FISCAL RESPONSIBILITY OF THE LOCAL COMMUNITIES IN UKRAINE

by

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Abstract

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This thesis examines fiscal responsibility of Ukrainian hromadas using deficit-based Fiscal Performance (FP) and fiscal-dependence indicators. Since bailout expectations and direct bailout episodes are not observed, the thesis does not test soft budget constraints directly. Instead, it uses a hromada-year panel for 2013–2025 to study three fiscal relationships: transfer dependence and FP, voluntary amalgamation and FP, and wartime exposure and FP.

The results show that transfer dependence is not robustly associated with weaker FP. Voluntary amalgamation is associated with lower FP, meaning better observed deficit-based fiscal performance, but also with higher transfer dependence, mainly through subventions, and lower Own Revenue Coverage (ORC). Wartime exposure is associated with lower FP, but this should not be interpreted as stronger fiscal responsibility because wartime fiscal outcomes may reflect constrained spending or other crisis-related adjustments.

The thesis concludes that fiscal responsibility cannot be inferred from FP or transfer dependence alone. It should be assessed jointly through fiscal performance, transfer dependence, transfer composition, and non-transfer expenditure coverage.

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AI USE DECLARATION

During the preparation of this thesis, Generative AI (ChatGPT) was used as a supplementary tool to:

- Support grammar correction and improvement of sentence clarity in Chapters I-VI of this thesis
- Idea brainstorming on Chapters I-III, VI (literature search, concepts explanation)
- Coding for Chapters IV–V (for visualization, modeling, optimization, and dataset construction)

Any suggestions produced by the AI tool were critically evaluated and substantially modified by the author before being incorporated into the thesis.

The tool was not used to generate research findings, produce literature summaries used directly in the thesis, create citations, or conduct any form of data analysis. All research questions, theoretical framing, methodology, analysis, interpretation of results, and conclusions were developed independently by the author. The author takes full responsibility for the originality, validity, and academic integrity of the work presented in this thesis.

LIST OF ABBREVIATIONS

ACLED — Armed Conflict Location & Event Data Project

ActiveShare — Active Exposure Share

AnyActive — Any Active Exposure

AnyPot — Any Potential Exposure

ATC — Amalgamated Territorial Community

ATT — Average Treatment Effect on the Treated

BD — Borrowing Dependence

BOOST — World Bank BOOST Public Expenditure Database

CPI — Consumer Price Index

DD — Dotation Dependence

DiD — Difference-in-Differences

DK — Driscoll–Kraay

EF — Expenditure Federalism

EverPot — Ever Potential Exposure

FE — Fixed Effects

FP — Fiscal Performance

GDP — Gross Domestic Product

GRP — Gross Regional Product

GSDP — Gross State Domestic Product

HBC — Hard Budget Constraint

IHS — Inverse Hyperbolic Sine

LIST OF ABBREVIATIONS—Continued

KATOTTG — Codifier of Administrative-Territorial Units and Territories of Territorial Communities

KOATUU — Classifier of Objects of the Administrative-Territorial System of Ukraine

KSE — Kyiv School of Economics

NASA — National Aeronautics and Space Administration

OECD — Organisation for Economic Co-operation and Development

ORC — Own Revenue Coverage

PIT — Personal Income Tax

PotShare — Potential Exposure Share

RE — Random Effects

RF — Revenue Federalism

SBC — Soft Budget Constraint

SE — Standard Error

SubD — Subvention Dependence

TD — Transfer Dependence

TWFE — Two-Way Fixed Effects

UAH — Ukrainian Hryvnia

VIF — Variance Inflation Factor

Chapter 1

INTRODUCTION

After February 24, 2022, Ukraine's decentralization reform acquired new practical relevance. Municipalities had to keep basic services functioning while responding to security risks, displaced residents, and humanitarian needs. Many Ukrainian reformers and international partners therefore see local governments as important actors for reconstruction, since locally elected authorities may better understand community needs and make recovery less centralized (Myerson 2023; OECD 2022).

This role is connected to the institutional transformation that began after 2014. The decentralization reform combined changes in intergovernmental finance with territorial consolidation. It aimed to replace a highly fragmented system of more than 10,000 small local councils with larger hromadas that had broader administrative and fiscal responsibilities. During the reform, this structure was consolidated into 1,469 hromadas, which changed the basic territorial structure of local self-government (Levitas and Djikic 2017; OECD 2022).

The reform changed local public finance, but it did not create full local fiscal independence. Fiscal decentralization gave first-tier local governments a stronger fiscal role and broader revenue sources, while voluntary amalgamation in 2015–2019 created larger jurisdictions with clearer responsibilities. At the same time, Ukraine's intergovernmental system retained earmarking, equalization instruments, and substantial transfer dependence. Therefore, decentralization is better understood as a restructuring of local fiscal responsibility within a still transfer-dependent system, rather than as a complete shift from central dependence to local fiscal autonomy (Levitas and Djikic 2017; Verkhovna Rada of Ukraine 2010).

The war added another layer to the fiscal-responsibility problem. Hromadas continued to provide services and participate in crisis response, while many communities also faced occupation risks, displacement, revenue losses, and emergency needs. The presence of locally elected leaders with real authority has also been linked to wartime mobilization and community resilience (Brik and Murtazashvili 2022; Myerson 2023). This makes the fiscal capacity of hromadas important for recovery, but it also raises a question: can local governments maintain fiscal responsibility when large transfers, emergency assistance, and reconstruction resources are available?

The soft budget constraint framework is useful for thinking about this concern, but it should be used carefully. Soft budget constraints are not created by transfers alone. They arise when local governments expect additional support from the central government in case of financial difficulty, and this expectation affects their fiscal behaviour (Kornai et al. 2003; Vigneault 2005). This is important for Ukraine because formal rules and formulas do not automatically mean hard budget constraints. As Vigneault explains, such rules can limit discretionary bailouts, but they can also support bailout expectations when equalization or minimum-service rules make central support likely (Vigneault 2005). Therefore, Ukrainian state-to-local transfers are not direct evidence of soft budget constraints, but they remain relevant for fiscal responsibility because they affect the link between local responsibilities, own fiscal capacity, and expectations of state support.

This is particularly important during wartime, when the central government has strong incentives to prevent local service collapse and to support communities affected by occupation, frontline proximity, displacement, and revenue losses. Wartime support to local governments should not be interpreted automatically as a bailout of irresponsible behavior, because it can also compensate for objective shocks outside local control. Still, such support remains relevant for

fiscal responsibility because it changes the fiscal environment in which hromadas make budgetary decisions (Vigneault 2005; OECD 2022).

Ukraine is a useful case for this research because decentralization and war affected hromadas in different ways. The reform changed local boundaries, responsibilities, and the role of hromadas in public finance. After that, the full-scale invasion created another shock, but this shock was not the same for all communities. Some hromadas were closer to fighting or occupation, while others were less exposed. Because of this variation, the thesis can compare fiscal outcomes across reform and wartime conditions.

The key research question of this thesis is: How did Ukraine's decentralization reform and Russia's full-scale invasion of Ukraine shape the fiscal performance of local governments, and how were these changes reflected in fiscal-dependence patterns?

This thesis adds to the literature by studying Ukrainian hromadas in a period that includes both decentralization reform and the full-scale war. By applying fiscal federalism and soft budget constraint theory to hromada-level fiscal data, it shows how local fiscal performance is connected with transfer dependence, reform entry, and wartime exposure.

The thesis proceeds as follows. Chapter 2 reviews the theoretical literature on hard and soft budget constraints, fiscal federalism, decentralization, territorial amalgamation, and local governance during wartime. In Chapter 3, we discuss the empirical strategy, while Chapter 4 presents the data construction and variables. Chapter 5 reports the main results and robustness checks. Chapter 6 concludes and discusses policy implications.

Chapter 2

LITERATURE REVIEW

This section reviews the literature used to analyze fiscal responsibility of Ukrainian hromadas. It first discusses hard and soft budget constraints, then presents the Tripathi and Grigoriadis (2023) framework linking fiscal dependence with fiscal performance. It then reviews Ukraine's decentralization reform and wartime local-governance literature as the main contexts for the empirical analysis.

2.1 Hard and Soft Budget Constraints: Theoretical Foundations

Kornai (1979) first formulated the concepts of hard and soft budget constraints in "Resource-Constrained versus Demand-Constrained Systems". There, he explains two different economic environments. First, he defines a "demand-constrained" (capitalist) system as one where production is limited by buyer demand rather than resource constraints. In this system, a firm's spending is strictly limited by its financial resources; thus, it must cover expenses. Financial failure leads to bankruptcy; thus, firms face "hard" budget constraints. Then he defines a "resource-constrained" (socialist) system as one where production is limited by physical bottlenecks rather than financial constraints. In such economies, budget constraints are "soft" because there is no strict relationship between expenditure and earnings. The state guarantees the firm's survival regardless of insolvency using subsidies, tax relief, or soft credit. This expectation of a bailout alters the behaviour of managers: firms become unresponsive to price signals and develop an "almost insatiable" demand for inputs, knowing that deficits will eventually be covered by the state.

