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FINANCIAL STABILITY AND INDEPENDENCE OF MUNICIPALITIES IN UKRAINE

The article assesses the local budgets independence using statistical methods and includes system dynamics research with a simplified explanatory model of aggregated municipal deposits. Using the method of analytical equalization, the share of local budgets' own funds was calculated, as they are a source of financial stability and independence.

A system dynamics hypothesis and model revealed important feedback mechanisms that play a role in financial autonomy and general financial well-being of municipalities – a higher deficit drives a higher debt that drives a higher deficit back; lower local tax revenues will bring higher transfers in the upcoming year; negative population growth decreases consumption, labor force, and other indicators, etc. The general reason for low financial autonomy lies in high dependency on transfers and income-based taxes, while taxes that are classified as local lay on businesses, which need more support. Some aspects revealed the need for deeper research and addition to the model – municipal borrowing and property markets. The model has been validated and built confidence through various tests, but yet it has serious assumptions, limitations, and aspects outside of the model boundary. Nevertheless the model has a potential for expansion and solving mode issues regarding this system or to be recalibrated for specific reasons and areas. The research can be used by the municipalities in Ukraine and needs to be updated with new data and expanded.

Keywords: local budget, municipality, decentralization, local taxes, financial independence, system dynamics, budget deficit.

JEL classification: E62, H21, H61, H72

Introduction and research problem. Local finances are the main source for satisfying the needs of territorial communities (municipalities) and performing local authorities' functions. Decentralization reforms enabled strategic changes for local budgets, creating the opportunity to increase revenues to local budgets to provide better services, implement social and infrastructural projects, create conditions for business development, attract investment capital, and other meaningful initiatives that increase the standards of life. The process of separate communities uniting into municipalities has ended, but local budgets of Ukraine are still in the process of deepening decentralization, which in turn exacerbates the problems of deficits, lack of own funds for operation and financial autonomy, management efficiency, imbalances and lack of a unified strategy for territorial development.

Recent publications analysis. Currently, there are several approaches and professional thoughts on indicators to determine the level of financial independence of the local budget, so many Ukrainian and western authors offer authorial methods in their works. Issues of decentralization, independence of local budgets as well as using dynamic methods of assessing the Ukrainian public sector are considered

in the studies of I. D. Wheat, I. Lukianenko, A. Bohuslavskaya, A. Nabatova, M. Yevdokimova, D. Moretti, S. Bugil, A. Antonova, J. Sterman and many others.

Unsolved part of the problem. Assessing financial independence is an important indicator and a fundamental part of planning future budget projects, as well as a basis for rethinking existing tax and budget systems and finding new approaches to enrich and effectively implement local budgets. The dependence of regional and local authorities on government transfers is the main problem of the domestic budget system, which slows down the development of the municipalities, projects implementation and determines **the relevance of this research topic.**

Research goal and questions. The purpose of the article is assessment of the current state, the structure, and dynamics of local budgets indicators in Ukraine, creating a dynamic hypothesis and simulating an explanatory system dynamic model of the process of forming and spending of municipal deposits in Ukraine in 2014–2020 using the main stages of system dynamics research.

Main findings. The revenue part of the local budget consists of four main components – tax and non-tax revenues, transfers from the government, and

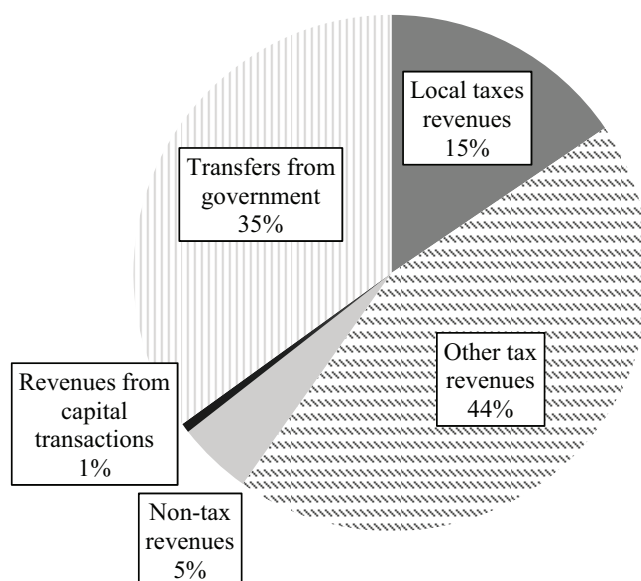


Fig. 1. The structure of revenues of local budgets in Ukraine in 2021

Source: by the authors based on data (Ministry of Finance of Ukraine, 2021; Open Budget, 2021)

revenues from capital transactions (Fig. 1). Municipalities' own income includes local taxes and fees, income from the sale and lease of communal property and communal property enterprises; administrative fines and sanctions, license, fees, and certificates.

