237	0.693
2015	1.453	0.356	0.155	0.475
2016	1.241	0.362	0.120	0.322
2017	1.081	0.367	0.121	0.241
The coefficient of pair correlation with the integral indicator of the financial system development	-0.579	0.695	0.913	1

Source: Authors' own calculation based on data by the World Bank (2020a, 2020b), SSSU (2020), NBU (2020)

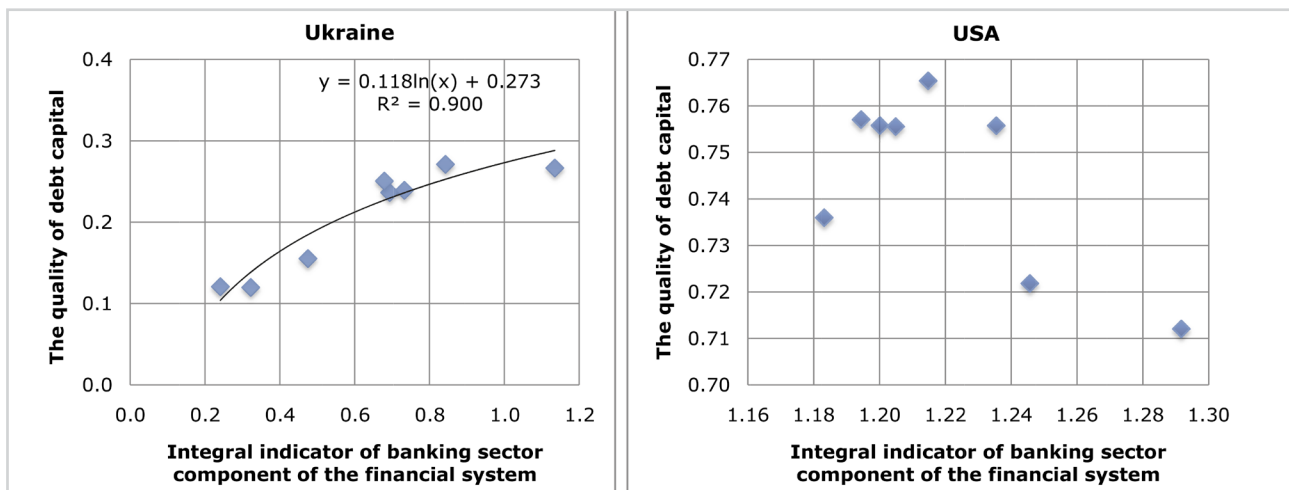


Figure 5:

The statistical relationship between the integral indicator of debt capital quality of agricultural enterprises and the integral indicator of banking sector component of the financial system, 2010-2017: Ukraine and the USA

Source: Authors' own elaboration based on data by the World Bank (2020a, 2020b), SSSU (2020), NBU (2020)

6. Conclusion

In the crisis of the financial system of Ukraine, there have been negative changes in the financing patterns of Ukrainian agricultural enterprises over 2010-2017. In particular, the level of the financial leverage increased significantly (especially in 2015); the quality of debt capital has deteriorated significantly. In addition, the study showed that Ukraine lagged far behind in terms of key indicators of the financing patterns of the agricultural enterprises compared with the USA (the leading country in the group of the world's largest agricultural producers) especially over 2015-2017. However, the identified financing problems did not significantly affect the operational efficiency of Ukrainian agricultural enterprises. This is evidenced by the lack of a direct statistical relationship between the integral indicator of the debt capital quality and the value added of agriculture per 1 hectare, which showed steady growth during the study period.

The inflated value of the financial leverage for agricultural enterprises in Ukraine cannot be considered a basis for drawing conclusions about the financing patterns, because equity is understated due to lack of fair valuation of agricultural land. The assessment of the value of agricultural lands and the addition of their value to equity of the agricultural enterprises reduced significantly the value of the financial leverage indicator from 1.081 to 0.128 in 2017, which is an even better value than the United States.

Correlation analysis showed a significant statistical relationship between the integral indicator of debt capital quality of the agricultural enterprises and the integral indicator of banking sector component of financial system in Ukraine. The strong statistical relationship allowed building the reliable regression model. It also confirmed the findings of previous studies that the financial structure of enterprises depends on institutional development. One of the important reasons for the low quality of debt capital may be that there is no specialized system of financing of agricultural enterprises in Ukraine (similar to the one that successfully operates in the USA) and this does not allow to offset the negative effects of the crisis in the country's financial system on agriculture. In spite of the obtained results, future studies will be directed to answer the question how the financing patterns of individual groups of agricultural enterprises are changing under the influence of the negative impacts associated with the crisis in the Ukrainian financial system. It also needs further research to substantiate instruments to protect agriculture from adverse impacts in the country's financial system.

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Received 11.02.2020

Received in revised form 29.03.2020

Accepted 30.03.2020

Available online 15.04.2020

Updated version of the paper as of 30.07.2020