While Kornai provided a descriptive analysis, in subsequent articles, scholars used game theory to formalize the mechanisms of hard and soft budget constraints. Kornai, Maskin, and Roland (2003) identify that Schaffer was the first to model the SBC as a dynamic commitment problem. Dewatripont and Maskin (1995) deepened this analysis by identifying the structural cause of this commitment failure: the presence of sunk costs in a centralized financing system. The logic is simple: at first, a creditor would prefer to deny support for a poor project; however, when the sunk costs have been incurred, ex-post, it becomes rational to provide funds to the project and recover some of the return, rendering the initial threat of termination incredible. Thus, the budget-constrained agent (the firm or local government) anticipates this ex-post rationality, and they have no incentive to maintain fiscal discipline in the first place; thus, "soft budget constraint" appears.

Kornai, Maskin, and Roland (2003) generalize this logic by emphasizing that the soft budget constraint is not only a sequence of financial support, but also an expectation-based behavioral syndrome. The relevant mechanism is not simply that support is provided, but that the budget-constrained organization expects support and this expectation affects its behavior. Therefore, the existence of subsidies, transfers, or other forms of public support is not sufficient by itself to prove a soft budget constraint. What matters is whether such support weakens fiscal discipline by changing expectations and incentives.

This distinction is especially important in intergovernmental fiscal relations. Vigneault (2005) explains that soft budget constraints at the subnational level arise when local or regional governments expect additional resources from the central government in case of fiscal stress, and when this expectation affects their spending, borrowing, or revenue behavior. In this setting, the problem is closely connected to vertical fiscal imbalance, limited own-revenue autonomy,

expenditure responsibilities, intergovernmental transfers, and the central government's inability to commit credibly to a no-bailout policy.

Empirically, soft budget constraints in intergovernmental relations can be studied in two ways. The most common one is the direct approach that focuses on realized bailouts or bailout expectations and tests whether expected rescue affects subnational fiscal behavior. Pettersson-Lidbom and Dahlberg (2003) provide a direct example of this approach using observed bailout data for Swedish local governments. Based on 286 municipalities and 1,697 central-government bailouts over 1974–1992, they find evidence of soft budget constraints: a municipality that expects a bailout with certainty increases its debt by about 6–10 percent compared with a municipality with no bailout expectation. Their study shows how soft budget constraints can be tested directly when bailout episodes are observable. However, such data is often unavailable. An alternative approach is shown by Tripathi and Grigoriadis (2023), where they studied soft-budget-constraint-related mechanisms indirectly through observable fiscal-dependence indicators and fiscal performance. Our thesis follows the second approach, as data on direct bailouts to Ukrainian hromadas are unavailable.

2.2 The Tripathi and Grigoriadis Framework

Tripathi and Grigoriadis (2023) provide the main empirical reference for our thesis because they connect the hard and soft budget constraint literature with subnational fiscal responsibility. Their article studies Indian fiscal federalism, where state governments have important spending responsibilities but still remain dependent on transfers and borrowing from the central government. The authors argue that this fiscal dependence can create disincentives for prudent fiscal behavior and can therefore be studied through the hard/soft budget constraint framework.

The logic of their argument is based on the relationship between revenue authority, expenditure responsibility, and fiscal discipline. In this framework, fiscal discipline depends on whether subnational governments face a clear connection between their spending responsibilities and the revenues used to finance them. When this connection is weak and subnational governments rely heavily on the central government, fiscal responsibility may weaken.

Tripathi and Grigoriadis (2023) use fiscal performance to measure the fiscal responsibility of Indian states. Their main indicator is the fiscal deficit relative to aggregate expenditure, with fiscal deficit relative to state GDP used as an alternative measure. A higher value means weaker fiscal performance, because a larger deficit is observed relative to the size of the state budget or economy. They then relate this outcome to transfer dependence and borrowing dependence. These variables show how strongly state governments rely on central financing, but they do not measure bailout expectations directly.

In Tripathi and Grigoriadis (2023), transfer dependence and borrowing dependence represent two different channels through which hard- and soft-budget-constraint-related mechanisms may be examined. Both channels describe dependence on the central government, but they capture different forms of this dependence: transfers reflect intergovernmental fiscal support, while borrowing reflects central financing through loans. In both cases, the empirical question is whether stronger dependence on the center is associated with weaker fiscal performance.

The Ukrainian case differs from the Indian one. Ukraine is not a federal state, and hromadas are not equivalent to Indian states. The framework is therefore not transferred as a direct institutional replication. It is used at a more general level: to study whether local fiscal performance is related to dependence on higher-level government finance.

2.3 Decentralization Reform and Wartime Exposure

In Ukraine, fiscal dependence and fiscal performance were shaped by two major contexts: decentralization reform and full-scale war.

The literature on intergovernmental finance treats transfers as a central instrument of intergovernmental fiscal relations. Transfers are used when local expenditure responsibilities are not fully matched by local own-revenue capacity. At the same time, their design affects fiscal management, accountability, and the incentives of subnational governments (Boadway and Shah 2007; Shah 2006). This is the part of the fiscal-decentralization literature that is closest to the Ukrainian case, where local budgets combine their own revenues, shared taxes, dotations, subventions, and delegated responsibilities.

Ukraine's 2014–2020 decentralization reform changed the structure of local public finance. Levitas and Djikic (2017) describe the 2015 reforms as a shift of power and money away from oblast and rayon levels toward cities and amalgamated hromadas. They also describe changes in the intergovernmental finance system, including new health and education grants, changes in PIT sharing, and the assignment of a 60 percent PIT share to amalgamated hromadas at the moment of their creation. The reform did not remove transfers from local budgets. Rather, it changed how resources and responsibilities were distributed across levels of government.

Nivievskyi et al. (2024) provide direct evidence on voluntary amalgamation. They describe amalgamation as part of the decentralization reform and show that amalgamated territorial communities received broader administrative and financial authority, broader revenue sources, and wider expenditure responsibilities. Their results show that local revenues and local expenditures increased after amalgamation. They also report that the revenue-expenditure ratio decreased over time after amalgamation, which indicates that expenditure growth

outpaced revenue growth. For this thesis, this means that amalgamation should be studied as a change in the fiscal structure of hromadas, not simply as an automatic improvement in fiscal performance.

Evidence from other countries also shows that amalgamation does not always lead to clear fiscal gains. For example, Allers and Geertsema (2016) study municipal amalgamation in the Netherlands and find no significant effect on total spending or taxation, although administrative spending decreases. For this thesis, this means that Ukrainian amalgamation should be treated as a possible change in fiscal structure, not as a reform that automatically improves fiscal performance.

The full-scale invasion did not affect all hromadas in the same way. Some communities faced direct hostilities, occupation risk, displacement, damage to local economic activity, and higher emergency needs. OECD (2022) describes subnational governments during the war as involved in disaster management, urgent humanitarian needs, recovery, and rebuilding local economies. This shows that wartime local governments had additional responsibilities, but it does not by itself show the fiscal effect of these responsibilities. This is why the fiscal consequences of wartime exposure need to be tested empirically.

Rabinovych et al. (2026) provide direct fiscal evidence on Ukrainian local self-government during the war. They study budget robustness, defined as the ability to return to pre-war revenue levels. Their findings show that budget robustness is positively associated with lower exposure to fighting and occupation. In other words, hromadas less exposed to fighting and occupation were more likely to restore their revenue levels, while stronger exposure was associated with weaker budget recovery.

Keudel and Huss (2024) provide complementary evidence on wartime local governance. Based on a wartime survey of Ukrainian local authorities, interviews, and focus groups, they show that local governments remained active in

decentralized crisis response. This does not mean that wartime exposure improved fiscal performance. Rather, it shows that hromadas continued to perform public functions under crisis conditions; the fiscal consequences of this crisis response need to be assessed separately.

2.4 Research Gap and Contribution

This thesis contributes to the literature by applying a fiscal-responsibility framework to Ukrainian hromadas. The existing soft budget constraint literature explains how dependence on higher-level support may weaken fiscal discipline, while Tripathi and Grigoriadis (2023) show how this logic can be studied indirectly through fiscal performance and fiscal-dependence indicators. However, this framework has not been applied to Ukrainian local governments in this specific way.

The contribution of this thesis is to adapt this framework to hromada-level fiscal data for 2013–2025, a period that covers the pre-reform local-government structure, voluntary amalgamation during decentralization reform, the completed hromada system, and the full-scale war. This allows the thesis to examine fiscal performance in three Ukrainian contexts: dependence on intergovernmental transfers, voluntary amalgamation, and local wartime exposure.

Chapter 3

METHODOLOGY

This chapter presents the empirical strategy used to analyse the fiscal performance of Ukrainian hromadas over 2013–2025. Building on the theoretical framework discussed in Chapter 2, the analysis focuses on deficit-based Fiscal Performance and related fiscal-dependence channels. The empirical strategy is organized around three hypotheses.

H1: Higher dependence on intergovernmental transfers is associated with weaker fiscal performance of Ukrainian hromadas.