Fig. 1 shows that transfers from the state budget accounted for more than a third of Ukraine's local

budgets revenues in 2021, while the share of national taxes allocated to local municipalities (mostly income taxes, rent, fees for natural resource usage, etc.) – for almost half, indicating their dependence on state aid and significant deficits. Local tax revenues (mostly property tax and “common” tax paid by locally registered entrepreneurs) account only for 15 % of the budget demonstrating a weak

Table 1. Structural elements of local budgets revenues in Ukraine, 2018–2020

Component name	Year	Sum, billions of UAH	Absolute growth, billions of UAH	The rate of increase	Growth rate, %	The absolute value of 1 % of the growth, billions of UAH
Local tax revenues	2018	61.03	X	X	X	X
	2019	73.58	12.55	1.206	20.56 %	0.610
	2020	75.69	2.11	1.029	2.87 %	0.736
	2021	89.9	14.21	1.188	18.77 %	0.757
Other taxes revenues	2018	171.5	X	X	X	X
	2019	196.97	25.47	1.149	14.85 %	1.715
	2020	395.79	198.82	2.009	100.94 %	1.970
	2021	256.8	-138.99	0.649	-35.12 %	3.958
Non-tax revenues	2018	28.03	X	X	X	X
	2019	26.11	-1.92	0.932	-6.85 %	0.280
	2020	21.46	-4.65	0.822	-17.81 %	0.261
	2021	27.78	6.32	1.295	29.45 %	0.215
Transfers	2018	289.94	X	X	X	X
	2019	260.3	-29.64	0.898	-10.22 %	2.899
	2020	160.18	-100.12	0.615	-38.46 %	2.603
	2021	202.73	42.55	1.266	26.56 %	1.602
Revenues from capital transactions	2018	2.14	X	X	X	X
	2019	2.93	0.79	1.369	36.92 %	0.021
	2020	3.47	0.54	1.184	18.43 %	0.029
	2021	3.46	-0.01	0.997	-0.29 %	0.035
Total fund	2018	562.42	X	X	X	X
	2019	560.52	-1.9	0.997	-0.34 %	5.62
	2020	471.5	-89.02	0.841	-15.88 %	5.61
	2021	580.7	109.2	1.232	23.16 %	4.72

Source: by the authors based on data (Ministry of Finance of Ukraine, 2021; Open Budget, 2021)

level of independence as well. Non-tax revenues (income from property and business activities, administrative fees, receipt of funds for equity participation in the development of infrastructure of the settlement, etc.) contribute only 5 % and, therefore, some of them also are considered as “own” income for municipalities, it is hard to include it as such for research purposes as the share of non-tax revenues to local budgets is so low as well as it holds limited opportunities for innovative policies and growth, in the long run, taking in the account current economic state of the country. Considering the dynamics of the last three fiscal years (Table 1), we can draw more detailed conclusions about the development of the decentralization process and the financial state of municipalities.

In 2021, compared to 2018, there is a significant increase in the other taxes, which are the government’s partial allocation of national taxes collected from an assigned territory – by 14.85 % and more than 100 % in 2019 and 2020 accordingly with a 35 % drop in 2021, and a simultaneous reduction in state aid by 10.22 % and 38.46, while it increased by almost 30 % in 2021. However, the local taxes grew only 20.56 %, 2.87 %, and 18.77 % in 2019, 2020, and 2021 accordingly, which means that financial independency development is yet not successful at first glance. The year 2021 was a major setback as transfers grew more than local taxes, which increased less than the total fund. The total general fund declined by less than 1 % in 2019 and by another 15.88 % in 2020 and regained 23.16 % in 2021, while real GDP growth was 3.2 % in 2019 and decline of 4 % in 2020 and +6.1 % in 2021 (World Bank Group, 2021).

The source of financial stability and autonomy of the local budget is its own income, as well as constant investment in future development. The larger the share of own funds in the revenue structure, the more stable the budget. In addition, by analyzing their own income, the community can

infuse and increase it, and invest in development programs (for example, increase the tourist tax by updating historical monuments, recreational areas, etc.). Among Ukrainian local budgets, the percentage of own funds averages 23 % from the beginning of the reform to 2020, while developed countries with longer and more thorough experience of financial decentralization keep the value at 69–80 % (Moretti & Kraan, 2018).

Using the method of analytical equalization and hard pre-war data, it is possible to predict the share of own funds in the local budgets of Ukraine for the years 2022–2025, assuming extrapolation of no-war events. To do this, we calculate the share of local budgets’ own funds for previous years as a relative indicator of the structure. Since the absolute increase in the calculated share is stable, the trend is determined by a linear trend: $\gamma = \alpha + bt$ (1). To solve the equations of analytical curves, the method of least squares is used (to find the parameters α and b), also use the method of simplified alignment, in which the sum of all values of t should be zero (Table 2).

We find the parameters α and b to determine the equation of the trend curve using the system of equations. For a calculation we substitute the data from Table 2 to formula and calculate the required values:

$$1) \alpha = \frac{176.34}{8} \approx 22.04;$$

$$2) b = \frac{9.78}{42} \approx 0.23.$$

Hence, the equation of the linear trend of the share of own income of local budgets of Ukraine is: $\gamma_t = 22.04 + 0.23t$ (2). From it we can conclude that on average over the observed 8 years the share of own revenues in total of local budgets in Ukraine was only 22.04 %, while it grew by an average of 0.23 % annually. With an assumption of extrapolation while using pre-war hard data, the forecasted value

Table 2. Method of analytical equalization for forecasting the share of own income of local budgets of Ukraine

