# THE EFFECT OF LAND CONCENTRATION ON RURAL WELLBEING IN UKRAINE

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Kyiv School of Economics

Abstract

# THE EFFECT OF LAND CONCENTRATION ON RURAL WELLBEING IN UKRAINE


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Unequal land distribution negatively impacts all human rights giving way to further development of income inequality, poverty, and poor living conditions. Since 1991, Ukraine is implementing land reform and excessive land concentration was one of the hottest topics in recent years. The ongoing discussion about different scenarios of land ownership restrictions in Ukraine requires empirical evidence regarding the effects of various levels of land concentration on rural development.

This paper aims to assess the effect of land concentration on rural wellbeing and provision of public goods in local communities of Ukraine using local budget revenues and expenditures data spanning for 2016-2017 years, as well as, 2016-2017 farm-level data. Land concentration, calculated by 4 alternative methods, appeared to have an ambiguous effect on rural wellbeing, measured as local budget revenues, and strong positive effects on the local expenditures on the public good provision to the population.

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## GLOSSARY

**SSSU** – State Statistics Service of Ukraine

**FE** – Fixed Effect

**RE** – Random Effect

**KOATUU –** Classification of Objects of the Administrative-Territorial System of Ukraine

**HHI** – Herfindahl-Hirschman Index

**OLS** – Ordinary Least Squares

## *Chapter 1*

# INTRODUCTION

*"We cannot afford more dispossessed, greater inequalities in the rural areas, and more smallholders driven off their land"*

Olivier de Schutter, UN Special Reporter on the Right to Food

Land concentration is referred to land use (ownership and lease) of big areas of land by a small number of people or organizations (Glass et al 2019).

Land concentration is observed almost in every country in the world. The example of Brazil shows one of the most extreme cases of concentration of land ownership. According to the Human Rights Sub-Commission (1999), 45% of the total area of the country is occupied by 1% of big agricultural holdings, 2.8% of medium landowners work on 56% of the land and 50% of small farmers have access to only 2.5% of all arable land. Damasceno et al (2017) state that insecure land rights in Brazil, as well as weak and biased policy, have resulted in a variety of land-related conflicts, great deforestation, slow development of land markets, and inefficient land-use decisions.

Unequal land distribution negatively impacts all human rights giving way to further development of income inequality, poverty, and poor living conditions. Ordinary households and farmers throughout the world under the presence of high land concentration are deficient in resources thus forced to struggle for survival. Excessive land usage affects not only socio-economic and human development but also neglects the civil and political rights of the people (Human Rights Sub-Commission, 1999).

Surprisingly, an increase in land concentration is present not only in poor or developing countries, in fact, land grabbing[1] is widely spread in the USA and it has become a "trend" in Europe recently. "Land ownership in Europe has become highly unequal reaching, in some countries, proportions similar to Brazil, Colombia, and the Philippines" (TNI 2013).

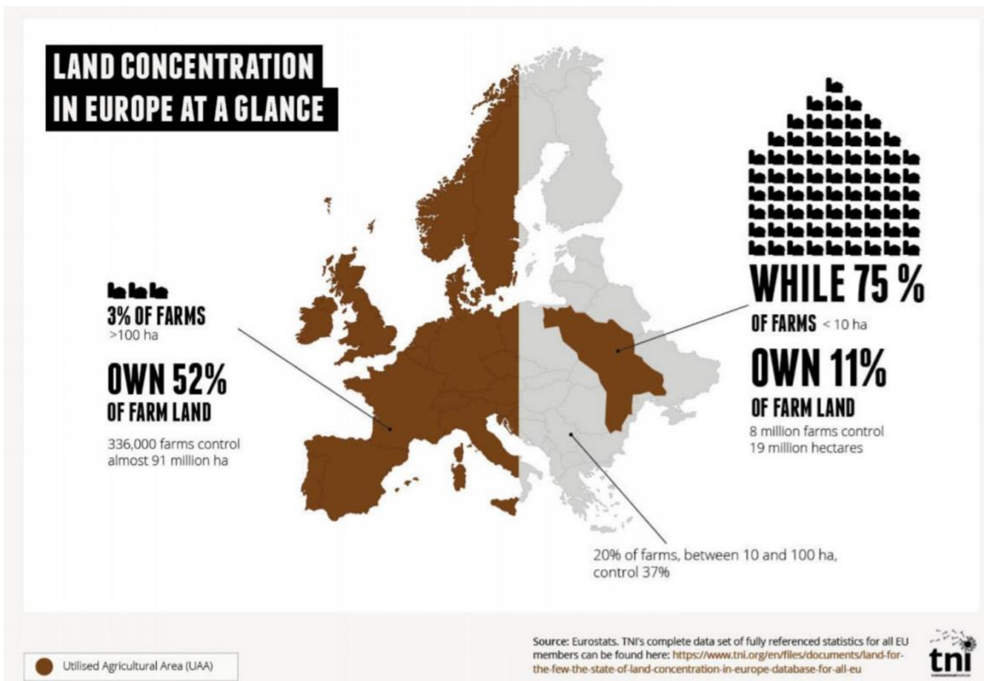


Figure 1. Land concentration in Europe

Source: Kay (2016)

[1] Land grabbing – a process of buying or leasing of very large pieces of land by any person or entities via any means – legal or illegal (Borras et al., 2011)

The Transnational Institute provides some infographics, which show that a huge share of small farmers controls only 11% of the total European arable land.[2] Considering the regional distribution of the European land concentration, Bulgaria and Hungary had the highest measures of land inequality in 2013 with the Gini coefficient equal to 0.93 and 0.91 respectfully.[3] The Gini coefficient lies between 0 and 1, where 1 means that a single agricultural holding holds all farmland. Romania, Italy, Poland, and Sweden were also among the countries with the highest measure of land concentration. Surprisingly, land in the EU was more unevenly distributed than income in 2013, with the income Gini coefficient equal to 0.3 and the average farmland usage Gini coefficient of 0.82.

Although all EU countries do not have a moratorium on land sales the situation with land concentration is similar to Ukrainian. It is believed that in Ukraine 10 biggest export-oriented agricultural holdings control about 2.8 million ha and some oligarchs use up to several hundreds of thousands of hectares each. According to the SSSU, 8.4% of all agricultural entities, with the area in use more than 1000 ha, produced 65.4% of all Ukrainian agricultural output, while those holding less than 1 thousand ha (91.6 %) cultivated 34.6% of all output in 2018.[4]

Excessive land concentration and its measure is an issue in Ukraine and one of the hottest topics discussed in recent years. Since 1991, Ukraine is implementing land reform. For now, the sales transactions for about 41 mn ha are restricted, which violates the constitutional rights of about 7 mn private landowners and therefore limits access to finance, productivity growth, and tax revenue in the rural areas.[5] The official launch of the land market and the ongoing discussion about different

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[2] Land for the few Infographics (TNI, 2016)

[3] Land for the few Infographics (TNI, 2016)

[4] SSSU

[5] https://voxukraine.org/en/land-reform-strategy-in-ukraine-until-2020/

scenarios of land ownership restrictions in Ukraine requires strong empirical evidence regarding the effects of various levels of land concentration on production and revenues as well as rural development.[6]

So the main goal of this study is to measure the effect of concentration of land use local communities in particular to fill the gap in empirical literature concerning the problem as well as to understand how to conduct the right government policy regarding the land market establishment. Deininger (2003) states that high land concentration affects human lives by giving power to big landlords over the local resources and labor markets, thus, making it possible to lower marginal costs, including employees' wages and a result blocking the development of the local community. Also, monopoly power granted to the small number of producers may have an impact on the development of infrastructure in the region by influencing local authorities, which may have an ambiguous effect on local citizens. Hence, in the paper, we focus on the two empirical questions. The first one regards the effects of land concentration on the well-being and development of local communities, and the second one is about the effects of land concentration on the political economy and the provision of local public goods. In line with the literature, we expect to see the negative effect of land concentration on the development of local communities.

The rest of the thesis paper is organized as follows: the second chapter gives the literature review on theoretical and empirical aspects of the impacts of land concentration. The third chapter discusses the methodology. The fourth chapter provides the data description. The fifth chapter presents the empirical results. Chapter six concludes with a summary of the main findings.

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[6]http://agroportal.ua/ua/views/blogs/fermery-ili-agrokholdingi-ili-pochemu-krainosti-ne-v-polzu-agrarnomu-sektoru-i-selu-ukrainy/

*C h a p t e r 2*

# LITERATURE REVIEW

The discussion of the effects of land concentration is a popular topic in both theoretical and empirical literature. Various studies confirm the negative impact for local communities from unequal land distributions. All of them, for example, Deininger (2003) and Glass et al (2019) support the idea that land concentration gives power to the landlords over local resources and authorities of local communities, diminishes opportunities for local family, small and medium farms to develop and blocks regional economic growth.

Galor (2009) and Binswanger-Mkhize (2007) state that the market itself should regulate and allocate the distribution of land among players in the most efficient way, but in the reality, the situation when big landowners are powerful market players is typical all over the world. Landlords aim to control a big share of the arable area to pay less for the resources they use or use a considerable amount of subsidies from the government. Deininger (2003) finds out that some state policies such as different taxation rates or tax reductions can enhance the inequality of land distribution.

In addition, immature financial system and policy, in the form of high interest rates and thus lack of access of small farmers to the loans to buy land, intensify land concentration. All these combined with probable biases of local authorities, as a result of possible influence on political satiation in the region by large landlords, force small enterprises to sell land to larger farmers (Glass 2019).

The negative consequences of the land concentration are described in detail by Deininger (2003). He states that the initial distribution of land affects the nature and rate of long-term economic growth. He provides the evidence by plotting Gini coefficients, which measure the concentration of the variable in its distribution, for different countries together with GDP growth. Figure 2 illustrates that countries with higher concentration index tend to have lower GDP growth, while those with low inequality are developing at higher rates.

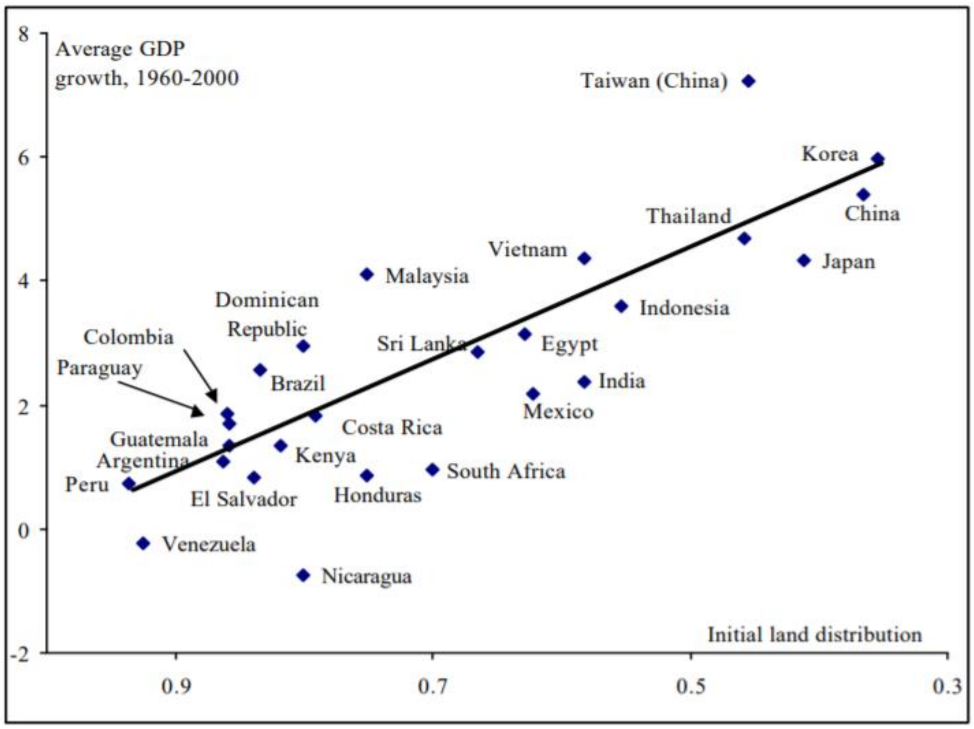


Figure 2. Initial land distribution and economic growth, selected countries

Source: Deininger (2003)

Deininger (2003) explains the differences by giving two possible reasons. First, land concentration reduces the efficiency of resource use meaning that landlords holding a big share of land in the region can have monopoly power over labor and output markets. Thus, landowners can lower their marginal costs on labor and diminish the chances for people to become wealthier as well as to decrease the incentives of people to accumulate human capital. Second, high land concentration affects the political economy and provision of local goods meaning that big landlords can influence the development of infrastructure in the region or have an impact on local authorities and pursue their interests. Several empirical studies, for example, Foster and Rozenzweig (2001) found that land ownership has an impact on the efficiency of public-goods supply. Deininger (2003) also discusses the effect of endowment inequality on welfare losses. Following the study of Deininger (2003), we will use these two statements as the main hypothesis of the research.