This hypothesis follows most directly from Tripathi and Grigoriadis (2023), who study whether dependence on higher-level government finance is associated with weaker subnational fiscal responsibility. In the Ukrainian case, intergovernmental transfers are the closest comparable fiscal-dependence channel. Vigneault (2005) also emphasizes that vertical fiscal imbalance and dependence on central transfers are important conditions in intergovernmental soft-budget-constraint problems. Therefore, higher transfer dependence is expected to be associated with weaker deficit-based fiscal performance.

H2: Voluntary amalgamation during the 2014–2020 decentralization reform improved the fiscal performance of Ukrainian hromadas.

Levitas and Djikic (2017) describe the reform as a shift of power and money toward cities and amalgamated hromadas. Nivievskyi et al. (2024) show that voluntary amalgamation changed local revenues, expenditures, transfers, and responsibilities. Since amalgamation strengthened the fiscal role of the basic local-government level, it may be expected to improve fiscal performance;

however, the broader amalgamation literature suggests that such fiscal effects are not automatic and require empirical testing (Allers and Geertsema 2016).

H3: Ukrainian hromadas with higher local wartime exposure exhibited worse fiscal performance than less exposed hromadas.

This hypothesis is based on the literature on Ukrainian local budgets during the full-scale invasion. Rabinovych et al. (2026) find that budget robustness of Ukrainian local self-government is positively associated with lower exposure to fighting and occupation. Since stronger wartime exposure is linked to weaker budget recovery in that study, this thesis tests whether more exposed hromadas also exhibit weaker deficit-based fiscal performance.

3.1 Hypothesis 1: Transfer Dependence and Fiscal Performance

As discussed in Chapter 2, Ukraine's local finance system that existed before the reform had all the features that make the hard/soft budget constraint perspective relevant, such as fragmented jurisdictions, limited real fiscal autonomy, centrally mandated expenditure obligations, and a gap-filling transfer logic. Following the empirical logic of Tripathi and Grigoriadis (2023), H1 uses observable fiscal-dependence channels to examine whether reliance on transfers from above is associated with weaker fiscal performance. At the same time, Ukraine's decentralization reform created larger hromadas and shifted resources and responsibilities toward the municipal level, so these channels do not necessarily have to operate in an SBC-consistent way.

We evaluate Hypothesis 1 using a panel design adapted to the Ukrainian hromada context. Tripathi and Grigoriadis (2023) estimate panel regressions for Indian states to test whether higher transfer dependence and borrowing dependence are associated with weaker fiscal performance. Their baseline specification is shown in equation (1):

$$FP_{s,t} = \alpha + \beta_1 TD_{s,t} + \beta_2 BD_{s,t} + \beta_3 EF_{s,t} + \\ +\beta_4 RF_{s,t} + \gamma X_{s,t} + \alpha_s + \eta_t + \varepsilon_{s,t} \quad (1)$$

where $FP_{s,t}$ is measured as the ratio of fiscal deficit to aggregate expenditure, $TD_{s,t}$) is defined as the ratio of grants plus the state share in central taxes to total revenue receipts, $BD_{s,t}$ is defined as loans from the center relative either to state GDP or to state expenditure, $EF_{s,t}$ is expenditure federalism, $RF_{s,t}$ is revenue federalism. Tripathi and Grigoriadis include a set of demographic and structural controls such as agricultural share, population, poverty, and aging.

Although Tripathi and Grigoriadis (2023) call the deficit-to-expenditure ratio "Fiscal Performance" (FP), their analysis actually uses it to discuss fiscal discipline and responsible behavior. Following this logic, in our thesis, we use Fiscal Performance (FP) as an observable deficit-based indicator related to fiscal responsibility and discipline.

The Ukrainian adaptation mainly focuses on transfer dependence. In the Ukrainian hromada context, transfers are the main observable top-down fiscal-dependence channel and the closest Ukrainian counterpart to the fiscal-dependence logic used by Tripathi and Grigoriadis (2023). TD is estimated as the share of dotations and subventions from the State Budget in total hromada revenue, since the Indian measure of transfer dependence cannot be reproduced mechanically using hromada-level Ukrainian fiscal data. Therefore, TD should be interpreted as an institutionally adapted measure of state-to-local fiscal support rather than as a directly equivalent variable.

The measure focuses specifically on state-to-local transfers and excludes transfers between local budgets, because H1 is concerned with top-down fiscal

dependence rather than horizontal interbudgetary flows. TD is then decomposed into Dotation Dependence (DD) and Subvention Dependence (SubD) because these transfer groups have different institutional meanings in the Ukrainian budget system. The Budget Code defines subventions as interbudgetary transfers used for a specific purpose, while the official budget classification records dotations and subventions under separate state-to-local transfer categories: code 41020000 for dotations and code 41030000 for subventions. This allows the thesis to test whether aggregate Transfer Dependence (TD) masks different associations across transfer types (Verkhovna Rada of Ukraine 2010, Arts. 2 and 96–97; Ministry of Finance of Ukraine 2011).

However, we don't use borrowing dependence in our adaptation of the Indian borrowing channel. In Tripathi and Grigoriadis (2023), borrowing dependence is defined as loans from the central government to states. In the Ukrainian case, local borrowing has a different institutional nature. It is legally available, but it is restricted mainly to development-budget purposes, subject to debt-service and debt-stock limits, and requires agreement with the Ministry of Finance. In addition, the state budget is not responsible for local debt obligations. Therefore, although a rough borrowing proxy can be constructed as the share of internal and external borrowing in total expenditure of hromadas, it is not treated as a central H1 channel. Given its limited institutional role and the small number of non-zero observations in the hromada-level data, BD is excluded from the main specifications and left only as a possible supplementary check (Verkhovna Rada of Ukraine 2010, Arts. 16, 18, and 74).

We do not transfer mechanically institutional controls used by Tripathi and Grigoriadis to the Ukrainian hromada-level setting. Their expenditure federalism and revenue federalism variables are meaningful in the Indian state-level context because they measure the relative role of states within a federal public-finance system. In Ukraine, analogous hromada-to-central revenue or expenditure ratios

would capture the small scale of individual local budgets relative to the state budget, rather than a comparable degree of fiscal federalism. For this reason, separate EF and RF controls are not included in the Ukrainian specification.

Then we adapt the control set to the available and relevant local-level information. Tripathi and Grigoriadis (2023) control for agricultural share, population, poverty, and demographic aging. In the Ukrainian hromada-level setting, these variables cannot be transferred mechanically because comparable annual hromada-level measures are unavailable. Therefore, the main time-varying structural control retained in the fixed-effects models is population. Additional controls, such as area and hromada type, are included in the RE models as summarized in Table 1.

Table 1. Adaptation of Tripathi and Grigoriadis Variables to the Ukrainian Hromada Context

Component	Tripathi and Grigoriadis (2023), India	Ukrainian hromada-level adaptation
Unit of analysis	Indian state-year panel	Hromada-year panel
Fiscal Performance	Fiscal deficit / aggregate expenditure	(Total Expenditure – Total Revenue) / Total Expenditure
Transfer Dependence	Grants plus state share in central taxes / total revenue receipts	(Dotations + Subventions) / Total Revenue
Dotation Dependence	-	Dotations / Total Revenue
Subvention Dependence	-	Subventions / Total Revenue
Borrowing Dependence	Central government loans / state GDP or expenditure	-
Expenditure Federalism	State expenditure / combined expenditure	-
Revenue Federalism	State revenue / combined revenue	-
Controls	Population, agricultural share, poverty, aging	Log population in FE models; log area and hromada type in RE models

To evaluate Hypothesis 1, we estimate two main fixed-effects model variants for the 2013–2025 hromada-year panel. The first model uses aggregate transfer dependence, while the second decomposes the transfer channel into DD and SubD. This structure allows the analysis to first test the overall association between state-to-local transfer dependence and fiscal performance, and then examine whether this association differs across the two main transfer types. The two specifications are shown in equations (2) and (3):

$$FP_{it} = \alpha + \beta_1 TD_{it} + \gamma X_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (2)$$

$$FP_{it} = \alpha + \beta_1 DD_{it} + \beta_2 SubD_{it} + \gamma X_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (3)$$

We start the analysis with a fixed-effects panel specification as the baseline design, as we continue to adapt Tripathi and Grigoriadis (2023). In their study, they introduce FE and then add RE and estimate them, comparing side by side. Thus, FE and RE are used in a complementary way: fixed effects provide the main benchmark by absorbing unobserved time-invariant heterogeneity across hromadas, while random effects allow time-invariant territorial and institutional characteristics, most importantly log area and hromada type, to enter the model explicitly. The relative suitability of the FE and RE specifications is assessed using the Hausman test, while FE is treated as the baseline specification throughout the analysis.