Year	Share of local taxes in local budgets (γ), %	t	$\gamma \cdot t$	t^2	γ_t
2014	9.20	-3.5	-32.20	12.25	22.8568
2015	27.50	-2.5	-68.75	6.25	22.62404
2016	28.80	-1.5	-43.20	2.25	22.39128
2017	26.20	-0.5	-13.10	0.25	22.15852
2018	26.20	0.5	13.10	0.25	21.92576
2019	27.20	1.5	40.80	2.25	21.693
2020	15.76	2.5	39.39	6.25	21.46024
2021	15.48	3.5	64.18	12.25	21.22748
Total	176.34	0.00	9.78	42.00	176.34

Source: by the authors based on data (Ministry of Finance of Ukraine, 2021; Open Budget, 2021)

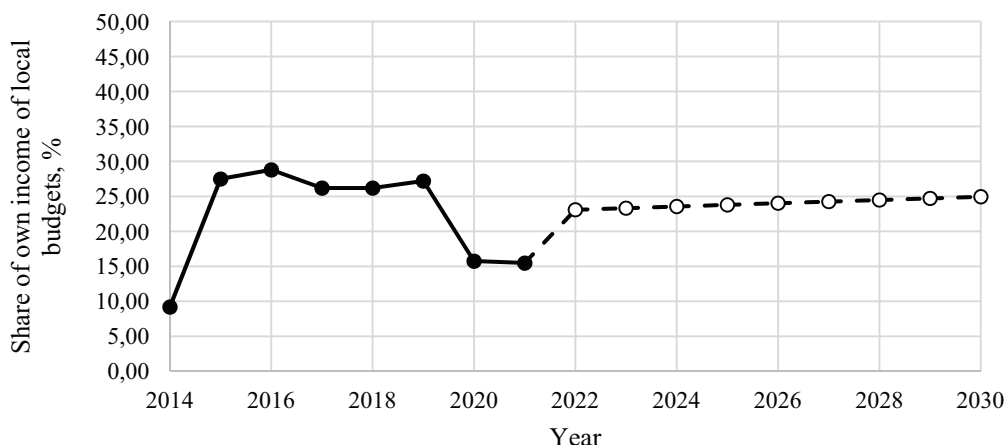


Fig. 2. Trend line of the share of own revenues in total local budgets in Ukraine with a forecast
Source: by the authors based on data Table 2 (Ministry of Finance of Ukraine, 2021; Open Budget, 2021)

for the share of own revenue in local budgets in Ukraine will be following:

$$2022 - \gamma_{4,5} = 22.04 + 0.23 \cdot 4.5 = 23.09 (\%);$$

$$2023 - \gamma_{5,5} = 22.04 + 0.23 \cdot 5.5 = 23.32 (\%);$$

$$2024 - \gamma_{6,5} = 22.04 + 0.23 \cdot 6.5 = 23.56 (\%);$$

$$2025 - \gamma_{7,5} = 22.04 + 0.23 \cdot 7.5 = 23.79 (\%).$$

Graphical representation of data including the forecasted values shown in Fig. 2, is not perfect for a real-life circumstance where the hard data 2021 and 2022 may show no changes or a decrease due to an additional assistance needed for most of local budgets, however, it demonstrates average development of a key value for research.

From the above calculations, it follows that on average over the observed 7 years the share of own funds of local budgets of Ukraine is about 22 %, while at the same time experts recommend a figure of at least 60–80 % (Davey, 2011, p. 59). If the same growth rate is maintained (on average 0.23 % per year), despite the war in Ukraine in 2022, the percentage of own revenues will reach the lower end of the desired range level no earlier than in 60 or more years, which shows that some extreme measures are needed to be taken, considering that war crimes in Ukraine may only worsen these conditions and time frames. The general trend from 2014 until 2021 is almost constant in the share of own revenues with an increase by an average of 0.23 %, firstly, due to the major decentralization reform and, secondly, further annual amendments and changes to the Budget and Tax Codes.

Since the local taxes account on average only for 22 % of total local budgets while about 70 % are held in national taxes allocated by the government and transfers, the budgets are not independent of the government, and this is a major step back for the financial system and autonomy and, furthermore, lots of meaningful changes in local communities cannot be implemented (Bui & Kovalchuk, 2020).

This leads to scenario analysis, where there is a forecasted scenario from Fig. 2 based on pre-war hard data and estimated scenarios. The “feared” scenario is a further decrease to the beginning-of-the-reform values due to war and inability to recover in medium-term time, and a “desired” increase to the European benchmark of around 60–80 % in local tax in total income in the next 5–10 years. The desired scenario is a goal of an upcoming simulation. Hence, the graph in Fig. 3 is a reference mode of behavior for further system dynamics-based research which the simulation will try to replicate.

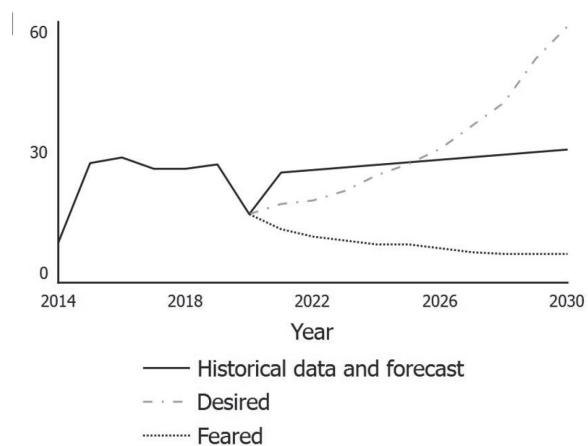


Fig. 3. Scenarios of prognosis for a share of own revenues on local budgets in Ukraine until 2030 as a key indicator of financial autonomy (using software Stella Architect) – reference mode of behavior for a model
Source: by the authors based on data Table 2 (Ministry of Finance of Ukraine, 2021; Open Budget, 2021)

The reference mode of behavior for a model is a historical behavior over time that identifies the problem and determines the time horizon for a simulation model as well as the boundary for what system parts to include (Forrester, 2009).