Deininger (2004) also states that property rights on land are key determinants of economic development and suggests that correctly conducted land reform helps to decrease inequality in the wealth among people as well as increase the ability to access production resources.

The empirical evidence on the topic is widely presented in the literature, however, it mainly includes comparisons between countries. Nevertheless, some studies explain the effect of land ownership inside different countries.

Cinnirella and Hornung (2016) studied the relationship between large landownership concentration and the expansion of mass education in nineteenth-century Prussia. They used a fixed effect panel data model and found a negative association between landownership concentration and enrollment rates.

Popovici et al (2018) study the effect of land concentration on socio-economic development of rural communities and find that areas with massive land concentration (almost 80% of all Local Administrative Units) have a low level of socio-economic development. The authors used a special kind of index to measure the impact of concentration and have not used the econometric modeling methods.

Roberts and Key (2008) examine the effects of land concentration on agricultural payments by using panel data models along with spatial regression analysis –

generalized additive model. They use acre weighted mean and median to measure the concentration of land ownership They find a positive association between government payments and land concentration growth.

Tavrov and Nivievskyi (2019) developed a theoretical partial equilibrium framework, which helped to understand how market imperfections such as ownership restriction on agricultural land holdings affect welfare. The main purpose of imposing such a restriction is preventing excessive land concentration. According to the analysis, such a policy resulted in a reduction of welfare in the economy. The framework considers the situation on the land market but does not measure the effect of additional land concentration on the wellbeing of people.

In general, both theoretical and empirical studies and confirm the negative effect of land concentration on the wellbeing of the rural population. Although there are a lot of international and some Ukrainian theoretical and empirical studies of the topic, there is a huge lack of empirical studies for Ukraine.

*Chapter 3*

# METHODOLOGY

The process of assessing the effects of inequality in landholdings on rural wellbeing requires the analysis and choice of the most suitable measure of land concentration.

## 3.1 Identifying the measurements of land concentration

The economic and statistical literature provides a great variety of methods measuring the concentration, in particular the concentration of farmland usage. When it comes to the decision of the measurement the first problem occurs – whether to choose concentration or inequality index. The next problem is the decision on how to calculate the chosen measurement based on the data available. (Bernat, 1986)

The measurements of land concentration differ not only in the computation methods but also in the differences in the conclusions that can be made based on the results obtained. Thus, it is important to examine closely the properties of each measurement and decide which to choose.

1. The Gini coefficient. It is one of the most popular coefficients to measure the inequality in the distributions of a certain variable. It is also widely used due to its relationship with the Lorenz curve and the simplicity of computation and interpretation. In most cases, the Gini coefficient is mainly used to measure the inequality in income and wealth between different groups of population or territorial units. However, it is also one of the most common measures of farmland usage concentration. There are a lot of methods on how to calculate the Gini coefficient, but we will use the following one, proposed by Bernat (1986). For

variable values $y_i, i = 1\ to\ n$, indexed in non-decreasing order such that $y_i \leq y_{i+1}$ the coefficient can be calculated as:

$$G = \frac{1}{n}\left(n + 1 - 2\left(\frac{\sum_{i=1}^{n}(n + 1 - i)y_i}{\sum_{i=1}^{n} y_i}\right)\right) \tag{1}$$

This may be rearranged to:

$$G = \frac{2\sum_{i=1}^{n} iy_i}{n\sum_{i=1}^{n} iy_i} - \frac{n + 1}{n}, \tag{2}$$

where $y_i$is the landholding of the ith farm, *n* – is the number of farms in each of the territorial units. The index takes values between 0 and 1, with 0 meaning complete equality and 1 – complete inequality.

2. Theil index. Theil index was derived from the generalized entropy index from the information theory (entropy).[7] The general formula of the entropy index is:

$$\max H(y) = yln\left(\frac{1}{y}\right), \tag{3}$$

[7] The information entropy, often just entropy, is a basic quantity in information theory associated to any random variable, which can be interpreted as the average level of "information", "surprise", or "uncertainty" inherent in the variable's possible outcomes. The concept of information entropy was introduced by Claude Shannon in his 1948 paper "A Mathematical Theory of Communication"

where $y_i$ is the share of land owned by the ith ownership unit in each of the territorial units. The value of the equation (3) is 0 when there is complete inequality – one unit owns all the land and is $\ln(n)$ when the land is equally distributed among the ownership units. To reach better interpretability of the coefficient, it was rearranged to take values from 0 to 1.

$$T = \frac{\sum_{i=1}^{n}\left(\frac{y_i}{\bar{y}}\right)\ln\left(\frac{y_i}{\bar{y}}\right)}{\ln(n)}, \tag{4}$$

where $\bar{y}$ is the average landholding in each territorial unit.

3. Coefficient of variation. This measure of variation is widely proposed by authors of the theoretical studies as well as highly popular as the measure of the concentration in the empirical literature. (Bernat 1986, Camberlin and Jayne 2018). The usage of this method is quite intuitive from the statistical point of view – values close to 0 imply low dispersion of values and more normal distribution, while values tending to infinity mean the presence of the extreme values from either one or both sides of the distribution of a variable. The measure is calculated as the ratio between the standard variation and the mean value of the variable. The formula for the coefficient is the following.

$$CV = \sqrt{\frac{\sum_{i=1}^{n}(y_i - \overline{y})^2}{n}}\frac{n}{\sum_{i=1}^{n} y_i} \tag{5}$$

4. Hectare weighted mean and median farm size (farmland ownership). Robets and Key (2008) use the weighted mean and median rather than ordinary mean and median to measure the concentration of land ownership because "these measures are extremely sensitive to the definition of a farm …, and are heavily influenced by a growing number of small "hobby" farms". The formula for the weighted mean is the following.

$$weigted\ \bar{y} = \frac{\sum_{i=1}^{n} y_i * f_i}{\sum_{i=1}^{n} f_i}, \tag{6}$$

where $f_i$ is the frequency of each ith observation. Following Roberts and Key (2008) the frequencies are nothing else than the sum of hectares (the size of the land-use area of each farm) squared, divided by the sum of hectares of all farms in each territorial unit.

According to the theory of statistics weighted median, which is robust to outliers on the contrary to the mean value and allows for non-uniform weights, is the 50% weighted percentile. The weighted percentile is calculated based on the percentage in total weights rather than on the percentage in the total number of observations. In the case of our research, the weights are the farmland sizes of each farm. For each $y_i, i = 1\ to\ n$, with positive weights $w_i, i = 1\ to\ n$, the weighted median is the element $y_k$ satisfying the condition:

$$\sum_{i=1}^{k-1} w_i \leq \frac{1}{2} \tag{7}$$

The hectare weighted median farmland size is the size such that half of the agricultural land in the district is operated by smaller farms and half by the largest. Empirics show that weighted median and specially weighted mean farmland sizes are much larger than unweighted statistics showing that large farms control most of the farmland in the particular region. We would use both mean and median in our calculations, however, most of the industrial organization economists treat weighted median as the standard measure of concentration. (Roberts and Key, 2008)

5. Herfindahl-Hirschman index. The index is mainly used in the market concentration analysis to determine the presence of the monopoly on the market. If we consider the land market in each of the territorial units, we can apply this method to measure the concentration, in other words, the monopoly on the district level markets. The calculation of the coefficients is extremely simple – the Herfindahl-Hirschman index is the sum of shares of the land each farm is operating on in the total area of the district expressed as a whole number (not a decimal). From the market analysis theory, we know that the greater is the value of the index the higher is the monopolization of the market, in particular, values of HHI more than 2,500 indicate a highly concentrated market.

6. The share of the farms with land in use of more than 1000 ha. This measure is rather straightforward and does not require additional data and complicated computations.

All presented methods have both advantages and limitations that are well explained in the economic literature. That is why we will use all of the measures to show the relationship between land concentration and rural wellbeing. The measure of coincidence between those coefficients calculated as the correlation is presented in Chapter 4.

## 3.2 Identifying the dependent variables

For the analysis and measuring the effects of land concentration on rural wellbeing, the local budget and expenditures of local communities are taken. After the decentralization reform launched in 2014[8] several Laws on Amendments were introduced to the Budget and Tax Codes of Ukraine, which resulted in a financial decentralization of the local communities. Thus, according to the Decentralization Reform Portal, local budgets have increased by UAH 165.4 billion during the last years: from UAH 68.6 billion in 2014 to UAH 234 billion in 2018[9]. According to the Budget Code of Ukraine[10], central and local governments receive taxes and fees in different proportions. After the decentralization reform, some of the shares were changed, indicating the relocation of revenues from fees and taxes to the local level, which, subsequently, resulted in the growth of local budgets. While the number of rural population remained almost the same (decreased by 0.4% from 2018 to 2019)[11], the average local budget revenues per capita increased from 4,471 UAH to 5, 447 UAH (or by 21.8% in nominal terms) in 2019 compared to 2018[12].

According to the Budget Code of Ukraine and Budget Revenues Classification of Ukraine[13], local budget revenues consist of 60% of personal income tax, except for income tax on income in the form of interest, 100% of the rent for the special use of the forest and subsoil of local significance, income tax on enterprises and financial institutions of communal property, land payments, vehicle parking fee, tourist tax, real estate tax, environmental tax, a single tax, state duty at the place of

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[8] https://decentralization.gov.ua/about

[9] https://decentralization.gov.ua/about

[10] Budget Code of Ukraine: https://zakon.rada.gov.ua/laws/show/2456-17

[11] http://www.ukrstat.gov.ua/operativ/operativ2007/ds/nas_rik/nas_u/nas_rik_u.html

[12] https://www.kmu.gov.ua/diyalnist/reformi/efektivne-vryaduvannya/reforma-decentralizaciyi

[13] Budget Revenue Classification of Ukraine: https://zakon.rada.gov.ua/rada/show/v0011201-11

action and issuance of documents, excise tax on the sale of excisable goods by retail trade entities and other small taxes and fees. As local budget revenues stay on-site in the full amount and are exercised for local communities' purposes, they can measure the wealth of the community. We do not include subventions received from the central government as well as subventions and grants received from assistance programs of the European Union, foreign governments, international organizations, donor agencies to the calculation of the budget revenues, as we are rather interested in the revenues generated in the community. By dividing the number of budget incomes by the size of the population, we receive a unified measure of rural wellbeing which can be compared both in time and cross-section.