As an additional robustness check, we estimate the per capita version of the main TD and split H1 specifications shown in equation (4) and (5):

$$FPpc_{it} = \alpha + \beta_1 TD_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (4)$$

$$FPpc_{it} = \alpha + \beta_1 DD_{it} + \beta_2 SubD_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (5)$$

This follows the logic of Tripathi and Grigoriadis (2023), who report alternative normalizations of fiscal performance, including fiscal deficit relative to expenditure and fiscal deficit relative to GSDP. Since hromada-level GRP is unavailable, FP per capita is used as a feasible local-level alternative normalization. These models do not replace the ratio specifications but check whether the results are sensitive to the choice of denominator. In the per-capita specifications, log population is not included as a control because population is already used in the construction of the dependent variable.

After estimating the FE/RE models, we conduct additional robustness checks. First, the baseline panel estimates are reported with standard errors clustered at the hromada level. Then, we re-estimate the FE specifications with Driscoll–Kraay standard errors in order to account more explicitly for possible residual serial correlation and cross-sectional dependence in the panel due to common national shocks, intergovernmental finance rules, macroeconomic conditions, and wartime disruptions. The diagnostic test results are reported in the results section.

Then we conduct descriptive diagnostics and multicollinearity checks, including variance inflation factors (VIF), to ensure that the main specifications are not distorted by problematic relationships among the explanatory variables.

Taken together, this empirical strategy preserves the core logic of Tripathi and Grigoriadis (2023) while adapting it to a different institutional setting and a different level of government. The Ukrainian model uses a deficit-based measure of fiscal performance and relates it to transfer dependence and its two components, dotations and subventions. These variables are interpreted as institutionally adapted hromada-level fiscal-dependence channels rather than direct measures of soft or hard budget constraints.

3.2 Hypothesis 2: Decentralization Reform and Fiscal Performance

Hypothesis 2 uses the fiscal indicators introduced in H1 to evaluate the decentralization and amalgamation reform. As we state in H1, FP is used as the main deficit-based indicator of fiscal performance, while TD and its split components are used to examine how transfer dependence relates to fiscal performance through the broader SBC/HBC lens. In H2, the empirical question changes: reform entry becomes the treatment variable, while FP and the transfer-dependence variables become outcomes. This allows the thesis to examine whether reform entry was associated not only with changes in observed fiscal performance, but also with changes in the transfer-dependence structure of hromada budgets.

FP remains the main outcome because H2 evaluates whether reform entry changed observed fiscal performance. TD, DD, and SubD are included as additional outcomes to show whether changes in FP were accompanied by changes in dependence on state-to-local transfers and in the composition of those transfers. Thus, H2 evaluates both the final deficit-based fiscal performance and the transfer-dependence pattern introduced in H1.

Then we interpret all the outcomes together. Changes in TD or its components are not treated as direct proof of softening or hardening by themselves, but they help qualify the interpretation of the Fiscal Performance (FP) result within the broader SBC/HBC framework.

In addition to FP and transfer-dependence outcomes, H2 includes Own Revenue Coverage (ORC) as an auxiliary fiscal-capacity outcome. Thus, while FP measures the final observed fiscal performance after transfers are included in revenues, and TD measures selected transfers as a share of total revenue, ORC shows the extent to which hromada expenditure is covered outside this selected transfer channel. The theoretical motivation for ORC comes from the fiscal federalism and

SBC/HBC literature, which emphasizes the link between expenditure responsibilities, local revenue capacity, and dependence on higher-level support. Tripathi and Grigoriadis (2023) link effective fiscal federalism to a strong connection between revenues and expenditures and argue that increased transfers should be matched by own-revenue effort and fiscal discipline. Vigneault (2005) similarly argues that vertical fiscal imbalance can create bailout expectations when subnational governments have limited ability to raise own revenues in response to fiscal stress. Therefore, ORC helps interpret whether reform-related changes in FP were accompanied by stronger or weaker expenditure coverage outside the selected state-to-local transfer channel.

Overall, the H2 estimates are interpreted jointly across several fiscal outcomes. FP remains the main outcome because it is the deficit-based Fiscal Performance indicator introduced in H1. TD, DD, and SubD are used to assess whether changes in FP were accompanied by changes in transfer dependence and transfer composition. ORC is used as an auxiliary fiscal-capacity outcome to assess whether observed fiscal performance was accompanied by stronger or weaker non-transfer expenditure coverage. Therefore, H2 does not treat FP alone as sufficient evidence of stronger or weaker fiscal responsibility, but evaluates the broader reform-related fiscal pattern across these outcomes. Given the staggered timing of reform entry across hromadas, Hypothesis 2 is estimated using a staggered difference-in-differences design following Callaway and Sant'Anna (2021), rather than a single before-versus-after comparison. The analysis is restricted to the period 2013–2019 in order to focus on the pre-war period of voluntary amalgamation and avoid later shocks that could contaminate the estimates. The empirical treatment is defined as entry into voluntary amalgamation, not as the whole decentralization reform package. Hromadas that entered voluntary amalgamation in 2015–2019 are treated as cohorts, while in

each year, the comparison group consists of hromadas that are not yet treated. Treatment is therefore defined by the voluntary amalgamation entry year :

$$G_i = \begin{cases} g, & \text{if hromada } i \text{ entered voluntary amalgamation in year } g,\ g \in \{2015, \ldots, 2019\}, \\ 0, & \text{if hromada } i \text{ is not treated within the 2013–2019 estimation window.} \end{cases}$$

The principal causal object, the cohort-time average treatment effect, is shown in equation (6):

$$ATT(g,t) = E[Y_{it}(g) - Y_{it}(0) \mid G_i = g,\ t \geq g]. \qquad (6)$$

where, i denotes a hromada, $t$denotes a calendar year, and $g$denotes the voluntary-amalgamation entry year. $Y_{it}(g)$ denotes the potential fiscal outcome of hromada $i$in year $t$if it entered voluntary amalgamation in year g, while $Y_{it}(0)$ denotes the potential outcome without treatment by that year. Therefore, $ATT(g,t)$ measures the average difference between the observed outcome of hromadas first treated in year g and their counterfactual outcome without voluntary amalgamation in year t.

Thus, for each voluntary-amalgamation cohort $g$and each post-treatment year t, the analysis compares hromadas first treated in cohort $g$to hromadas that are not yet treated in the same calendar year. These group-time treatment effects are estimated using the ATT framework with doubly robust estimation and covariate adjustment (log population, log area, hromada type).

Thus, we do not interpret a single TWFE coefficient as the effect of voluntary amalgamation. Instead, effects are estimated at the cohort-time level and then

aggregated into more interpretable summary measures, which is more appropriate when treatment timing is staggered and treatment effects may be heterogeneous.

After estimating the cohort-time effects, the analysis reports two main aggregations. The simple aggregation provides one overall estimate for each outcome. The dynamic aggregation presents the event-time profile around voluntary amalgamation entry and allows the assessment of pre-treatment dynamics and post-treatment adjustment. Together, these aggregations allow the analysis to distinguish between the average association with voluntary amalgamation entry and its timing around entry into the new hromada structure.

In addition to the main Callaway–Sant'Anna estimates, for H2 we conduct several robustness checks for the ratio-based outcomes.

First, we re-estimate our specifications under stricter winsorization thresholds. For the robustness version, we use the 2.5th and 97.5th percentiles, while our baseline ratio variables are winsorized at the 1st and 99th percentiles. This checks whether the results are sensitive to extreme budget observations.

Second, because the population for hromada-years 2013-2021 is reconstructed, the main ratio models are re-estimated using an alternative population-control measure based on the population-share reconstruction. This checks whether the H2 results depend on the specific population control used in the baseline model.

Next, we conduct a pre-treatment placebo test using the pre-reform period 2013–2014. Hromadas treated later are marked as future-treated, while 2014 is treated as a false post-treatment year. This checks whether future-treated hromadas already displayed different pre-reform dynamics before actual reform entry.

Then we conduct a leave-one-cohort-out procedure and exclude reform-entry cohorts one at a time from the 2015–2019 treated cohorts. This verifies whether the results are driven by a single-entry cohort rather than by the broader reform pattern.

Finally, we use the per capita specifications as an additional robustness check to determine whether the results are sensitive to changing the denominator from total budget size to population. The main H2 outcomes are ratios, so they scale fiscal variables by the size of the local budget. The per capita outcomes help us measure fiscal amounts per resident, in thousand UAH, and are transformed with IHS after winsorization. Since population is already part of the dependent variable, we do not include it as a control variable.

3.3 Hypothesis 3: Wartime Exposure and Fiscal Performance

Hypothesis 3 examines whether local wartime exposure during the full-scale invasion was associated with changes in the fiscal outcomes of Ukrainian hromadas. The analysis applies the same fiscal-responsibility framework used in H1 and H2 to the wartime period. Methodologically, it follows the general conflict-exposure logic used by Abay et al. (2023) in their study of the welfare and livelihood effects of the war in Ethiopia. Their design combines a broad affected-versus-unaffected comparison with more granular conflict-exposure measures, distinguishing between extensive exposure to conflict and intensive exposure to conflict events. This thesis adapts this logic to Ukrainian hromada-level fiscal data. Instead of household welfare outcomes and ACLED battle events, the analysis uses annual fiscal outcomes and administrative measures of wartime exposure at the hromada level.