The expenditure part of local budgets is essential for analysis as the efficiency of expenditure management can positively contribute to gaining more financial autonomy as well as helps to observe the current priorities of municipalities. Expenditures are divided into functional categories, similar to the functional classification of expenditures and the state budget. Fig. 4 shows that some of the largest accounts of expenditures are education (44 %), where more than 60 % are spent on secondary education, and health care (16 %), both of which are mostly financed by government subsidies. Significant expenditures to be provided by local budgets are financing of economic activities (20 %) – more than half are expenditures on transport, and construction (24.5 %), – and the expenses on government functions (8 %), where the largest share is occupied by financing the local self-governing (89 %). At the same time, general economic, trading and labor activity, agriculture, and the fuel-and-energy complex together account for less than 2 % of expenditures on economic activity (Open Budget, 2021).

The smallest share of expenditures goes to the protection of the environment and public order. We observe that a lot of crucial for higher standards of life accounts (utilities, mental and physical development, environmental protection, public order, security, and judiciary) are very low, which means that the budget struggles to cover critical

expenses before it has an opportunity to develop the quality of secondary aspects. Low financial autonomy also contributes to the inability to provide for new initiatives.

The goal of the research is to create a simplified model of the process described as the problem by simulating the main sources of revenue and spending ways of local governments in Ukraine. Financial independence (autonomy) is identified as a share of local tax revenues (own revenues) in the total revenues of local budgets (Bugil, 2016, p. 57). The formulation is based on the fact that local tax revenue (and other components whose share is too small to consider) is the only revenue that is generated specifically by local municipalities from their territories that is allocated straight to their budgets. Since some spending decisions affect revenues, they are to be included too. It is also important to note that the research is focused on aggregated municipal deposits and not a specific individual municipality. Therefore, a lot of processes described in the feedback story might not be true for all municipalities, but the majority. Based on the macroeconomic literature and description of the reference mode of behavior (Fig. 3), the following mechanisms were identified and summarized in the form of a causal loop diagram (Fig. 5). There are a total of 4 reinforcing feedback loops and 2 balancing feedback loops, all of which are described in detail below.

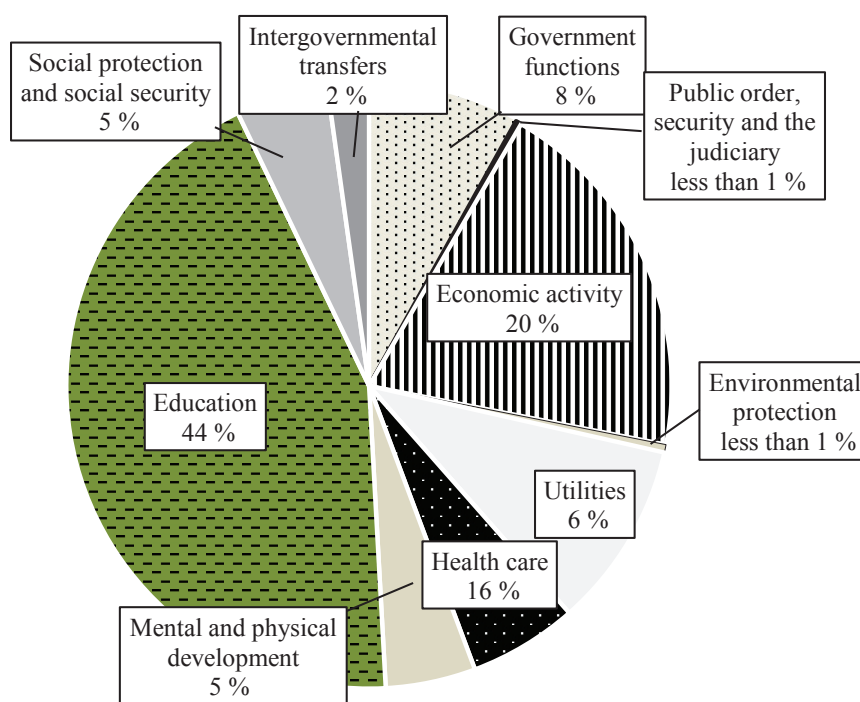


Fig. 4. The structure of expenditures of local budgets in Ukraine in 2021

Source: by the authors based on data (Ministry of Finance of Ukraine, 2021; Open Budget, 2021)