As a second measurement of rural wellbeing, we use only local taxes received by local governments, which include real estate tax, a single tax, vehicle parking fee, and tourist tax. Single tax per capita accounted for almost half of the amount of taxes per capita (44.9% on average[14]) at the local level. The single tax, standardized by the population or area of the territorial unit, may serve as a proxy for the size and profitability of local businesses. Thus, by treating the amount of local taxes per capita as a dependent variable, we try to estimate the effect of land concentration not only on rural wellbeing but also on the economic activity in the area.

To measure the possible effect of land concentration on the political economy and provision of public goods in the community, firstly, we use the definition of public goods by Varian (2010), in particular, "public good – is a good that is both non-excludable and non-rivalrous, in that individuals cannot be excluded from use or could benefit from without paying for it". Secondly, we use the Functional

[14] Own calculations based on the "State and local budget revenues" data available at Open Budget Portal

Classification of Budget Expenditures and Lending of Ukraine[15] to calculate the number of public goods. The resulting measure of government expenditures on public goods includes the expenditures on education and schooling, health-care, culture (financial assistance to theaters, libraries, natural reserves, etc.), physical culture and sport, utilities (ensuring the collection and removal of garbage and waste, water supply and sewerage, organization of settlements improvement, etc.) and expenditures related to construction, reconstruction, repair and maintenance of roads. As a result, we are able to test whether the high land concentration, meaning the localization of land in use in one hand, can somehow be associated with local expenditures.

### 3.3 Modelling the effect of land concentration on rural wellbeing

In the analysis of measures of land concentration and its effects panel data estimation is frequently used (Roberts and Key, 2008). The models of this research are estimated using fixed-effect within and between estimators, random effects, and pooled OLS panel regression in order to control for unobserved local-specific characteristics that may affect the wellbeing of the population in the area. In such a way we partially control for the endogeneity issue. The final choice of the specification of the models is based on the Hausman test for correlated effects statistics (Wooldridge, 2010). The test tests the null hypothesis, that covariance between independent variables and unobserved time-invariant error is absent, which is assumed by the random-effects model, versus the alternative, that variables and the error term are, indeed, somehow correlated, which is the assumption of the fixed-effect model.

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15 Functional Classification of Budget Expenditures and Lending of Ukraine: https://zakon.rada.gov.ua/rada/show/v0011201-11

The main hypothesis to be tested is that the high land concentration in the particular local community negatively affects the wellbeing of rural citizens. The specification of the econometric model being used to test the main hypothesis is the following:

$$y_{it} = \beta_{ylc} LC_{it} + \beta_{yfs} DS_{it} + v_t + \alpha_i + \varepsilon_{it} \tag{8}$$

where $y_{it}$ is the measurement of rural wellbeing in the particular local community and time period;

$LC_{it}$ – is the variable that measures land concentration for each observation (village) and time period;

$DS_{it}$ – is the matrix of local community-specific controls that affect rural wellbeing;

$v_t$ – is a time-variant error, which includes all time-specific characteristics that do not change across observations;

$a_i$ – is a time-invariant error, which includes all district-specific characteristics that do not significantly change across time (agro-climatic zones, soil fertility, political economy, level of the development of institutions, etc.).

In this study, we want to examine the pure effect of land concentration on rural well-being. In our case, we will use local budget revenues and local taxes in each territorial unit as a proxy measure of wellbeing due to the lack of other data, such as profits or wages of rural citizens, available for the rayon level in Ukraine (described in detail in section 3.2).

In order to test another hypothesis that land concentration influences the provision of local public goods we sum the expenditures of local governments on road building, environmental protection, development of utilities, health care, cultural development (libraries, museums, reserves, etc.), and education.

Community specific controls include the productivity measures in each village, in particular, crop yields (crop production per ha), and its interaction with other variables, which can produce interesting insides. For instance, the interaction between inverse crop productivity and concentration level may reveal some dependence between low productivity and high concentration on the local budget revenues in the average district (Roberts and Key 2008).

We also add a single tax obtained from entrepreneurship to the set of control variables in the regression on public goods expenditures. According to the Tax Codex of Ukraine, single tax stays on the local level and is used by the local governments.[16] The objects of unified taxpayers of the fourth group are agricultural producers. However, the law on inclusion the forth group payments into the local revenues came into force only in 2018[17], which is not under the scope of this research. Nevertheless, the single tax collected on the local level can be a good proxy for the level of business activity in the region, which, in turn, can influence the rural wellbeing through increased expenditures on public goods provision.

In order to control for both time-invariant and variant error occurring in the panel data models estimation, the theory suggests using two-way FE (fixed effect) model (Wooldridge 2010, Green 2003). Two-way within estimator assumes that non-zero time-dependent error ($v_t \neq 0$) is present in the model. These unobserved time-variant characteristics, for example, may include agro-climatic conditions (temperature regimes, moisture level, etc.) in different years, which highly influence

[16] http://sfs.gov.ua/nk/rozdil-xiv--spetsialni-podat/edynyi-podatok/

[17] http://ngoipr.org.ua/blog/podatkovi-dzherela-dohodiv-mistsevyh-byudzhetiv/

the output of agricultural production and thus the amount of taxes paid to the local communities.

The most common and efficient way of handling the problem is to use a two-way error model (Baltagi 013). Statistical software (R) and special packages allow for running two-way within model and correctly adjust the degrees of freedom. However, the interpretability of two-way FE is substantively difficult as the model produces estimates that are "complex amalgamation of variation in the over-time and cross-sectional effects" and relying on this model is not recommended until the necessary assumptions are well-stated and understood (Kropko and Kubinec 2018). An alternative way of handling this problem is to include dummy variables for n-1 years (one a base year) presented in the data. Yet, introducing more variables may result in the over-dampening of the model, reducing both useful and useless information obtained from the regression. Fortunately, in cases when the panel is short[18] including time dummies and running one-way FE is feasible (Wooldridge 2010). So we proceed with this method.

In addition, there are two ways of estimating the fixed-effect model – within and between. The difference between the two estimators lies in the methodology and interpretation of the coefficients. While within estimator estimates the model using time-series information in the data, between model is about cross-sectional differences.[19] The methodology of the fixed effect within estimator, in particular time-demeaning, does not allow to control for unobservable cross-sectional effect by including individual dummies, which reflect the changes between subjects. Thus, the interpretation of the regression coefficients is different. While, within estimator answers the question of what is the expected change in the dependent

[18] We have panel data spanning for two years (described in detail in Chapter 4)

[19] https://statisticalhorizons.com/between-within-contextual-effects

variables, if the regressor changes by 1, between estimator, answers the question – what is the expected difference between y1 and y2, where y1 and y2 are dependent variable levels of different individuals if they differ in the regressor by 1 unit (Wooldridge 2011). In the ideal case and right specification, the regression coefficients from running the random effects model should be asymptotically equal to the average of both within and between fixed-effect models (Bell et al. 2014).

In order to minimize the time-invariant endogeneity, we include a set of dummies that control for the region (the highest administrative unit (oblast) dummies) to random effects, between fixed effects and pooled OLS model. Oblast fixed effects can somehow control for such a time-independent factor as an agro-climatic zone which may be correlated with the measurement of land concentration, as agricultural production is highly dependent on the type and quality of soil as well as on climate (Roberts and Key, 2008). Also, oblast dummies may control for such factors as the level of the development of institutions in the region as well as the state of political economy.

*Chapter 4*

# DATA DESCRIPTION

## 4.1 Data source and preparation

The major source of the data for this research is Ukrainian farm-level accounting data for an unbalanced panel of agricultural enterprises collected by the State Statistics Service of Ukraine (SSSU) – form 29-SG. This database contains 87,703 observations for 2016-2017 years only for farms that produce crops. The dataset includes the following variables: KOATTU (Classification of Objects of the Administrative-Territorial System of Ukraine) code where the farm is registered, year, area of land in operation, amounts of output for all of the types of crop production (i.e. sunflower cultivation, soy cultivation, tomato cultivation, etc.). Using these data, the measurements of land concentration are calculated.

The source of the dependent variable is a manually combined dataset from 3 data sources: "State and local budget expenditures by economic classification", "State and local budget expenditures by functional classification" and "State and local budget revenues" collected by the Ministry of Finance of Ukraine and retrieved from the Open Budget Portal.[20]

The data contain 21,258 observations and include all territorial units of Ukraine from the level of big cities and oblasts (admin 1 and 2) to the level of districts (rayons) and village councils (admin 3 and 4). The dataset includes total budget revenues and expenditures of each territorial unit as well as its further breakdown

[20] https://openbudget.gov.ua/analytics/incomes

into different types. We kept only observations spanning for 2016-2017 years for village councils in the dataset which resulted in obtaining 17,095 observations.

The following steps were taken to prepare the final dataset:

- Farms with 0 land in use were deleted from the sample, as we are not interested in farms which do not operate on land. The number of lost observations was not significantly large given the size of the sample.
- We kept village councils where there were at least 2 farms registered, which is necessary for calculating some concentration measures. For instance, the natural logarithm of the number of farms operating in the community is taken as the denominator on the formula of Theil index (4). As the natural logarithm of 1 is zero, the Theil index will produce infinite values.
- Variables that describe budget revenues and expenditures were calculated from the raw data using budget classificatory.
- The budget dataset was merged with the data on population and area of the territorial unit, obtained from the SSSU 6-zem form, in order to make the cross-sectional comparison.
- All missing and negative values in budget revenues and expenditures variables were converted to 0 assuming that missing value is nothing else than an absence of a certain type of tax, for example, in the budget of a village council.
- Firms that produced nothing during 2016-2017 years were dropped, as we are not interested in them.
- Budget revenues and expenditures dataset was merged with agricultural production data using KOATUU code and year. The measurements of concentration were calculated for each territorial unit and year.
- All variables of interest were cleaned of extreme outliers by deleting the $99^{th}$ percentile of the distribution.

- The data on budget revenues and costs were deflated using annual price indexes (CPI) and are now represented in the 2016 year units.[21]
- To all variables of interest, which are 0, 0.01 was added in order to be able to take logs (as log(0) = -∞).
- All datasets were merged using the territory unit ID - KOATTU code and year, which uniquely identifies the location of each territorial unit and each farm in Ukraine.

The final dataset consists of 124 variables and 10,323 observations spanning across the 2016-2017 years. For the purposes of the analysis, we use only 18 variables. The detailed description of the variables is presented in Table 1.

Table 1. Description of the key variables

| **Variable** | **Description**[22] |
|---|---|
| **Local budget revenues, UAH/cap** | Budget revenues (taxes and fees) receives by local governments, which stay at the local level |
| **Local taxes, UAH/cap** | Local taxes received by local governments, which stay at the local level |
| **Single tax, UAH/cap** | Single taxes received by local governments and are a part of local taxes |

[21] CPI in 2017 was 113.7, source: http://www.ukrstat.gov.ua/operativ/operativ2006/ct/cn_rik/isc/isc_u/isc_m_u.htm

[22] Described in detail in section 3.1 – 3.2

Table 1. - continued

| | |
|---|---|
| **Expenditures on public goods, UAH/cap, UAH/ha** | Local government expenditures on public goods provision per capita and per hectare of land in the community |
| **Yields, quintal/ha** | Land productivity of agricultural producers calculated as production divided by the land in operation |
| **Inverse productivity, ha/ quintal** | Inverse measure to productivity, calculated as 1 divided by productivity |
| **Area in use, ha** | Area in operation by agricultural producers |
| **Theil index** | The measure of concentration, where the higher is the value of index the more excessive is the concentration |
| **Coefficient of variation** | The measure of concentration, the coefficient of variation of the mean farm size in term of land in operation, the lower is the value the more normal is the distribution of land in use, the lower is the land concentration |
| **Weighted average, thousand ha** | The measure of concentration calculated as the mean farm size weighted by the share of each farm in the total area of the community, the higher if the measure the higher is the concentration |
| **Share of farms > 1000** | The measure of concentration, calculated as the share of farms in the community which operates on more than 1000 ha of land[23]. In case of high concentration, the share should be big |

[23] SSSU define large agricultural producers, as those which operate on more than 1000 ha of land

The descriptive statistics of the main variables are presented in Table 2.