The analysis is restricted to the period 2020–2025. The years 2020 and 2021 are treated as pre-war years, while 2022–2025 correspond to the period of the full-scale invasion. This restricted window is used to separate the wartime analysis from earlier decentralization-reform dynamics. The unit of observation is a hromada-year.

The main wartime exposure variables are summarized in Table 2. They capture two dimensions of local wartime exposure: the intensive margin, measured by the share of the year under exposure, and the extensive margin, measured by whether any exposure occurred in a given year.

Table 2. Wartime Exposure Variables Used in H3

Standardized variable	**Short name**	**Construction**	**Interpretation**
Potential exposure share	PotShare	Potential warzone days / days in year	Share of the year under potential wartime exposure
Active exposure share	ActiveShare	Active warzone days / days in year	Share of the year under active-warzone exposure
Any potential exposure	AnyPot	1 if PotShare > 0, otherwise 0	Indicator for any potential wartime exposure in a given year
Any active exposure	AnyActive	1 if ActiveShare > 0, otherwise 0	Indicator for any active-warzone exposure in a given year
Ever-potential exposure	EverPot	1 if a hromada had any potential exposure during 2022–2025; 0 otherwise	Indicator for ever entering potential wartime exposure during the full-scale war

Potential exposure share (PotShare) captures a broader form of potential wartime threat, while active exposure share (ActiveShare) captures a more direct and severe form of active-warzone exposure. AnyPot and AnyActive are used as extensive-margin counterparts to check whether the presence of exposure itself is associated with fiscal outcomes, regardless of the duration of exposure.

The primary fiscal outcome in H3 is Fiscal Performance (FP), defined in the same way as in H1 and H2. Higher values of FP indicate weaker observed fiscal performance, because a larger share of expenditure is not covered by revenue. Lower values indicate stronger observed fiscal performance. To interpret the fiscal pattern behind changes in FP, the analysis also estimates models for

Transfer Dependence (TD), Dotation Dependence (DD), Subvention Dependence (SubD), and Own Revenue Coverage (ORC). These additional outcomes are not interpreted as independent mechanisms. Instead, they are used jointly with FP to describe whether wartime exposure was associated with changes in observed fiscal performance, transfer dependence, transfer composition, and non-transfer expenditure coverage.

Before estimation, the main fiscal ratio outcomes are winsorized at the 1st and 99th percentiles. This reduces the influence of extreme budget observations while preserving the interpretation of the variables as fiscal ratios. The main variables used in the ratio-based models are therefore the winsorized versions of FP, TD, DD, SubD, and ORC.

The empirical strategy proceeds in four main steps.

First, we estimate a baseline calendar-year DiD model comparing hromadas that ever entered potential wartime exposure with those that never did. This broad comparison is implemented using EverPot, which equals one if a hromada had any potential exposure during the full-scale war period. The model specified is shown in equation (7):

$$Y_{it} = \alpha + \sum_{k \neq 2021} \beta_k \left(EverPot_i \times Year_k\right) + \mu_i + \lambda_t + \varepsilon_{it} \qquad (7)$$

where Y_{it}denotes one of the fiscal outcomes, 2021 is the reference year, $\mu_i$are hromada fixed effects, and $\lambda_t$are year fixed effects. This model provides a broad trajectory comparison between ever-potentially exposed and never-potentially exposed hromadas before and after the start of the full-scale invasion. It is not interpreted as the main causal estimator, because wartime exposure in Ukraine

was spatially dispersed and does not correspond to one clearly defined treated region. Its purpose is to provide an introductory pre/post comparison consistent with the broad layer of the conflict-exposure approach.

Second, we estimate the main intensive-exposure TWFE models separately for potential exposure and active exposure. They are shown in equations (8) and (9):

$$Y_{it} = \alpha + \beta_1 PotShare_{it} + \gamma \log Population_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (8)$$

$$Y_{it} = \alpha + \beta_1 ActiveShare_{it} + \gamma \log Population_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (9)$$

We use these models to estimate whether hromadas that spent a larger share of the year under potential or active wartime exposure experienced different fiscal outcomes, conditional on hromada and year fixed effects. Hromada fixed effects absorb time-invariant local characteristics, such as geography, administrative type and other fixed local traits. Year fixed effects absorb common annual shocks affecting all hromadas, including national wartime policy changes, macroeconomic shocks, inflationary pressures, and changes in the overall fiscal environment.

After that, we estimate extensive-margin TWFE models separately for any potential exposure and any active exposure. They are shown in equation (10) and (11):

$$Y_{it} = \alpha + \beta_1 AnyPot_{it} + \gamma \log Population_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (10)$$

$$Y_{it} = \alpha + \beta_1 AnyActive_{it} + \gamma \log Population_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (11)$$

These models test whether the presence of wartime exposure in a given hromada-year is associated with changes in fiscal outcomes, regardless of the duration of

exposure. They complement the intensive models by distinguishing the association with being exposed at all from the association with spending a larger share of the year under exposure.

Fourth, we report Callaway–Sant'Anna estimates as a robustness check for binary first-exposure timing. This is motivated by the fact that hromadas entered exposure status at different times after 2022. The first-exposure year is defined separately for potential exposure and active exposure. The Callaway–Sant'Anna estimator is therefore used to check whether the extensive-margin results are sensitive to staggered treatment timing. These estimates are not the main specification for continuous exposure intensity, because PotShare and ActiveShare are annual intensity measures rather than binary treatment-timing variables. Since first exposure is treated as an absorbing event in this specification, these estimates are interpreted as robustness checks for exposure onset rather than as estimates of annual exposure intensity.

The H3 estimates are interpreted jointly across fiscal outcomes. FP remains the primary outcome because it is the deficit-based Fiscal Performance indicator introduced in H1 and used in H2. TD, DD, SubD, and ORC are used to assess whether changes in FP were accompanied by changes in transfer dependence, transfer composition, or non-transfer expenditure coverage. Therefore, H3 does not treat FP alone as sufficient evidence of stronger or weaker fiscal responsibility, but evaluates the broader wartime fiscal pattern across these outcomes.

Then we re-estimate the main FP exposure models using stricter winsorization thresholds. The baseline FP ratio is winsorized at the 1st and 99th percentiles, while the robustness version uses 2.5th and 97.5th percentiles. This checks whether the fiscal-performance result is sensitive to extreme budget observations.

Second, the ratio-based models are re-estimated using alternative population controls. The baseline models use the average population series, while the robustness checks replace it with the alternative minimum and maximum population series. This is especially relevant in the wartime period, when displacement and migration may make population measurement less stable.

Next, leave-one-oblast-out checks are reported for the main FP outcome by excluding one exposed oblast at a time. This checks whether the fiscal-performance result is driven by a single highly exposed region.

Finally, we use the per capita specifications as an additional robustness check to determine whether the results are sensitive to changing the denominator from total budget size to population. The main H3 outcomes are ratios, so they scale fiscal variables by the size of the local budget. The per capita outcomes help us measure fiscal amounts per resident, in thousand UAH, and are transformed with IHS after winsorization. Since population is already part of the dependent variable, we do not include it as a control variable.

Chapter 4

DATA

4.1. Data sources and panel construction

This thesis builds a hromada–year panel for 2013-2025 by combining administrative budget execution data and hromada-level data from different sources. The two main sources of fiscal data are the World Bank BOOST platform for 2013–2017 and the Open Budget platform for 2018–2025 (World Bank Group 2025; Ministry of Finance of Ukraine, n.d.).

We use KOATUU and KATOTTG identifiers to harmonize fiscal data to contemporary hromada boundaries (Kyiv School of Economics, n.d.). Because many contemporary hromadas did not exist as administrative units before the decentralization reform, the pre-amalgamation fiscal observations are reconstructed retrospectively. In those years, the unit of analysis should therefore be understood as a synthetic hromada constructed according to contemporary hromada boundaries, not as a historical administrative unit that already existed at the time. Pre-amalgamation local councils and settlements were matched to current hromadas, with the matching checked manually on a stratified sample of 370 settlements from more than 10,000 records. Budgets of pre-amalgamation local councils and settlements that later became part of the same hromada are summed to obtain comparable hromada-year fiscal indicators. This backward harmonization is necessary to compare fiscal outcomes before and after voluntary amalgamation within a consistent territorial framework.

The fiscal data are reported in nominal Ukrainian hryvnia (UAH). All monetary fiscal variables are deflated to constant 2021 prices using the Consumer Price Index from the State Statistics Service of Ukraine while non-financial data, such as the hromada list, hromada UA code, and region, are taken from the KSE Local

Data Hub (State Statistics Service of Ukraine, n.d.-b; Kyiv School of Economics, n.d.).

War-related variables, such as potential warzone and active warzone status, are taken from the official "List of territories where hostilities are (were) conducted or temporarily occupied by the Russian Federation" issued under Order No. 376 of the Ministry for Communities and Territories Development of Ukraine dated February 28, 2025 registered with the Ministry of Justice of Ukraine on March 11, 2025, under No. 380/43786 (Ministry for Development of Communities and Territories of Ukraine 2025) and then harmonized and merged.