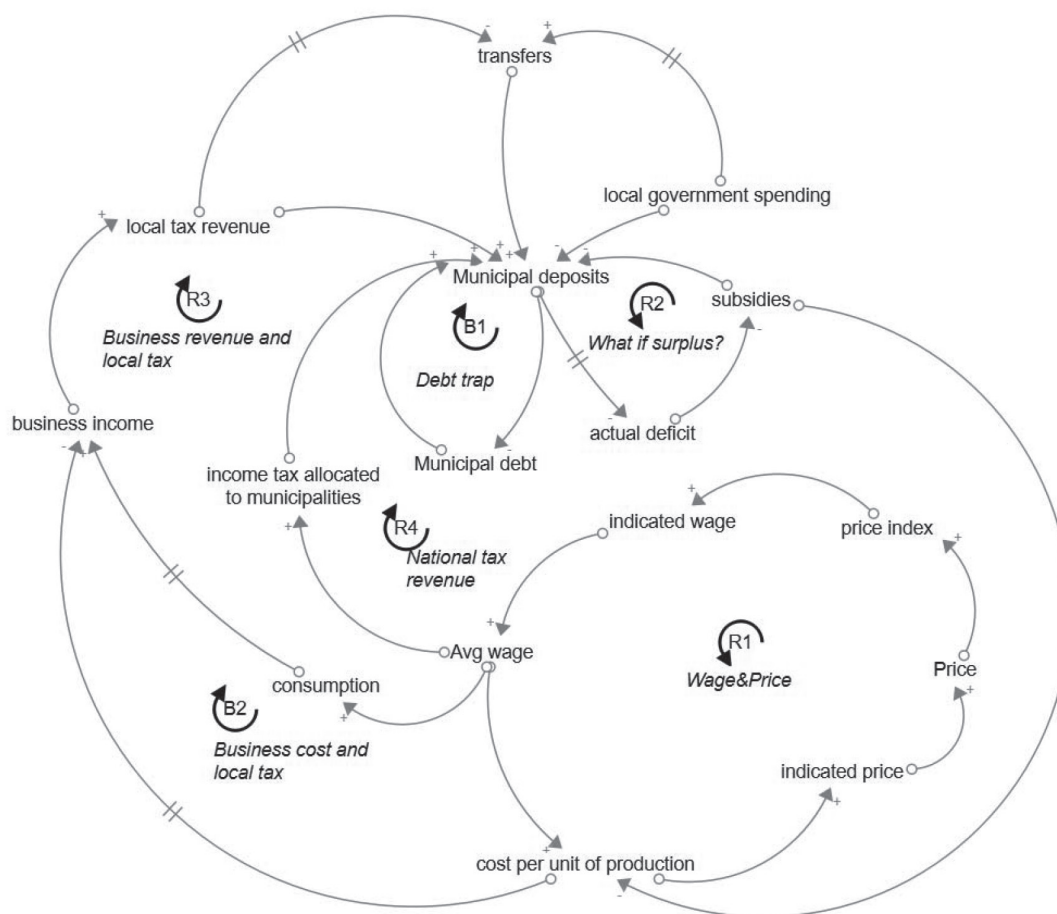


Fig. 5. Causal Loop Diagram
 Source: by the authors in Stella Architect

Wage and Price (R1). This reinforcing mechanism was inspired by the wage and price sub-model designed and introduced by David Wheat in “Feedback Economies” (Cavana et al., 2021) and adapted for this model. The assumption is that the total production is labor-intensive, which is mostly true for Ukrainian production (Stadnytskyi, Tovkan, & Symak, 2008, p. 688); hence, the only wage is taken into consideration and other costs like capital or land are outside of the model boundary. As prices rise or fall, the wages also adjust accordingly and proportionally to the price index over time. This feedback loop describes the process of inflation/deflation influence on average wage and unit costs. Since Ukraine exercises a proportional tax system (flat tax), the taxes are set as a fixed percentage of the taxable base, which could be any income, property, etc.

National tax revenue (R4). Out of all taxes that are classified as national and collected by the central government, the income tax from individuals (PIT) accounts for the biggest absolute revenues and is partially allocated to local municipalities. Since the

wage is the main and largest income for most Ukrainians, it determines the total amount of income tax collected. Because income tax has the largest share of this process other national taxes are considered to be outside of the model boundary.

Business revenue and local tax (R3). From macroeconomic theory, an individual’s income is split into two parts – consumption of goods and services and saving (McConnell, Brue, & Flynn, 2009). Goods and services are provided by the business and the more people spend on the consumption of goods and services, the higher the income of businesses will be. As the main local taxpayer, the entrepreneurial sector will pay more in tax if their income grows. It adds to local governments’ total revenues and accumulates in municipal deposits.

If local municipalities find themselves in surplus (R2), it is assumed that they could spend these extra resources on some changes in their communities as, for example, subsidizing local businesses. These subsidies will be additional expenditures for them and, therefore, decrease deposits.

Business cost and local tax (B2). Allocated subsidies decrease the cost of unit per production that businesses have to invest from their own funds, which decreases costs for business in general, because governmental subsidies cover part of it. This means they will have higher profits and pay a higher amount in tax. This respectfully increases local tax collected and total revenues of municipalities in their deposits.

Debt trap (B1). This balancing mechanism describes the process of borrowing and outcomes from it. Municipalities that experience a deficit have to cover it to maintain planned spending and requesting a loan is often a way to cover an accumulated deficit. Additional borrowing increases accumulated debt and deposits as well since approved loans are added to deposits. However, any borrowing has repayments later, which are subtracted from the deposits as an expenditure.