Table 2. Descriptive statistics of variables in the dataset

| Statistic | N | Mean | St. Dev. | Min | Max |
|---|---|---|---|---|---|
| Village council agro area, ha | 10,323 | 5,723.3 | 3,926.8 | 90.5 | 62,868.9 |
| Population | 10,323 | 1,599.5 | 1,615.4 | 62 | 25,085 |
| Local revenues, UAH/cap | 10,323 | 1,895.9 | 5,327.6 | 0.0 | 375,609.9 |
| Local taxes, UAH/ha | 10,323 | 320.7 | 663.6 | 0.0 | 21,738.3 |
| Local taxes, UAH/cap | 10,323 | 1,175.5 | 2,790.1 | 0.0 | 199,306.1 |
| Single tax, UAH/ha | 10,323 | 148.9 | 294.2 | 0.0 | 11,195.8 |
| Single tax, UAH/cap | 10,323 | 527.4 | 380.0 | 0.0 | 10,474.5 |
| Expenditures on public goods, UAH/ha | 10,323 | 174.4 | 548.6 | 0.0 | 20,411 |
| Expenditures on public goods, UAH/cap | 10,323 | 465.2 | 1,330.9 | 0.0 | 95,900 |
| Expenditures on public goods incl. roads, UAH/ha | 10,323 | 201.0 | 615.8 | 0.0 | 21,443 |
| Expenditures on public goods incl. roads, UAH/cap | 10,323 | 525.8 | 1,428.3 | 0.0 | 104,019 |
| Yields, quintal/ha | 10,323 | 20.2 | 76.8 | 0.1 | 4,634.2 |
| Production, th tones | 10,323 | 117.7 | 220.2 | 0.003 | 5,543.3 |
| Area in use, ha | 10,323 | 2,823.3 | 3,841.5 | 0.2 | 47,280.1 |
| Theil index | 10,323 | 0.5 | 0.2 | 0.0 | 0.9 |
| Coefficient of variation | 10,323 | 2.7 | 3.1 | 0.0 | 62.2 |
| Weighted average, thsd ha | 10,323 | 1.2 | 0.6 | 0.0 | 7.6 |
| Share of farms > 1000 ha | 10,323 | 0.2 | 0.2 | 0.0 | 1.0 |

According to Table 2, the Theil index lies between 0 and 0.9, where 0.9 indicates the extreme level of concentration. Thus, we may conclude that there are local communities, where a big amount of farms operates on small pieces of land, and, on the contrary, one big farm controls all available land. This is confirmed with other measures of concentration, for instance, the share of farms with land in use of more than 1000 ha. Some communities have rather diversified land distribution between farmers, whereas, in others, all land is in the hands of several biggest producers.

## 4.2 Data description

The key independent variable is the level of concentration. Following Chapter 3, the measurements of the concentration of land usage were calculated using six different methods.

Because of the fact that some agricultural producers operate on the areas, that are significantly larger than the total area of the community, the calculations of the Gini coefficient and HHI become not trustable. Gini coefficient, as well as HHI, are based on the share of each farm's land in use, which sometimes is more than 1. Hence, the Gini coefficient no longer lies between 0 and 1, and in our case, has a minimum at 0.48 and maximum at 65156.2. The same problem occurred with the HHI, which values should lie between 0 and 10000. The actual values fall in the range between 0.25 and 47280.2. Because the data are not suitable for calculation of the Gini coefficient and HHI we are left only with 4 alternative concentration measures: Theil index, coefficient of variation, weighted average, and share of farms with land in operation more than 1000 ha.

To understand whether these measures are consistent with each other the correlation plot was constructed (Figure 3).

All measurements of concentration are highly correlated with each other, except for the variable, which describes the share of farms in the village council with land in holding and lease more than one thousand ha. The correlation matrix gives a certain conclusion that all these variables are able to equally determine the level of land concentration.

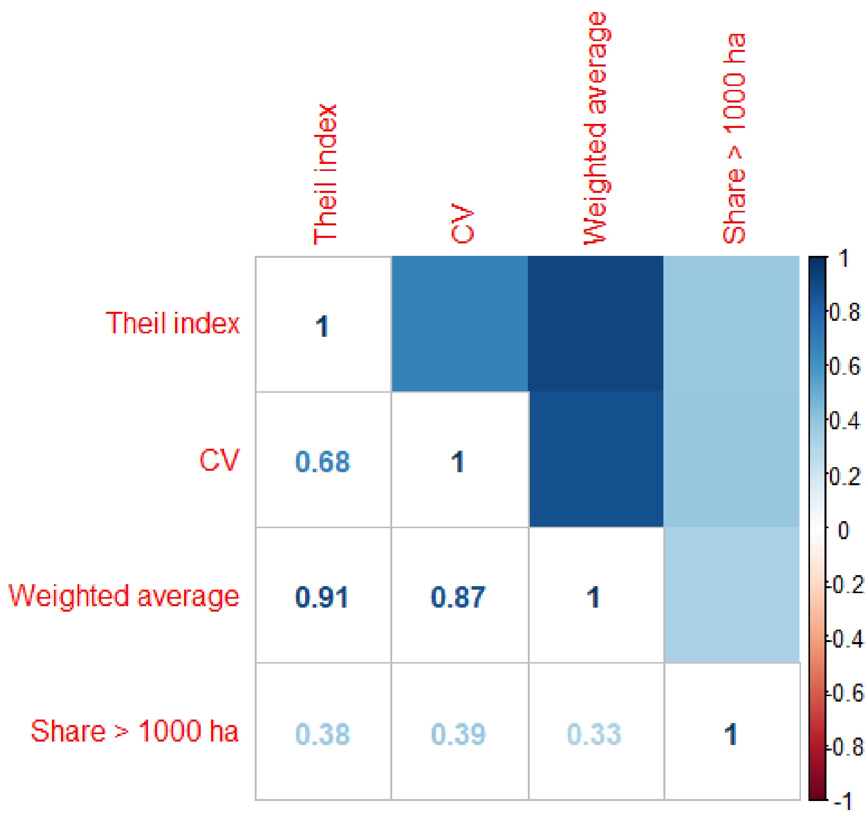


Figure 3. The correlation plot between different measures of land concentration

Source: Calculations based on the SSSU database

The next set of factors consists of different dependent and control variables, which are later included in the models. First of all, we want to look at the distribution of the main dependent variable – local budget revenues per capita (Figure 4).

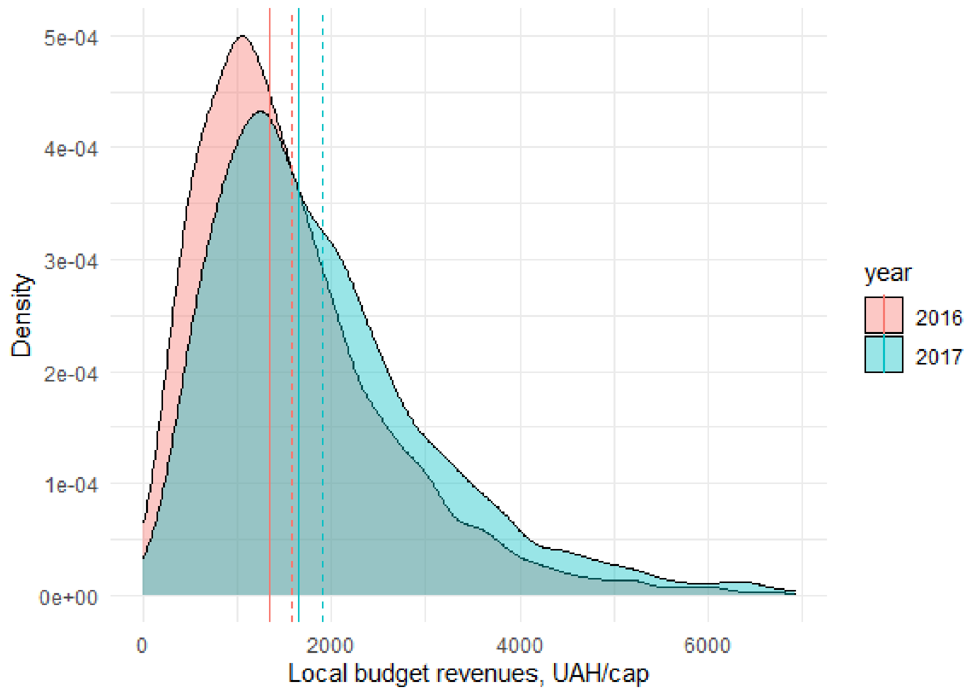


Figure 4. Distribution of local budget revenues per capita in 2016-2017[24]

Source: Calculations based on the Open Budget database

Local budget revenues per hectare had slightly different distributions in the 2016 and 2017 years. The mode of the distribution has moved to the right in 2017 meaning that the majority of the village councils started to receive higher budget revenues. The mean values have also shifted to the right as well as median levels. 50% of all village citizens received 1339.2 UAH per capita in 2016 and 1638.2 UAH per capita in 2017, which is on 22.3% more in real terms, which may partially confirm the benefits of the decentralization reform.

The next variable of interest is local taxes received by governments (Figure 5).

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[24] Dashed line shows the average of the variable, the solid line shows the median value

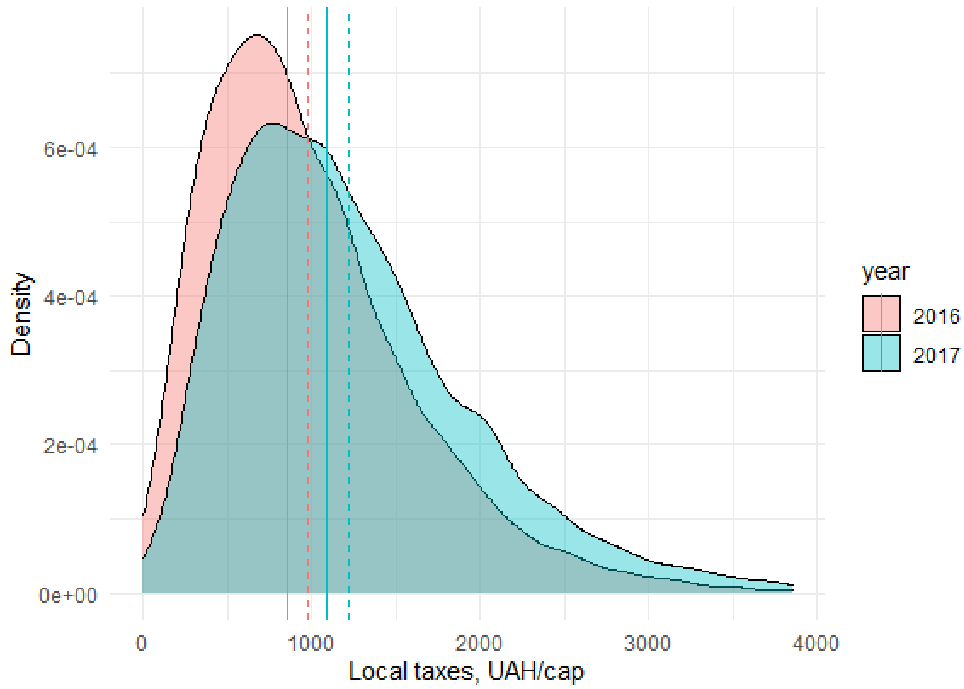


Figure 5. Distribution of local taxes per capita in 2016-2017[25]

Source: Calculations based on the Open Budget database

The distribution of the local taxes is almost the same as the local budget revenues. The distribution in 2017 became flattered indicating that more local communities started to receive similar to the average Ukrainian level of local taxes per capita. Both mode, mean, and the median levels shifted to the right, pointing to the increased wealth of local communities. On average each village council received 981.2 UAH per capita in the form of local taxes and fees in 2016, whereas in 2017 the level increased to 1214.6 UAH per capita pointing to the 23.8% growth.