Hromada-level population is directly observed only for 2021–2022 (Kyiv School of Economics, n.d.). To obtain a consistent size control and to construct per-capita fiscal indicators for the full 2013–2025 panel, we extrapolate population for missing years using two methods: oblast-level annual population growth rates for 2013–2021 and fixed oblast population shares (State Statistics Service of Ukraine, n.d.-a). Nighttime-light data from NASA Earth Science Data Systems (2025) are used to construct and extrapolate population for missing years in 2023–2025. The nighttime-light elasticity used for this extrapolation is reported in Appendix C, Table 32. Table 3 shows how the raw hromada-year panel is transformed into the analytical samples used in the empirical analysis.

Table 3. Transformation of the Raw Master Panel into Analytical Samples

Step	Rows	Unique hromadas
Cleaned analysis panel	18,675	1,438
H1 sample, 2013-2025	18,675	1,438
H2 reform sample, 2013-2019	10,051	1,438
H3 wartime sample, 2020-2025	8,624	1,438

Note: Rows are hromada-year observations. Samples differ by the time window used for each empirical hypothesis.

The cleaned analysis panel covers 2013-2025 and includes 18,675 hromada-year observations for 1,438 hromadas. This full cleaned panel is used for H1. The H2 sample is restricted to 2013 - 2019 and includes 10,051 observations, allowing the analysis to focus on voluntary amalgamation before the full-scale war. The H3 sample covers 2020 - 2025 and includes 8,624 observations for the wartime-exposure analysis. Thus, the samples differ mainly by the time window required for each hypothesis, while the number of hromadas remains the same across H1, H2, and H3.

4.2. Reform and Wartime Exposure Structure

Figure 1 shows the distribution of hromadas by voluntary-amalgamation entry year.

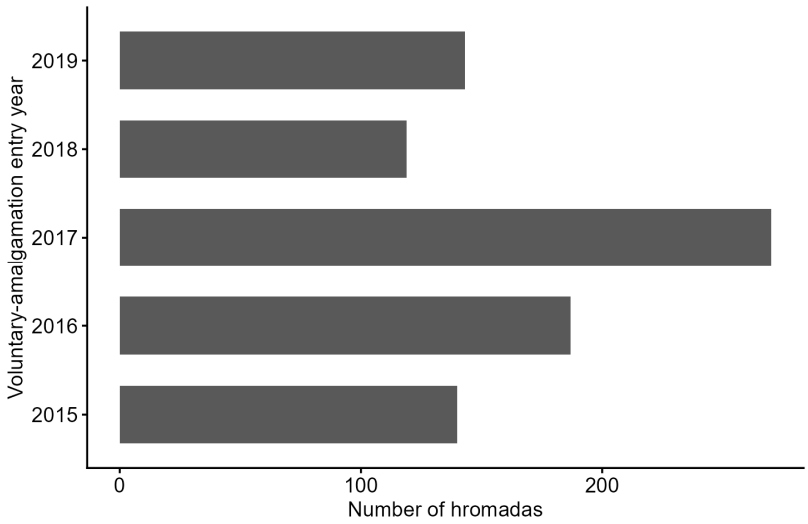


Figure 1. Distribution of Voluntary-Amalgamation Entry Cohorts

Note. Based on the constructed hromada-year panel and KSE Local Data Hub data.

The largest entry cohort is 2017, with 270 hromadas. The second largest cohort is 2016, with 187 hromadas. 143 hromadas entered in 2019, 140 hromadas entered in 2015, and 119 hromadas entered in 2018.

Overall, the figure shows that voluntary amalgamation was not evenly distributed across years. Most entries occurred in 2016–2017, while 2018 had the smallest number of new entries. In total, the 2015–2019 voluntary-amalgamation cohorts include 859 treated hromadas.

Figure 2 summarizes the annual coverage of warzone exposure in the H3 sample for 2022–2025.

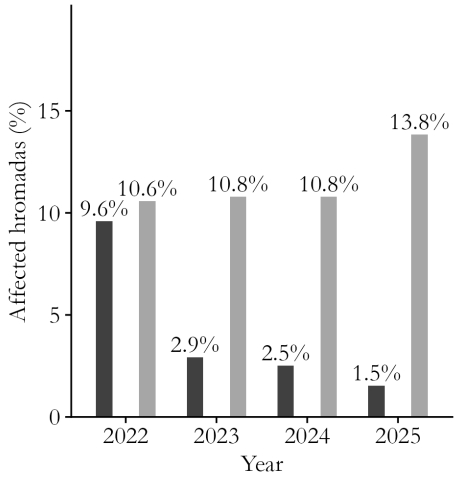


Figure 2. Share of Hromadas with Any Warzone Exposure by Year

Notes. Light bars indicate potential exposure and dark bars indicate active exposure. Figure 2 reports the percentage of hromadas with at least one day of exposure in a given year.

Active warzone exposure, which captures hromadas with direct active-warzone status, declined from 9.6 percent of hromadas in 2022 to 2.9 percent in 2023, 2.5 percent in 2024, and 1.5 percent in 2025. In contrast, potential warzone exposure

remained recorded for a larger share of hromadas: 10.6 percent in 2022, 10.8 percent in 2023 and 2024, and 13.8 percent in 2025.

This means that the share of hromadas under direct active-warzone status decreased compared with the first year of the full-scale war, while the share of hromadas officially classified as potentially exposed remained relatively high. Therefore, the figure suggests that active warzone exposure became more concentrated, whereas potential warzone exposure continued to describe a broader risk category. This distinction is important for H3 because the two variables capture different types of warzone exposure.

4.3. Cleaning and Descriptive Statistics

Table 4 presents the 1st and 99th percentile winsorization used for the main fiscal ratio variables. It shows the percentile cutoffs together with the means before and after winsorization, allowing us to assess how strongly extreme values affect the data.

Table 4. Baseline Winsorization of Fiscal Ratio Variables

Variable	Raw p1	Raw p99	Winsorized min	Winsorized max	Raw mean	Winsorized mean
Fiscal Performance (FP)	-0.7692	0.2773	-0.7692	0.2773	-0.0483	-0.0431
Transfer Dependence (TD)	0.0000	0.8602	0.0000	0.8602	0.3315	0.3310
Dotation Dependence (DD)	0.0000	0.6470	0.0000	0.6470	0.1095	0.1084
Subvention Dependence (SubD)	0.0000	0.6394	0.0000	0.6394	0.2219	0.2214
Own Revenue Coverage (ORC)	0.1270	1.3124	0.1270	1.3124	0.6970	0.6941

Notes: Fiscal ratio variables are winsorized at the 1st and 99th percentiles. Lower Fiscal Performance (FP) values indicate better observed deficit-based fiscal performance.

The mean values remain close to the raw data after winsorization: Fiscal Performance (FP) changes from -0.0483 to -0.0431, while Transfer Dependence (TD) changes only from 0.3315 to 0.3310. The same applies to the split-transfer variables: Dotation Dependence (DD) changes from 0.1095 to 0.1084, and Subvention Dependence (SubD) changes from 0.2219 to 0.2214. Own Revenue Coverage (ORC) changes from 0.6970 to 0.6941. Therefore, the transformation mainly limits extreme hromada-year observations before model estimation, while the descriptive averages of the main fiscal ratio variables remain almost unchanged.

Table 5 reports descriptive statistics for the full H1 sample for 2013–2025. Fiscal Performance (FP), the main deficit-based outcome, has a mean of -0.0431 and a median of -0.0183.

Table 5. Descriptive Statistics for the H1 Sample, 2013–2025

Variable	Obs.	Mean	SD	Min	Median	Max
Fiscal Performance (FP)	18,675	-0.0431	0.1345	-0.7692	-0.0183	0.2773
Transfer Dependence (TD)	18,675	0.3310	0.2061	0.0000	0.3212	0.8602
Dotation Dependence (DD)	18,675	0.1084	0.1437	0.0000	0.0520	0.6470
Subvention Dependence (SubD)	18,675	0.2214	0.1616	0.0000	0.2225	0.6394
Log reconstructed population	18,675	9.4501	0.8940	6.9963	9.3576	14.2085
Log hromada area (km^2)	18,675	5.6644	0.8161	0.8755	5.6931	7.8229

Notes: Fiscal ratio variables are winsorized at the 1st and 99th percentiles. Lower Fiscal Performance (FP) values indicate better observed deficit-based fiscal performance.

Since Fiscal Performance (FP) is defined as expenditure minus revenue divided by expenditure, negative values mean that revenue exceeds expenditure. Thus, the average and median hromada-year show a small observed surplus according to this indicator. The range from -0.7692 to 0.2773 shows substantial variation

across observations, while the lower mean relative to the median suggests some asymmetry toward more negative FP values.