Local government spending is not a part of any feedback loop, however, it is not exogenous, even

though the simplified causal loop diagram does not include variables that affect it. Total labour productivity and labour force determine production, which is the equivalent to gross domestic product (GDP) in this research. Local government purchases, which are defined as a part of GDP by the standard macroeconomic equation of GDP being a sum of consumption, investments, government purchases, and net export, equal spending and decrease in municipal deposits. Transfers as financial aid from the central government to partially cover money shortage of funds are paid before the spending fiscal year. That is why when local governments plan their next year, they report expected revenues from taxes and expected spending based on previous experience. Higher estimated revenues mean that a municipality needs less aid, and higher spending requires higher transfers to sustain the expenditures. Then, allocated transfers are yet another source of revenue for municipal deposits.

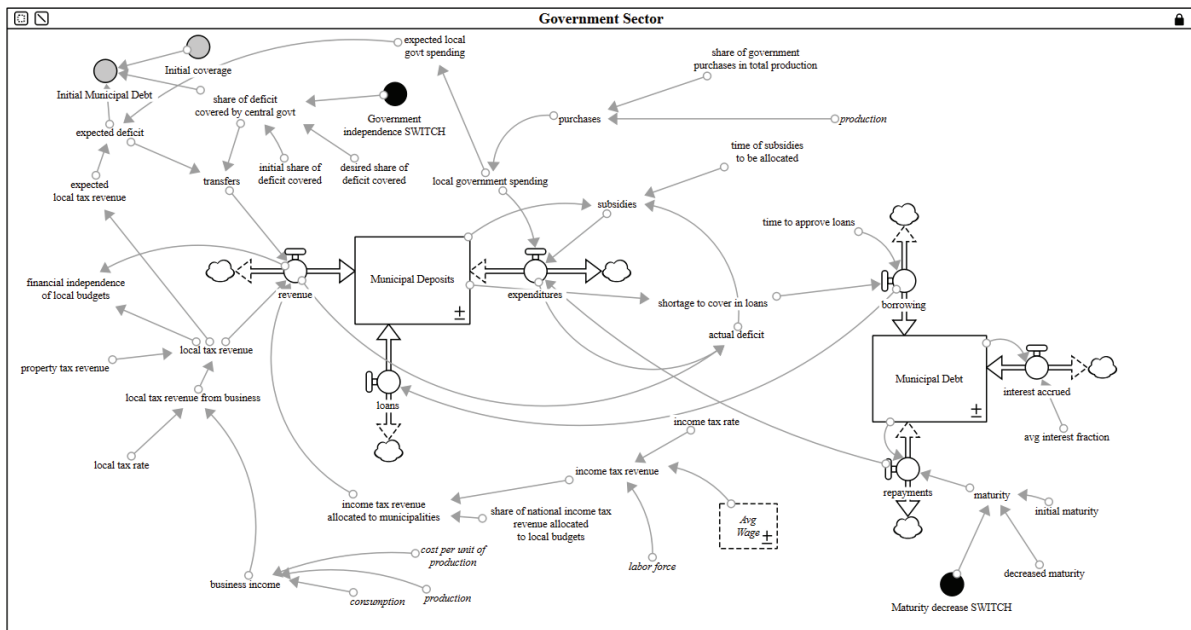


Fig. 6. Government sector of the system dynamics model
Source: by the authors in Stella Architect

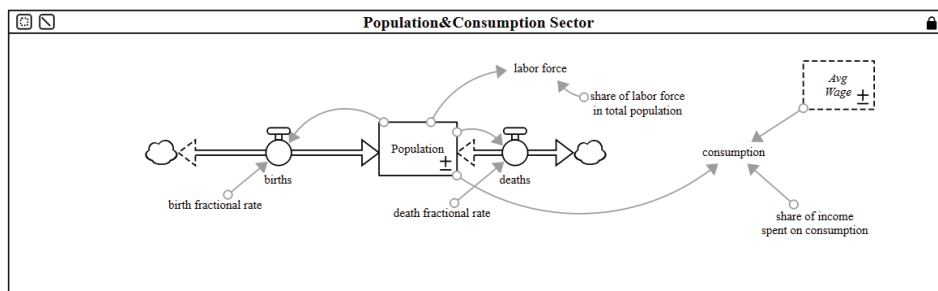


Fig. 7. Population and consumption sector of system dynamics model
Source: by the authors in Stella Architect