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[25] Dashed line shows the average of the variable, the solid line shows the median value

The single tax as a part of local budget revenues and taxes is the next variable of interest (Figure 6).

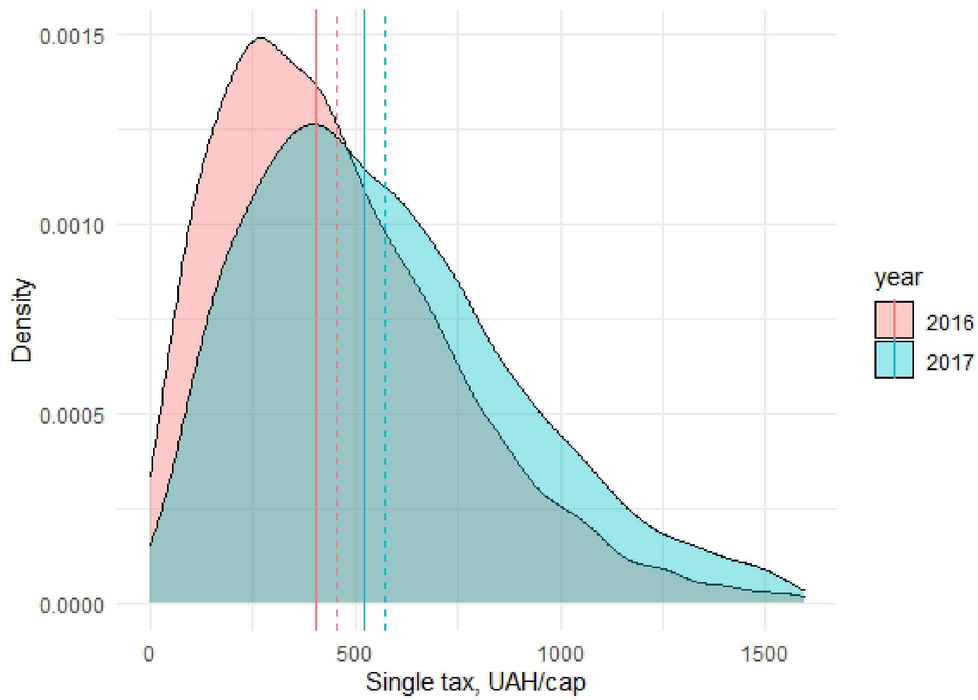


Figure 6. Distribution of the single tax per capita in 2016-2017

Source: Calculations based on the Open Budget database

Not surprisingly, both the mean, mode, and median level of the single tax per capita have shifted to the right indicating the growth in the amount of single tax collected on the local level. Such growth may be explained from two sides. Firstly, the increase may be connected to the development of business in local communities, in terms of the increased number of registered individual entrepreneurs. Alternatively, such an increase may be explained by the growth in profits and, subsequently, taxes. On average the real budget revenues from the single tax increased by 29% in 2017 compared to 2016.

On the contrary to the increased amount of single tax collected, the average and the median farm productivity decreased in 2017 compared to 2016 (Figure 7). The distribution is highly skewed to the right meaning that in the majority of village councils farm productivity is less than median and mean value.

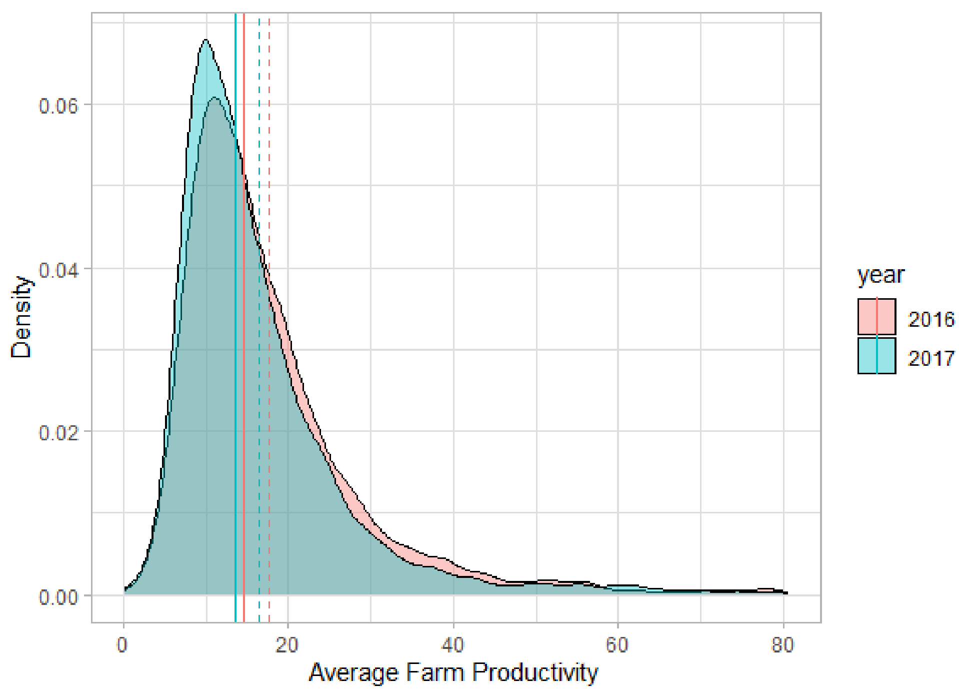


Figure 7. Distribution of average farm productivity, quintal/ha in 2016-2017

Source: Calculations based on the SSSU database

Finally, the distribution of public goods expenditures per capita has not changed at all in 2017 compared to 2016. The mean and the median levels changed only by 1-2 UAH per capita. Each village council on average spent 472.8 UAH/cap on public goods on average in 2017, and half of the villages spent less than 381.5 UAH/cap (Figure 8).

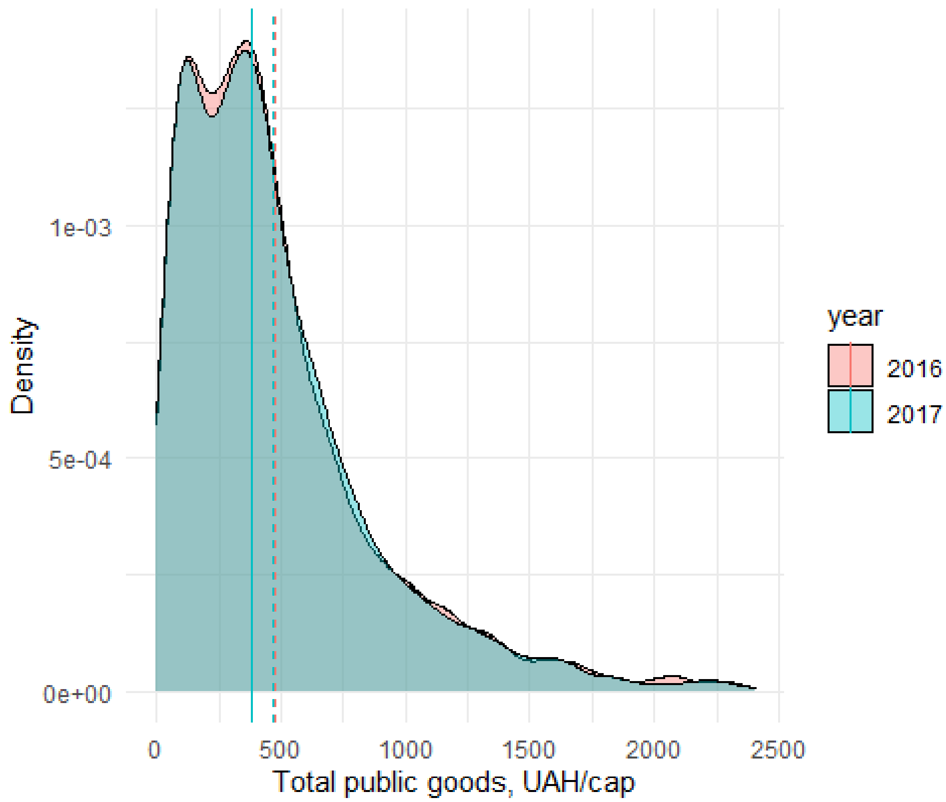


Figure 8. Distribution of expenditures on public goods per capita in 2016-2017

Source: Calculations based on the Open Budget database

The distribution of the public expenditure per hectare is more skewed to the right, and highly asymmetrical, even after deleting the 99% percentile. The mean, median, and mode values have not changed at all during the 2016-2017 years. Such a difference in the distribution of public goods per hectare and per capita may be explained by the more dispersed distribution of the total land area of the local community. That is why it is better to use the variable regarding the population.

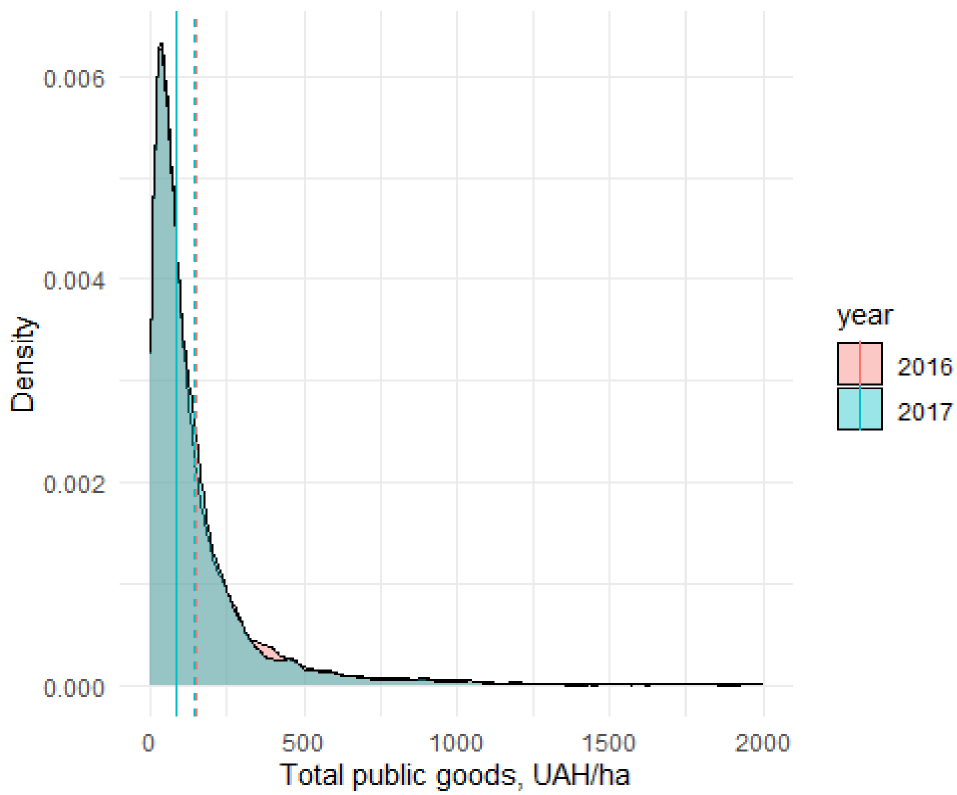


Figure 9. Distribution of expenditures on public goods per capita in 2016-2017

Source: Calculations based on the Open Budget database

Summarizing all stated above, we can conclude that all distributions of dependent and control variables are rather normal except for the public goods expenditures per hectare. Thus, we will estimate the models in levels. In addition, we conclude that budget revenues and expenditures increase in the 2017 year, which can be somehow contributed to the ongoing decentralization reform.