Transfer Dependence (TD) averages 0.3310, with a median of 0.3212, so selected state-to-local transfers account for about one third of total revenue in the average hromada-year. The split-transfer variables show that Subvention Dependence (SubD) is the larger component of transfer dependence, with a mean of 0.2214 compared with 0.1084 for Dotation Dependence (DD). Dotation Dependence (DD) appears more unevenly distributed, since its mean is more than twice its median, 0.1084 versus 0.0520. Overall, the H1 sample contains meaningful variation in both Fiscal Performance and the structure of transfer dependence, which is necessary for testing the H1 relationship.

Table 6 reports descriptive statistics for the H2 reform sample, which is restricted to 2013–2019 and includes 10,051 hromada-year observations. Fiscal Performance (FP) has a mean of -0.0442 and a median of -0.0228, which is close to the full H1 sample and indicates slightly better observed fiscal performance on average.

Table 6. Descriptive Statistics for the H2 Reform Sample, 2013–2019

Variable	Obs.	Mean	SD	Min	Median	Max
Fiscal Performance (FP)	10,051	-0.0442	0.1225	-0.7692	-0.0228	0.2773
Transfer Dependence (TD)	10,051	0.2994	0.2067	0.0000	0.2919	0.8602
Dotation Dependence (DD)	10,051	0.1069	0.1492	0.0000	0.0280	0.6470
Subvention Dependence (SubD)	10,051	0.1914	0.1843	0.0000	0.1361	0.6394
Own Revenue Coverage (ORC)	10,051	0.7285	0.2358	0.1270	0.7304	1.3124
Log estimated population	10,051	9.4868	0.8986	7.5093	9.3945	14.2085
Log hromada area (km^2)	10,051	5.6646	0.8160	0.8755	5.6931	7.8229

Notes: Fiscal ratio variables are winsorized at the 1st and 99th percentiles. Lower Fiscal Performance (FP) values indicate better observed deficit-based fiscal performance.

The range from -0.7692 to 0.2773 shows substantial variation across observations, while the lower mean relative to the median suggests some asymmetry toward more negative FP values.

Transfer Dependence (TD) averages 0.2994, with a median of 0.2919, so selected state-to-local transfers account for about 30 percent of total revenue in the average hromada-year during the pre-war reform period. The split-transfer variables again show that Subvention Dependence (SubD) is larger than Dotation Dependence (DD), with means of 0.1914 and 0.1069, respectively. Dotation Dependence (DD) is more unevenly distributed, since its mean is much higher than its median, 0.1069 versus 0.0280. Own Revenue Coverage (ORC) averages 0.7285, meaning that revenue excluding selected state-to-local transfers covers about 72.9 percent of expenditure on average. Overall, the H2 sample shows meaningful variation in Fiscal Performance, transfer dependence, and non-transfer expenditure coverage before the full-scale war.

Table 7 reports descriptive statistics for the H3 wartime sample. Fiscal Performance (FP) has a mean of -0.0418 and a median of -0.0146, which remains close to the H1 and H2 samples. Transfer Dependence (TD) is higher in the H3 sample, with a mean of 0.3678 and a median of 0.3478. This higher transfer dependence is mostly reflected in Subvention Dependence (SubD), which averages 0.2563, compared with 0.1102 for Dotation Dependence (DD). Own Revenue Coverage (ORC) is lower than in the H2 sample, with a mean of 0.6540 compared with 0.7285.

The warzone exposure variables are sparse. Potential Exposure Share (PotShare) has a mean of 0.0612 and a median of 0, while Any Potential Exposure (AnyPot) equals 0.0766, meaning that 7.7 percent of hromada-year observations record any potential warzone exposure.

Table 7. Descriptive Statistics for the H3 Wartime Sample, 2020-2025

Variable	Obs.	Mean	SD	Min	Median	Max
Fiscal Performance (FP)	8,624	-0.0418	0.1471	-0.7692	-0.0146	0.2773
Transfer Dependence (TD)	8,624	0.3678	0.1992	0.0000	0.3478	0.8602
Dotation Dependence (DD)	8,624	0.1102	0.1369	0.0000	0.0722	0.6470
Subvention Dependence (SubD)	8,624	0.2563	0.1213	0.0000	0.2563	0.6394
Own Revenue Coverage (ORC)	8,624	0.6540	0.2152	0.1270	0.6645	1.3124
Log reconstructed population	8,624	9.4073	0.8867	6.9963	9.3138	14.1871
Log hromada area (km^2)	8,624	5.6642	0.8163	0.8755	5.6920	7.8229
Potential exposure share (PotShare)	8,624	0.0612	0.2268	0.0000	0.0000	1.0000
Active exposure share (ActiveShare)	8,624	0.0151	0.1097	0.0000	0.0000	1.0000
Any potential exposure (AnyPot)	8,624	0.0766	0.2660	0.0000	0.0000	1.0000
Any active exposure (AnyActive)	8,624	0.0276	0.1638	0.0000	0.0000	1.0000

Notes: Fiscal ratio variables are winsorized at the 1st and 99th percentiles. Lower Fiscal Performance (FP) values indicate better observed deficit-based fiscal performance.

Active Exposure Share (ActiveShare) is more concentrated, with a mean of 0.0151 and a median of 0, while Any Active Exposure (AnyActive) equals 0.0276, or 2.8 percent of observations. Overall, the H3 sample shows higher transfer dependence and lower own-revenue coverage than the reform sample, while warzone exposure is concentrated in a relatively small share of hromada-year observations.

Chapter 5

RESULTS

5.1 Transfer Dependence and Fiscal Performance

In Hypothesis 1, we test whether higher dependence on intergovernmental transfers is associated with weaker fiscal performance of Ukrainian hromadas. Table 8 reports the main estimates for the H1 sample.

Table 8. Main models: H1 Transfer Sample, 2013–2025

	Transfer Dependence FE	Transfer Dependence RE	DD + SubD FE	DD + SubD RE
Transfer Dependence (TD)	-0.038*** (0.010)	-0.011 (0.009)		
Dotation Dependence (DD)			-0.149*** (0.017)	-0.130*** (0.016)
Subvention Dependence (SubD)			0.048*** (0.009)	0.087*** (0.007)
Log reconstructed population	-0.035*** (0.008)	0.005*** (0.002)	-0.047*** (0.008)	0.003* (0.002)
Log hromada area (km^2)		-0.006*** (0.002)		-0.004*** (0.002)
Settlement hromada (ref.: urban)		-0.006* (0.004)		-0.002 (0.003)
Rural hromada (ref.: urban)		-0.012*** (0.004)		-0.010** (0.004)
N	18675	18675	18675	18675
R2	0.004	0.111	0.020	0.131

Notes: FE = fixed effects; RE = random effects. FE models include hromada and year fixed effects. RE models include year dummies, log population, log area, and hromada type. Standard errors are reported in parentheses. (FP) values indicate better observed deficit-based fiscal performance. Stars: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Because Fiscal Performance (FP) and the transfer-dependence variables are measured as ratios, the coefficients are interpreted in percentage-point terms. In the aggregate Transfer Dependence (TD) model, the FE coefficient is negative and statistically significant (-0.038). A 10-percentage-point increase in Transfer Dependence (TD), for example from 30 percent to 40 percent of total revenue, is associated with a 0.38 percentage-point decrease in the FP indicator. Since lower FP values indicate better observed fiscal performance, the FE estimate points to better observed fiscal performance, not weaker performance. In the RE model, the TD coefficient is smaller and statistically insignificant (-0.011).

The split-transfer ratio models show different associations for dotations and subventions. Dotation Dependence (DD) is negative and statistically significant in both FE and RE models. The FE coefficient is -0.149, while the RE coefficient is -0.130. A 10-percentage-point increase in Dotation Dependence (DD), for example from 10 percent to 20 percent of total revenue, is associated with a 1.49 percentage-point decrease in the FP indicator in the FE model and a 1.30 percentage-point decrease in the FP indicator in the RE model. Since lower FP values indicate better observed fiscal performance, higher Dotation Dependence (DD) is associated with better observed fiscal performance in both ratio specifications.

Subvention Dependence (SubD) has the opposite sign. Its coefficient is positive and statistically significant in both ratio models: 0.048 in FE and 0.087 in RE. A 10-percentage-point increase in Subvention Dependence (SubD), for example from 20 percent to 30 percent of total revenue, is associated with a 0.48 percentage-point increase in the FP indicator in the FE model and a 0.87 percentage-point increase in the FP indicator in the RE model. Since higher FP values indicate weaker observed fiscal performance, higher Subvention Dependence (SubD) is associated with weaker observed fiscal performance in the

main ratio specifications. This contrast suggests that the aggregate transfer variable hides different associations across dotations and subventions.

The control variables show additional structural differences across hromadas, holding the transfer variables constant. Log reconstructed population is statistically significant in all four models, but its sign differs across estimators: it is negative in the FE models (-0.035 and -0.047), suggesting lower FP indicator values within the same hromada over time, but positive and much smaller in the RE models (0.005 and 0.003). Therefore, the population result is not consistent across estimators.