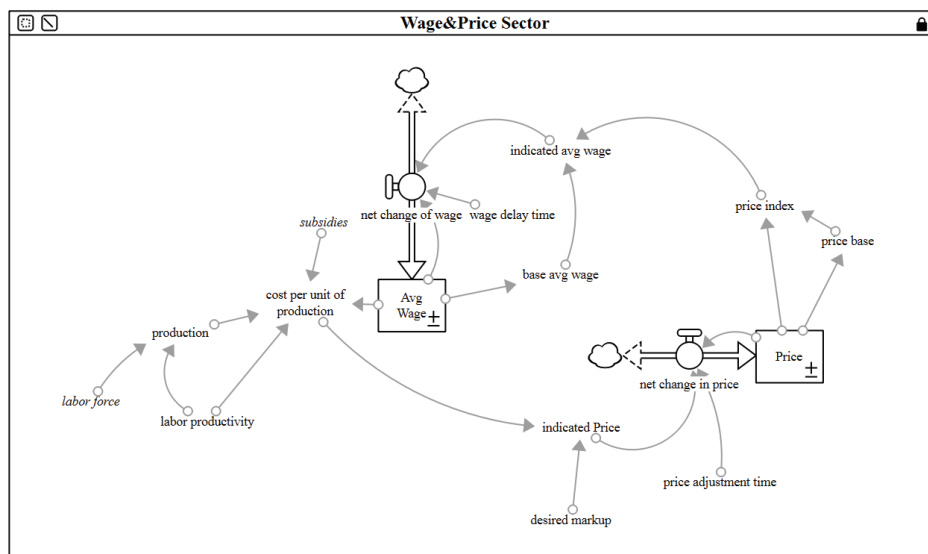


Fig. 8. Wage and price sector of the system dynamics model
 Source: by the authors in Stella Architect

The separate three main sectors of the model are presented in Fig. 6–8. To build confidence in the model and its simulation results, a series of validation tests were performed (including ones by (Barlas, 1996)). Historical data behavior modes were closely replicated, which builds confidence in the model too. Exogenous variables are mostly based on reliable data sources like the Ministry of Finance of Ukraine, the State Statistics Service of Ukraine, and the World Bank. Model documentation was created according to guidelines (Rahmandad & Sterman, 2012). Model validation details in terms of tests conducted include: structure confirmation test; parameter confirmation test; dimensional consistency; partial model testing and extreme conditions; integration error test; sensitivity analysis.

The graph in Fig. 9 shows the simulation results of the baseline scenario meant to reproduce the reference mode of financial independence.

The graphs in Fig. 10 show some other variables replication, which there was reliable historical data available for.

All fits are not perfect, however, show similar behavior modes. The reference mode simulated is the same in terms of increase at first as decentralization policies in the real system “kicked in” and decrease towards the end of the time horizon. This helps to build confidence that future policy interaction will show reliable enough results.

Conclusions and further research proposals. The process of villages uniting in territorial communities is finishing, however, the state of local budgets in Ukraine is alarming. In 2021 most of the local budgets

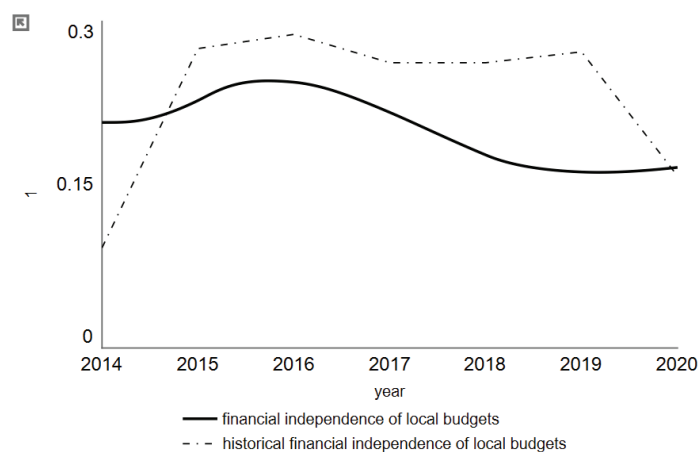


Fig. 9. Reference mode replication results in the baseline simulation
 Source: by the authors in Stella Architect