*Chapter 5*

# EMPIRICAL RESULTS

We use panel data models, random effects, between fixed effects and pooled OLS, to estimate the relationship between the level of land concentration measured using four different approaches and rural wellbeing measured as the number of local budget revenues, local taxes, and public goods expenditures per capita.

We decide on the estimation methodology by conducting the Hausman specification test. On the contrary to any FE model, Random effect estimation assumes that errors are not correlated with independent variables, and the time-invariant error is generated randomly, meaning that the dependent variable is independent of pre-defined and unobserved differences in observations (Bell et al. 2014).

Panel data is almost always a source of non-constant conditional variance of errors and clustering bias, which leads to lower standard errors of the coefficients and wrong inferences. Clustering means that observations can be related to each other and that some particular values of the explanatory variables can be identical or similar for groups of observations (Wooldridge, 2011). In our case, we have clustering, as not all village councils are present in the data and we have aggregated data of farm characteristics, so to control both for heteroscedasticity of errors and correlation between observations we report robust standard errors clustered by KOATUU code (presented in parentheses in the output tables).

## 5.1 The effects of land concentration on local budget revenues

Using the specification from Chapter 3, we estimate models on different dependent variables and the set of regressors described in Chapters 3 and 4. For testing the first hypothesis of the research: high land concentration negatively affects rural wellbeing, we build the main model with the local taxes as a proxy for the wellbeing of the rural population. We run 12 regressions with different measures of concentration as independent variables using different methods: random effects, between fixed effects, pooled OLS. Estimation results with different measures of concentration are presented in Table 3.

According to Wooldridge (2011), pooled OLS is employed when you select a different sample that is selected for each year, month, or another period of the panel data. Otherwise, the beta-coefficients produces by this model are biased and inconsistent, meaning that we cannot trust them. Although we have unbalanced panel data, the observations are the same in both years, as the code of KOATUU does not change in time. Though the pooled OLS model produces similar results as other models, we decided to stick to the random and between the fixed-effects model.

The Hausman statistics reported in Table 3 are very small and insignificant, meaning that the random-effects model is suggested. Thus, we assume, that the variables introduced in the regression are sufficient in explaining local budget revenues and there are no unobservable factors that may influence both dependent and independent variables. As a result, the model rather explains the variation between different local communities. Table 3 represents the shortened estimation results for the random-effects model, full results are in Annex A.

Table 3. Estimation results for time RE model for local taxes per capita

| | Local taxes UAH per capita | | | |
|---|---|---|---|---|
| | Theil index | Weighted Average | Coefficient of Variation | Share > 1000 ha |
| Theil index | 45.805 | | | |
| | (49.061) | | | |
| Weighted Average | | -4.380 | | |
| | | (17.382) | | |
| Coefficient of Variation | | | -8.945** | |
| | | | (4.054) | |
| Share > 1000 ha | | | | 124.612*** |
| | | | | (43.962) |
| Year 2017 | 241.145*** | 240.792*** | 240.307*** | 240.451*** |
| | (4.148) | (4.219) | (4.219) | (4.221) |
| Inverse productivity | 137.194 | -44.706 | -174.233 | -65.719 |
| | (274.897) | (211.948) | (139.747) | (144.409) |
| Theil index: Inverse productivity | -680.335<br>(530.053) | | | |
| Weighted Average: Inverse productivity | | -133.748<br>(165.219) | | |
| Coefficient of Variation: Inverse productivity | | | -3.582<br>(33.516) | |
| Share > 1000 ha: Inverse productivity | | | | -301.026<br>(525.769) |
| Observations | 10,116 | 10,116 | 10,116 | 10,116 |
| $R^2$ | 0.364 | 0.364 | 0.365 | 0.365 |
| Adjusted $R^2$ | 0.362 | 0.363 | 0.363 | 0.363 |
| F Statistic | 5,778.089*** | 5,778.988*** | 5,796.102*** | 5,796.346*** |
| Hausman test , Chi^2 | 6.62 | 10.63 | 11.14 | 4.43 |
| Notes: | ***Significant at the 1 percent level. | | | |
| | **Significant at the 5 percent level. | | | |
| | *Significant at the 10 percent level. | | | |

All measures of land concentration except for Theil index and hectare weighted average landholding is statistically significant at 5% level of significance. Holding other factors fixed, all of them show a different effect on local budget revenues, which does not allow us to accept or reject the null hypothesis we stated. According to the regression with the coefficient of variation as the measurement of land concentration, an increase in the coefficient of variation of average landholding by 1 unit is associated with the decrease in local taxes per capita by 8.95 UAH on average. On the contrary, additional percent to the number of farms operating on the area of more than 1000 ha, increases the local tax revenues by 124.6 UAH per capita on average. This implies, that local communities where the larger farmer is located receive more local taxes to the budget.

In other words, the less variant is the distribution of the land between farmers in the village, meaning the absence of cases of extreme values of land in operation, the more local taxes the local community receives.

Year dummy is also significant across models and indicated that on average local taxes in 2017 were higher than in 2016 by around 240 UAH/capita, which is also confirmed by the investigation of graphs in Chapter 4.

Local budget revenues are not influenced by the measurements of agricultural productivity and there is no significant dependency between local taxes and interaction between land concentration and agricultural productivity of farms in the village. Although local taxes include a single tax, which is also paid by agricultural producers, it turns out that there is no significant relation between single tax paid by average productivity of farmers.

To control for special correlation in the model (heteroscedasticity) we also introduce regional dummies (oblast dummies), where Vynnytsia region levels are taken as the base. The interesting fact is that almost all western Ukrainian regions, such as Ivano-Frankivsk, Rivne, Lviv, Chernivtsi, Zakarpattia, and Ternopil, have significantly lower budget revenues received from the local taxes than the central region Vynnytsia. On the contrary, all other regions have significantly larger values.

Because the results are not explicit and the effects of land concentration are not fully described we run the model with local budget revenues per capita. The estimation results are presented in Table 4 and in Annex B. Again, Hausman test statistics are small and insignificant, so we proceed to work with the random-effects model.

Table 4. Estimation results for time RE model for local budget revenues per capita

| | Local revenues UAH per capita | | | |
|---|---|---|---|---|
| | Theil index | Weighted Average | Coefficient of Variation | Share > 1000 ha |
| Theil index | 46.070 | | | |
| | (87.931) | | | |
| Weighted Average | | -7.313 | | |
| | | (30.253) | | |
| Coefficient of Variation | | | -13.704* | |
| | | | (7.059) | |
| Share > 1000 ha | | | | 174.289** |
| | | | | (76.630) |
| Year 2017 | 341.507*** | 340.983*** | 340.231*** | 340.292*** |
| | (7.230) | (7.336) | (7.334) | (7.338) |
| Inverse productivity | 218.563 | 41.454 | -243.718 | -200.596 |
| | (487.302) | (369.521) | (243.902) | (251.658) |
| Theil index: Inverse productivity | -1,158.880<br>(916.338) | | | |
| Weighted Average: Inverse productivity | | -349.043<br>(287.498) | | |
| Coefficient of Variation: Inverse productivity | | | -33.907<br>(58.327) | |
| Share > 1000 ha: Inverse productivity | | | | -11.819<br>(920.052) |

Table 4. - continued

| | | | | |
|---|---|---|---|---|
| Constant | 1,281.554*** | 1,311.947*** | 1,331.361*** | 1,256.160*** |
| | (54.812) | (54.173) | (45.281) | (45.976) |
| Observations | 10,116 | 10,116 | 10,116 | 10,116 |
| R2 | 0.293 | 0.293 | 0.294 | 0.294 |
| Adjusted R2 | 0.291 | 0.291 | 0.292 | 0.292 |
| F Statistic | 4,183.927*** | 4,188.116*** | 4,203.806*** | 4,199.193*** |
| Hausman test , Chi^2 | 6.62 | 10.63 | 11.14 | 4.43 |
| Notes: | ***Significant at the 1 percent level. | | | |
| | **Significant at the 5 percent level. | | | |
| | *Significant at the 10 percent level. | | | |

In general, the estimation results are almost the same as in the previous model with only local taxes. While local taxes substitute the large share of local budget revenues (around 62%[26]), it is not surprising that the effects are similar.

The effect of land concentration on rural wellbeing is not completely defined, even if we look at the total local budget revenues. Additional farms registered in a particular village council with land in use more than one thousand hectares will lead to an increase in budget revenues by 174.3 UAH/capita on average. On the contrary, the higher concentration of land in use, measured by the coefficient of variation, decreases local budget revenues on 13.7 UAH/capita on average.

Time and region effects are significant in the determination of changes in local budget revenues of the community. The regional diversification of budget revenues

[26] Own calculations based on Open Budget Portal data

is exercised at the same pattern as local taxes, in particular, western regions receive on average fewer revenues that other Ukrainian regions.

Summing up, the estimated models did not allow to precisely measure the effects of land concentration on rural wellbeing. Two out of four measures of concentration turned out to be insignificant, indicating either no dependencies between rural well-being and concentration or wrongly chosen dependent and independent variables. One of the problems may lie in the definition of "rural wellbeing", which cannot be explained by the local budget revenues. This variable can measure the overall wealth of the community but not the wealth of a particular citizen. That is why for better estimation and interpretation of the effect other dependent variables should be chosen. In addition, the set of controls should be broader, while we are restricted by the data available on the local level.

### 5.2 The effects of land concentration on the provision of local public goods

The second hypothesis of the research is stated as land concentration effects the provision of local public goods. To test it we estimate the random-effects model with public goods expenditures (described in Chapter 3). Following the methodology and the first estimation on local budget revenues, we continue running four different regression depending on the measure of land concentration.

Results of the Hausman test suggest that the individual-level effects should be modeled by a random-effects model. We also add region (oblast) dummy in the random effect estimation to partially control for individual-level differences as suggested by Roberts and Key (2008). The estimated results are presented in Table 5 and Annex C.

Table 5. Estimation results for time RE model for public goods expenditures per capita

| | Expenditures on public goods per capita | | | |
|---|---|---|---|---|
| | Theil index | Weighted Average | Coefficient of Variation | Share > 1000 ha |
| Theil index | 156.015*** | | | |
| | (45.792) | | | |
| Weighted Average | | 57.180*** | | |
| | | (15.020) | | |
| Coefficient of Variation | | | 15.454*** | |
| | | | (3.525) | |
| Share > 1000 ha | | | | 22.956 |
| | | | | (38.153) |
| Year 2017 | -11.005 | -10.929 | -11.274* | -12.376* |
| | (6.715) | (6.658) | (6.657) | (6.661) |
| Inverse productivity | -106.289 | -92.739 | -126.611 | -233.397* |
| | (251.802) | (204.702) | (137.078) | (141.049) |
| Single tax | 0.120*** | 0.122*** | 0.125*** | 0.123*** |
| Theil index: Inverse productivity | -216.299<br>(504.830) | | | |
| Weighted Average: Inverse productivity | | -133.615<br>(159.139) | | |
| Coefficient of Variation: Inverse productivity | | | -57.814*<br>(33.666) | |
| Share > 1000 ha: Inverse productivity | | | | 146.359<br>(500.928) |
| Constant | 365.501*** | 382.256*** | 412.271*** | 437.959*** |
| | (28.200) | (23.522) | (18.463) | (18.757) |
| Observations | 10,014 | 10,014 | 10,014 | 10,014 |
| R2 | 0.079 | 0.079 | 0.079 | 0.075 |
| Adjusted R2 | 0.076 | 0.076 | 0.077 | 0.072 |
| F Statistic | 850.877*** | 855.294*** | 860.722*** | 810.386*** |
| Hausman test , Chi^2 | 2.25 | 9.56 | 1.68 | 6.80 |
| Notes: | ***Significant at the 1 percent level.<br>**Significant at the 5 percent level.<br>*Significant at the 10 percent level. | | | |

All coefficients, land concentration measures, except for a share of the land more than 1000 hectares, are statistically significant and positive, meaning, that, indeed, an increase in land concentration is associated with the increase in expenditures on the provision of public goods to the population. The magnitude of the coefficients is different across models, however, we may certainly confirm that high land concentration positively affects public good expenditures. In terms of economics, such an effect is an indicator of the dependence of the political economy in the local community on the presence of farms, which operate on the large areas of land. The results confirm with the Deininger (2003), who stated that excessive land concentration influences the provision of local public goods.

Additionally, we may refer to the results of this model to test whether land concentration has an impact on rural well-being. As public goods include local government expenditures on health care, education, utilities, construction of roads, which indirectly (not in the monetary terms) increase the well-being of each person. Hence, we may also conclude that high land concentration increases rural-wellbeing by indirectly influencing the expenditures on public goods provided to the population.

The activity of the business in the area measured by the single tax was included in the model and appears to be statistically significant and have a positive effect on public goods provision. An increase in single tax by 1 UAH/capita is related to an increase in budget spendings by 0.12 UAH/capita on average. We may conclude, that level of business development in the local community positively affects government expenditures and, as a result, the wellbeing of the rural population.

On the contrary to the local budget revenues model, time dummies have no significant effects on the dependent variable, which indicates that average expenditures on public goods have not changed much during 2016-2017.

According to Annex C, only half of all regions showed statistically significant differences in the public goods expenditures from the Vynnytsia region. So, explaining differences between observations by the location of the village is not suitable, thus, we may conclude that expenditures on the public goods do not differ much across Ukraine. Although agro-climatic zones and regions of different types of soils do not fully coincide with the borders of each oblast, the inclusion of regional dummies can explain differences, for example, in local labor and capital markets, the efficiency of local government bodies both on the village and oblast level.

The effect of agricultural productivity on public goods provision is also insignificant. Consequently, the regression coefficients on interaction terms between inverse productivity and measures of land concentration are mainly not statistically significant across the models. The model with the coefficient of variation as the measure of land concentration is the only one, where agricultural productivity may play a role. It suggests, that when land concentration is high in the community but agricultural productivity is low, budget expenditures on the public goods are decreasing.

*C h a p t e r 6*

# CONCLUSIONS

High land concentration is considered to be a great issue almost in all countries in the world. It is believed that the concentration of land increases the poverty gap and unequal income distribution. The worldwide trends show that the percentage of owned land by the biggest agricultural companies increases drastically not only in the Latin American countries but also in Europe from year to year. Ukraine is also among such countries.

In this paper, we use a two-year panel (2016-2017) of village-council level data on budget and revenues of village councils to explore the effects of land concentration on rural wellbeing measured by local government revenues and expenditures on public goods. Additionally, we use wide panel data for the total area in the use and production of crop producers in Ukraine.

We find that there is a negative association between land concentration and rural wellbeing, measured as the local budget revenues per capita. However, the effects differ when using different approaches to the calculation of land concentration. We do not include transfers from the central government and are focused on measuring the effect of land concentration on pure local budget revenues, which are collected and used on the local level.

We use four alternative approaches to measure the land concentration, namely, the Theil index, the weighted average farm size, the coefficient of variation, and the share of farms in each local community with the land in use more than 1000 ha. These measures are correlated with each other, indicating the consistency of the approach.

We use different approaches to estimate the effects of land concentration, including pooled OLS, between fixed effect model and random effects. All of the estimators give similar results in terms of the sign, magnitude, and significance of the variables. Although all approaches have their limitations, we decided to report random effects for both models as suggested by the Hausman specification test.

We are not able to reject or confirm the main hypothesis of the research regarding the negative effect of excessive land concentration on rural well-being measures as local budget revenues, due to the ambiguous and not defined results. On the contrary, land concentration is significantly and positively related to public goods expenditures in the communities. This may be connected to the fact that local budget revenues are calculated as those that are collected and stay at the local level, while local budget expenditures are the composition of both own expenditures and transfers received from the central government. Thus, the situation with the concentration of land use in the community may have a different impact on the provision of public goods and decisions made by local authorities.

As public goods include local government expenditures on health care, education, utilities, construction of roads, which indirectly (not in the monetary terms) increase the well-being of each person. Hence, we may also conclude that high land concentration increases rural-wellbeing by indirectly influencing the expenditures on public goods provided to the population. Thus we can reject the main hypothesis of the research about the negative effect of land concentration on rural well-being.

Summarizing all stated above, the effect of land concentration on rural well-being is ambiguous and highly depends on the chosen measure of well-being. Additionally, the increase in land concentration is, indeed, associated with the increase in expenditures on the provision of public goods to the population, which may indirectly and positively influence on rural population's lives.

The ways for further research include the broadening of the dataset in time and including farm performance indicators. Moreover, more sophisticated and flexible models should be introduced to measure the effects of such and complicated terms as land concentration, for example, Generalizes Additive Models (GAMs), which make it possible to better control for the individual effects. In addition, alternative measurements of land concentration and rural wellbeing should be introduced.

The data used in the research are not representative enough to capture the influence of the presence of big agricultural farms in the community on the local governments, as it includes only the farms that are operating in the crop production industry and are registered in a village council, while the biggest players of agricultural production are registered in big cities.

When bringing the policy outlined in the thesis to life, several implementation issues need to be addressed by the policymakers. While imposing land holding restrictions state bodies responsible for the land reform implementation should measure and keep in mind the effects of such restrictions on the rural population. The increased or decreased land concentration in the region, meaning large holdings of land used by several producers, can affect the rural wellbeing in different ways, depending on the measures used for its definition.

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ANNEX A

Table 6. Estimation results for a random-effects model for local tax revenues per capita

| | Local taxes per capita | | | |
|---|---|---|---|---|
| | Theil index | Weighted Average | Coefficient of Variation | Share > 1000 ha |
| Theil index | 45.805 | | | |
| | (49.061) | | | |
| Weighted Average | | -4.380 | | |
| | | (17.382) | | |
| Coefficient of Variation | | | -8.945** | |
| | | | (4.054) | |
| Share > 1000 ha | | | | 124.612*** |
| | | | | (43.962) |
| Year 2017 | 241.145*** | 240.792*** | 240.307*** | 240.451*** |
| | (4.148) | (4.219) | (4.219) | (4.221) |
| Inverse productivity | 137.194 | -44.706 | -174.233 | -65.719 |
| | (274.897) | (211.948) | (139.747) | (144.409) |
| Volyn | -371.814*** | -372.650*** | -373.775*** | -365.010*** |
| | (32.551) | (50.200) | (50.132) | (50.165) |
| Dnipro | 244.241*** | 250.003*** | 265.650*** | 241.906*** |
| | (38.904) | (42.949) | (42.985) | (42.506) |
| Donetsk | 277.467*** | 278.497*** | 282.330*** | 267.330*** |
| | (58.759) | (56.403) | (56.335) | (56.399) |
| Zhytomyr | -151.030*** | -153.746*** | -156.254*** | -158.540*** |
| | (35.063) | (43.950) | (43.869) | (43.901) |
| Zakarpattia | -568.649*** | -567.917*** | -558.470*** | -546.279*** |
| | (54.233) | (70.208) | (70.175) | (70.321) |
| Zaporizhzhia | 401.905*** | 404.441*** | 413.580*** | 392.577*** |
| | (49.840) | (44.307) | (44.245) | (44.128) |
| Ivano-Frankivsk | -496.749*** | -499.578*** | -501.778*** | -489.981*** |

Table 6. – continued

| | | | | |
|---|---|---|---|---|
| | (29.768) | (50.682) | (50.588) | (50.602) |
| Kyiv | 229.938*** | 228.661*** | 227.588*** | 224.758*** |
| | (35.802) | (38.431) | (38.372) | (38.394) |
| Kirovohrad | 660.391*** | 662.912*** | 669.443*** | 658.983*** |
| | (42.654) | (38.056) | (38.005) | (37.900) |
| Luhansk | 128.170** | 127.953** | 129.357** | 117.653** |
| | (53.003) | (53.693) | (53.611) | (53.756) |
| Lviv | -494.410*** | -497.225*** | -499.799*** | -486.657*** |
| | (27.054) | (44.317) | (44.231) | (44.253) |
| Mykolaiv | 134.675*** | 140.343*** | 157.853*** | 132.343*** |
| | (35.310) | (42.681) | (42.772) | (42.144) |
| Odesa | 127.449*** | 133.825*** | 154.394*** | 125.702*** |
| | (38.172) | (38.101) | (38.405) | (37.666) |
| Poltava | 680.328*** | 681.290*** | 684.018*** | 677.955*** |
| | (41.017) | (37.594) | (37.547) | (37.534) |
| Rivne | -375.970*** | -378.035*** | -380.447*** | -374.171*** |
| | (37.526) | (56.406) | (56.316) | (56.308) |
| Sumy | 463.257*** | 462.334*** | 461.765*** | 451.178*** |
| | (46.644) | (44.326) | (44.262) | (44.358) |
| Ternopil | -419.851*** | -422.803*** | -425.853*** | -416.942*** |
| | (33.384) | (48.080) | (47.988) | (47.969) |
| Kharkiv | 405.704*** | 405.090*** | 405.244*** | 392.327*** |
| | (42.968) | (39.440) | (39.386) | (39.533) |
| Kherson | 242.021*** | 245.303*** | 252.861*** | 239.208*** |
| | (51.838) | (43.738) | (43.658) | (43.522) |
| Khmelnytskyi | -58.513* | -59.782 | -60.798 | -57.597 |
| | (34.135) | (43.646) | (43.579) | (43.576) |
| Cherkasy | 520.293*** | 519.598*** | 518.981*** | 518.274*** |
| | (39.284) | (37.082) | (37.030) | (37.034) |
| Chernivtsi | -548.108*** | -547.908*** | -546.325*** | -538.044*** |
| | (26.969) | (55.606) | (55.532) | (55.602) |
| Chernihiv | 158.815*** | 156.292*** | 153.856*** | 147.569*** |
| | (45.164) | (45.084) | (44.996) | (45.075) |

Table 6. – continued

| | | | | |
|---|---|---|---|---|
| Theil index: Inverse productivity | -680.335<br>(530.053) | | | |
| Weighted Average: Inverse productivity | | -133.748<br>(165.219) | | |
| Coefficient of Variation: Inverse productivity | | | -3.582<br>(33.516) | |
| Share > 1000 ha: Inverse productivity | | | | -301.026<br>(525.769) |
| Constant | 820.997*** | 848.536*** | 862.031*** | 811.370*** |
| | (31.366) | (31.114) | (26.006) | (26.400) |
| Observations | 10,116 | 10,116 | 10,116 | 10,116 |
| $R^2$ | 0.364 | 0.364 | 0.365 | 0.365 |
| Adjusted $R^2$ | 0.362 | 0.363 | 0.363 | 0.363 |
| F Statistic | 5,778.089*** | 5,778.988*** | 5,796.102*** | 5,796.346*** |
| Hausman test , Chi^2 | 16.76 | 19.26 | 22.28 | 20.95 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