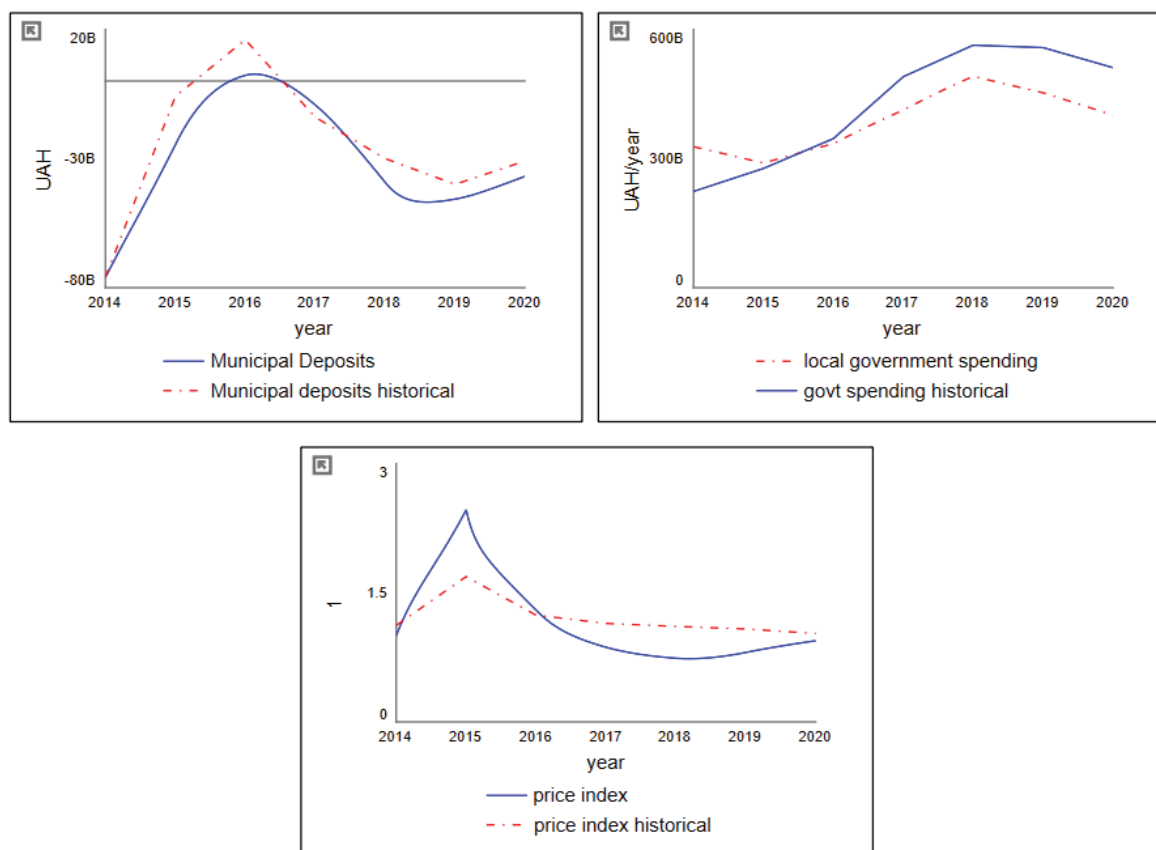


Fig. 10. Historical data replication results in the baseline simulation
Source: by the authors in Stella Architect

in Ukraine are the budgets of territorial communities (75%), of which about 58 per 1 regional budget. The revenue structure shows that the largest sources of income are other (all taxes excluding local) taxes and transfers (44% and 35% of the general fund in 2021), while local taxes accounted for only 15%, which is one of the lowest values since the reform. The level of financial autonomy is on average equals 22%, while the goal is at least 60%. The analytical equalization shows that annual growth is less than a quarter of 1%, which is insufficient to ensure financial stability and will take decades to reach desired levels if the trend continues.

An explanatory system dynamics model has proven to be valid and real data-based, which allows finding sensitive points in the model to design proper policy strategy. A dynamic hypothesis and model revealed important feedback loops that

determine the behavior of financial autonomy and general financial well-being of municipalities – higher deficit drives higher debt that drives higher deficit back, lower local tax revenues will bring higher transfers in the upcoming year, negative population growth decreases consumption, labor force, and other indicators, etc.

The general reason for low financial autonomy lies in massive dependency on government aid and income-based taxes, while taxes that are classified as local lay on businesses, which need more support. The research revealed the need for additions to the model in the future – property markets and municipal borrowing. The model has been validated and built confidence in through various tests, but yet has serious assumptions, limitations, and aspects outside of the model boundary, which can be improved and added as new data and research appear.

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ФІНАНСОВА СТАБІЛЬНІСТЬ І НЕЗАЛЕЖНІСТЬ МУНІЦИПАЛІТЕТІВ В УКРАЇНІ

У статті оцінено стан місцевих бюджетів за допомогою статистичних методів і здійснено кілька етапів дослідження методом системної динаміки зі спрощеною пояснювальною моделлю агрегованих муніципальних депозитів. Результати дослідження свідчать, що процес об'єднання окремих адміністративних одиниць у територіальні громади завершується, однак стан місцевих бюджетів в Україні не характеризується стабільністю. У структурі доходів місцевих бюджетів переважають загальнодержавні податки і трансферти, тоді як місцеві податки відіграють незначну роль. Отже, рівень фінансової самостійності муніципалітетів в Україні відстає від середньоєвропейського.

За допомогою методу аналітичного вирівнювання розраховано тренд частки власних коштів місцевих бюджетів, оскільки вони є джерелом фінансової стабільності та незалежності. Рівняння тренду показує збільшення частки власних коштів, проте середнє значення за період дослідження становить лише 22 %.

Виявлено шість основних петель зворотного зв'язку (динамічні гіпотези), які впливають на формування та виконання місцевих бюджетів. Вони лягли в основу моделі, побудованої методом системної динаміки в програмному забезпеченні Stella Architect. З основних петель виокремлено чотири позитивні петлі (підсилювальні – «Заробітна плата і ціна», «Дохід від загальнодержавних податків», «Зв'язок доходів підприємств і місцевих податків», «Профіцит») та дві негативні (балансувальні – «Зв'язок витрат підприємств і місцевих податків», «Боргова пастка»). Ці механізми зворотного зв'язку відіграють значну роль у забезпеченні фінансової автономії та загальному фінансовому добробуті муніципалітетів: більший обсяг дефіциту призводить до зростання рівня боргу, що спричиняє ще вищий рівень дефіциту; нижчі надходження місцевих податків призведуть до більших міжбюджетних трансфертів у наступному році; негативний приріст населення зменшує рівень споживання, робочої сили та впливає на інші макроекономічні показники. Дослідження методом системної динаміки підтвердило хронічний дефіцит місцевих бюджетів (негативні муніципальні депозити) та зростання муніципального боргу, задля подолання яких потрібно вжити комплексних заходів в адміністративному, фінансовому та демографічному напрямках.

Ключові слова: місцевий бюджет, муніципалітет, децентралізація, місцеві податки, фінансова незалежність, системна динаміка, бюджетний дефіцит.

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