ANNEX B

Table 7. Estimation results for a random-effects model for local budget revenues per capita

| | Local revenues per capita | | | |
|---|---|---|---|---|
| | Theil index | Weighted Average | Coefficient of Variation | Share > 1000 ha |
| Theil index | 46.070 | | | |
| | (87.931) | | | |
| Weighted Average | | -7.313 | | |
| | | (30.253) | | |
| Coefficient of Variation | | | -13.704* | |
| | | | (7.059) | |
| Share > 1000 ha | | | | 174.289** |
| | | | | (76.630) |
| Year 2017 | 341.507*** | 340.983*** | 340.231*** | 340.292*** |
| | (7.230) | (7.336) | (7.334) | (7.338) |
| Inverse productivity | 218.563 | 41.454 | -243.718 | -200.596 |
| | (487.302) | (369.521) | (243.902) | (251.658) |
| Volyn | -452.374*** | -453.677*** | -455.272*** | -441.221*** |
| | (55.925) | (87.367) | (87.263) | (87.366) |
| Dnipro | 343.900*** | 355.739*** | 378.789*** | 333.921*** |
| | (61.344) | (74.832) | (74.900) | (74.124) |
| Donetsk | 456.497*** | 459.038*** | 464.788*** | 437.572*** |
| | (118.405) | (98.553) | (98.450) | (98.613) |
| Zhytomyr | -105.093 | -109.322 | -112.474 | -116.373 |
| | (66.709) | (76.612) | (76.484) | (76.586) |
| Zakarpattia | -718.318*** | -714.702*** | -698.516*** | -680.257*** |
| | (129.811) | (123.069) | (123.035) | (123.344) |
| Zaporizhzhia | 618.294*** | 624.400*** | 637.424*** | 596.893*** |
| | (77.374) | (77.349) | (77.250) | (77.094) |

Table 7. – continued

| | | | | |
|---|---|---|---|---|
| Ivano-Frankivsk | -640.217*** | -644.417*** | -646.879*** | -626.983*** |
| | (61.550) | (88.206) | (88.057) | (88.126) |
| Kyiv | 374.047*** | 372.207*** | 370.926*** | 366.358*** |
| | (66.160) | (67.007) | (66.915) | (66.987) |
| Kirovohrad | 1,123.141*** | 1,128.360*** | 1,137.270*** | 1,117.393*** |
| | (72.251) | (66.165) | (66.085) | (65.935) |
| Luhansk | 63.343 | 63.622 | 64.836 | 41.768 |
| | (80.726) | (93.449) | (93.322) | (93.631) |
| Lviv | -621.372*** | -625.651*** | -628.747*** | -606.549*** |
| | (58.183) | (77.128) | (76.991) | (77.070) |
| Mykolaiv | 199.411*** | 212.100*** | 239.006*** | 189.828*** |
| | (59.398) | (74.290) | (74.460) | (73.400) |
| Odesa | 230.468*** | 243.463*** | 275.827*** | 222.727*** |
| | (64.870) | (66.438) | (66.983) | (65.711) |
| Poltava | 1,225.161*** | 1,227.085*** | 1,231.016*** | 1,220.480*** |
| | (71.163) | (65.406) | (65.334) | (65.347) |
| Rivne | -421.765*** | -425.009*** | -427.766*** | -415.982*** |
| | (82.868) | (98.145) | (98.003) | (98.039) |
| Sumy | 851.735*** | 850.732*** | 849.878*** | 832.573*** |
| | (80.738) | (77.143) | (77.045) | (77.254) |
| Ternopil | -639.851*** | -644.068*** | -647.847*** | -632.779*** |
| | (59.008) | (83.865) | (83.719) | (83.729) |
| Kharkiv | 624.844*** | 623.919*** | 624.157*** | 602.473*** |
| | (69.028) | (68.631) | (68.548) | (68.842) |
| Kherson | 385.229*** | 392.075*** | 402.144*** | 376.109*** |
| | (79.892) | (76.119) | (75.991) | (75.793) |
| Khmelnytskyi | -85.262 | -87.174 | -88.145 | -82.224 |
| | (56.249) | (75.961) | (75.856) | (75.891) |
| Cherkasy | 927.788*** | 926.720*** | 925.942*** | 925.061*** |
| | (66.325) | (64.583) | (64.503) | (64.543) |
| Chernivtsi | -765.113*** | -763.957*** | -761.876*** | -749.354*** |
| | (52.233) | (96.775) | (96.662) | (96.835) |
| Chernihiv | 390.830*** | 387.132*** | 384.431*** | 374.738*** |

Table 7. – continued

| | | | | |
|---|---|---|---|---|
| | (77.603) | (78.320) | (78.179) | (78.358) |
| Theil index: Inverse productivity | -1,158.880 (916.338) | | | |
| Weighted Average: Inverse productivity | | -349.043 (287.498) | | |
| Coefficient of Variation: Inverse productivity | | | -33.907 (58.327) | |
| Share > 1000 ha: Inverse productivity | | | | -11.819 (920.052) |
| Constant | 1,281.554*** | 1,311.947*** | 1,331.361*** | 1,256.160*** |
| | (54.812) | (54.173) | (45.281) | (45.976) |
| Observations | 10,116 | 10,116 | 10,116 | 10,116 |
| $R^2$ | 0.293 | 0.293 | 0.294 | 0.294 |
| Adjusted $R^2$ | 0.291 | 0.291 | 0.292 | 0.292 |
| F Statistic | 4,183.927*** | 4,188.116*** | 4,203.806*** | 4,199.193*** |
| Hausman test , Chi^2 | 6.62 | 10.63 | 11.14 | 4.43 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

ANNEX C

Table 8. Estimation results for a random-effects model for local public goods expenditures per capita

| | Expenditures on public goods per capita | | | |
|---|---|---|---|---|
| | Theil index | Weighted Average | Coefficient of Variation | Share > 1000 ha |
| Theil index | 156.015*** | | | |
| | (45.792) | | | |
| Weighted Average | | 57.180*** | | |
| | | (15.020) | | |
| Coefficient of Variation | | | 15.454*** | |
| | | | (3.525) | |
| Share > 1000 ha | | | | 22.956 |
| | | | | (38.153) |
| Year 2017 | -11.005 | -10.929 | -11.274* | -12.376* |
| | (6.715) | (6.658) | (6.657) | (6.661) |
| Inverse productivity | -106.289 | -92.739 | -126.611 | -233.397* |
| | (251.802) | (204.702) | (137.078) | (141.049) |
| Single tax | 0.120*** | 0.122*** | 0.125*** | 0.123*** |
| | (0.018) | (0.015) | (0.015) | (0.016) |
| Volyn | -29.727 | -29.675 | -29.195 | -30.087 |
| | (28.264) | (29.560) | (29.541) | (29.684) |
| Dnipro | 21.730 | 17.915 | 14.665 | 40.047 |
| | (27.196) | (25.562) | (25.521) | (25.331) |
| Donetsk | 150.391*** | 148.433*** | 146.914*** | 149.657*** |
| | (42.942) | (33.594) | (33.571) | (33.805) |
| Zhytomyr | 71.113*** | 71.103*** | 68.599*** | 59.280** |
| | (25.984) | (26.346) | (26.313) | (26.491) |
| Zakarpattia | 50.772 | 37.333 | 28.046 | 47.158 |
| | (37.483) | (41.204) | (41.236) | (41.497) |
| Zaporizhzhia | 82.196*** | 81.907*** | 79.872*** | 92.429*** |

Table 8. - continued

| | | | | |
|---|---|---|---|---|
| | (31.904) | (26.771) | (26.696) | (26.803) |
| Ivano-Frankivsk | -231.95*** | -232.593*** | -235.065*** | -239.516*** |
| | (24.602) | (30.264) | (30.231) | (30.355) |
| Kyiv | -53.901** | -54.575** | -56.502** | -60.757*** |
| | (24.059) | (22.481) | (22.459) | (22.577) |
| Kirovohrad | 45.643** | 43.780* | 42.773* | 54.855** |
| | (23.175) | (22.652) | (22.620) | (22.655) |
| Luhansk | -264.01*** | -263.028*** | -263.228*** | -264.441*** |
| | (24.731) | (31.719) | (31.680) | (32.050) |
| Lviv | -174.31*** | -174.340*** | -176.367*** | -181.009*** |
| | (22.623) | (26.279) | (26.248) | (26.359) |
| Mykolaiv | 83.242*** | 79.601*** | 76.304*** | 102.714*** |
| | (25.409) | (26.077) | (26.036) | (25.691) |
| Odesa | 7.247 | -1.089 | -9.816 | 22.803 |
| | (24.048) | (22.280) | (22.456) | (22.036) |
| Poltava | -14.995 | -16.456 | -17.719 | -13.364 |
| | (21.947) | (22.102) | (22.091) | (22.176) |
| Rivne | -101.63*** | -102.084*** | -103.815*** | -109.431*** |
| | (32.546) | (33.482) | (33.451) | (33.585) |
| Sumy | 30.411 | 29.956 | 28.847 | 24.362 |
| | (26.661) | (26.088) | (26.067) | (26.256) |
| Ternopil | -249.81*** | -250.134*** | -252.450*** | -259.442*** |
| | (18.171) | (28.547) | (28.509) | (28.608) |
| Kharkiv | -24.495 | -24.239 | -25.745 | -29.598 |
| | (23.901) | (23.261) | (23.245) | (23.474) |
| Kherson | 98.278*** | 97.607*** | 97.560*** | 111.447*** |
| | (23.748) | (26.296) | (26.213) | (26.244) |
| Khmelnytskyi | 30.555 | 29.669 | 27.955 | 25.382 |
| | (23.040) | (25.498) | (25.475) | (25.581) |
| Cherkasy | 92.361*** | 92.218*** | 91.053*** | 89.327*** |
| | (22.471) | (21.668) | (21.651) | (21.744) |
| Chernivtsi | -131.29*** | -133.429*** | -133.212*** | -127.775*** |
| | (26.446) | (32.657) | (32.633) | (32.806) |

Table 8. – continued

| | | | | |
|---|---|---|---|---|
| Chernihiv | -93.285*** | -93.875*** | -96.851*** | -106.907*** |
| | (22.309) | (26.362) | (26.323) | (26.526) |
| Theil index: Inverse productivity | -216.299<br>(504.830) | | | |
| Weighted Average: Inverse productivity | | -133.615<br>(159.139) | | |
| Coefficient of Variation: Inverse productivity | | | -57.814*<br>(33.666) | |
| Share > 1000 ha: Inverse productivity | | | | 146.359<br>(500.928) |
| Constant | 365.501*** | 382.256*** | 412.271*** | 437.959*** |
| | (28.200) | (23.522) | (18.463) | (18.757) |
| Observations | 10,014 | 10,014 | 10,014 | 10,014 |
| $R^2$ | 0.079 | 0.079 | 0.079 | 0.075 |
| Adjusted $R^2$ | 0.076 | 0.076 | 0.077 | 0.072 |
| F Statistic | 850.877*** | 855.294*** | 860.722*** | 810.386*** |
| Hausman test , Chi^2 | 2.25 | 9.56 | 1.68 | 6.80 |

*Notes:* ***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.