The time-invariant controls are reported only in the RE models because FE models absorb characteristics that do not change over time. Log hromada area is negative and statistically significant in both RE specifications (-0.006 and -0.004), meaning that larger-area hromadas tend to have lower FP indicator values. Hromada type is measured relative to urban hromadas: settlement hromadas are negative only in the aggregate TD model (-0.006), while rural hromadas are consistently negative (-0.012 and -0.010). Since lower FP values indicate better observed fiscal performance, these controls suggest structural differences across hromadas, but they are not interpreted as direct evidence for H1.

Then we compare the main ratio results with the per-capita robustness specifications. These models use IHS-transformed deficit-based Fiscal Performance (FP) per resident as the dependent variable. Transfer Dependence (TD), Dotation Dependence (DD), and Subvention Dependence (SubD) remain measured as shares of total revenue. Since the dependent variable is measured in thousand UAH per resident before IHS transformation, the coefficients are not exact UAH effects. They are interpreted cautiously as approximate UAH-per-resident changes in the deficit-based FP measure for a 10-percentage-point increase in the relevant transfer-share variable. The results are shown in Table 9.

Table 9. H1 Per-Capita Robustness Models, 2013–2025

	FP per capita TD FE	FP per capita TD RE	FP per capita DD + SubD FE	FP per capita DD + SubD RE
Transfer Dependence	-0.210***	-0.012		
(TD)	(0.030)	(0.025)		
Dotation Dependence			-0.377***	-0.175***
(DD)			(0.054)	(0.046)
Subvention Dependence (SubD)			-0.081*** (0.030)	0.123*** (0.025)
Log hromada area		-0.004		-0.003
(km^2)		(0.006)		(0.006)
Settlement hromada		-0.028***		-0.019**
(ref.: urban)		(0.008)		(0.008)
Rural hromada		-0.072***		-0.065***
(ref.: urban)		(0.009)		(0.009)
N	18675	18675	18675	18675
R2	0.003	0.090	0.005	0.092

*Notes: The dependent variable is Fiscal Performance per capita, measured in thousand UAH per resident and transformed using IHS after winsorization. Standard errors are reported in parentheses. Lower Fiscal Performance (FP) values indicate better observed deficit-based fiscal performance. Stars: * p < 0.10, ** p < 0.05, *** p < 0.01.*

In the TD per-capita models, the FE coefficient is negative and statistically significant (-0.210), while the RE coefficient is close to zero and statistically insignificant (-0.012). A 10-percentage-point increase in Transfer Dependence (TD), for example from 30 percent to 40 percent of total revenue, is associated with approximately 21 UAH lower deficit-based FP per resident in the FE model. Since lower FP values indicate better observed fiscal performance, this points to better observed fiscal performance in the FE specification. The corresponding RE estimate is close to zero.

In the split-transfer per-capita models, Dotation Dependence (DD) is negative and statistically significant in both FE and RE models. A 10-percentage-point increase in Dotation Dependence (DD), for example from 10 percent to 20

percent of total revenue, is associated with approximately 38 UAH lower deficit-based FP per resident in the FE model and 18 UAH lower deficit-based FP per resident in the RE model. Since lower FP values indicate better observed fiscal performance, higher Dotation Dependence (DD) is associated with better observed fiscal performance in both per-capita specifications. Subvention Dependence (SubD) differs across specifications: a 10-percentage-point increase in Subvention Dependence (SubD), for example from 20 percent to 30 percent of total revenue, is associated with approximately 8 UAH lower deficit-based FP per resident in the FE model, but approximately 12 UAH higher deficit-based FP per resident in the RE model. Overall, Table 9 suggests that the H1 estimates are partly sensitive to the choice of normalization.

After reporting the baseline ratio models and the per-capita normalization checks, we conduct diagnostic tests for the H1 panel specifications. The results are reported in Table 10.

Table 10. Diagnostics: Hausman and Wooldridge Tests

Diagnostic test	TD (Transfer Dependence), ratio	FP per capita, TD ratio	Split transfers, ratio	FP per capita, split transfers
Hausman test: FE vs RE p-value	<0.001	<0.001	<0.001	<0.001
Wooldridge test: serial correlation p-value	<0.001	0.0342	<0.001	0.0420

Notes: The table reports diagnostic test p-values for the H1 panel specifications. The Hausman test compares FE and RE models. The Wooldridge test checks for serial correlation.

The Hausman tests reject the RE specification in all model groups ($p < 0.001$), so FE is used as the baseline, while RE is reported only as a complementary specification with time-invariant controls. The Wooldridge tests indicate serial correlation in all FE models, which motivates the additional Driscoll–Kraay

standard-error check reported in Table 11. Variance inflation factors were also checked for the H1 specifications. The VIF values, indicating that multicollinearity is not a concern in these models are in Appendix D, Table 33.

Table 11. H1 Fixed-Effects Models with Driscoll–Kraay Standard Errors

	TD model, ratio outcome	TD model, per-capita outcome	DD + SubD model, ratio outcome	DD + SubD model, per-capita outcome
Transfer Dependence (TD)	-0.038	-0.210	-	-
	(0.053)	(0.156)		
Dotation Dependence (DD)	-	-	-0.149	-0.377
			(0.138)	(0.452)
Subvention Dependence (SubD)	-	-	0.048	-0.081
			(0.041)	(0.174)
Log reconstructed population	-0.035**	-	-0.047**	-
	(0.016)		(0.020)	
N	18675	18675	18675	18675
R2	0.004	0.003	0.020	0.005
Scale	Ratio	Per capita	Ratio	Per capita
SE	DK	DK	DK	DK

Note: Driscoll–Kraay standard errors are reported in parentheses. Lower Fiscal Performance (FP) values indicate better observed deficit-based fiscal performance. Stars: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Once these standard errors are applied, the key transfer-dependence coefficients lose statistical significance in both the ratio and per-capita specifications. Transfer Dependence (TD), Dotation Dependence (DD), and Subvention Dependence (SubD) therefore cannot be interpreted as statistically robust predictors of Fiscal Performance (FP) in this robustness check. The signs of the coefficients are broadly comparable to the baseline models, but the loss of significance means that the baseline H1 findings should be treated cautiously.

In this sense, the transfer-dependence channel does not appear to operate as a SBC channel in the H1 models. This does not mean that Ukrainian state-to-local transfers prove hard budget constraints. Rather, it means that this thesis does not find robust evidence that transfer dependence systematically weakens fiscal responsibility. Dependence on dotations and subventions shows different signs in the baseline models, but these coefficients lose statistical significance after applying Driscoll–Kraay standard errors. Therefore, state-to-local transfers remain relevant for the SBC/HBC discussion, but H1 does not confirm them as a systematic source of weaker fiscal responsibility.

5.2 Decentralization Reform and Fiscal Performance

Hypothesis 2 tests whether voluntary amalgamation during Ukraine's decentralization reform was associated with stronger fiscal performance of Ukrainian hromadas. Table 12 reports the simple ATT estimates for the main H2 ratio outcomes. The Fiscal Performance (FP) estimate is negative and statistically significant. The ATT equals -0.0175, meaning that voluntary amalgamation entry is associated with approximately 1.75 percentage points lower FP. Since lower FP values indicate better observed fiscal performance, this means that treated hromadas show lower observed deficits relative to not-yet-treated hromadas. However, the other outcomes show that this improvement was not accompanied by lower transfer dependence. Transfer Dependence (TD) increases by 0.2271, or 22.71 percentage points.

The split-transfer outcomes show that most of this increase comes from subventions: Dotation Dependence (DD) increases by 2.83 percentage points, while Subvention Dependence (SubD) increases by 19.88 percentage points.

Table 12. Simple ATT Estimates for Voluntary Amalgamation

Outcome	ATT	Pre-p
Fiscal Performance (FP)	-0.0175***	0.622
	(0.0063)	
Transfer Dependence (TD)	0.2271***	0.390
	(0.0063)	
Dotation Dependence (DD)	0.0283***	0.087
	(0.0055)	
Subvention Dependence (SubD)	0.1988***	0.178
	(0.0063)	
Own Revenue Coverage (ORC)	-0.2192***	0.839
	(0.0088)	

Notes: ATT = average treatment effect on the treated. Standard errors are reported in parentheses. Pre-p reports the Callaway–Sant'Anna pre-trend p-value where available. Stars: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Thus, voluntary amalgamation is associated not only with higher overall transfer dependence, but especially with a stronger role of subventions in hromada budgets.

Own Revenue Coverage (ORC) moves in the opposite direction. The ATT equals -0.2192, meaning that treated hromadas have about 21.92 percentage points lower non-transfer expenditure coverage after reform entry. The pre-trend p-values do not provide strong evidence of systematic pre-treatment divergence for most outcomes: 0.622 for FP, 0.390 for TD, 0.178 for SubD, and 0.839 for ORC. DD is more cautious because its pre-trend p-value is lower, 0.087, although it remains above the conventional 5 percent threshold. Overall, Table 12 suggests lower observed deficits after voluntary amalgamation, but within a more transfer-dependent budget structure.

Figure 3 shows the dynamic ATT estimates for Fiscal Performance (FP). The pre-treatment coefficients are small and statistically insignificant, which does not suggest clear pre-entry divergence.

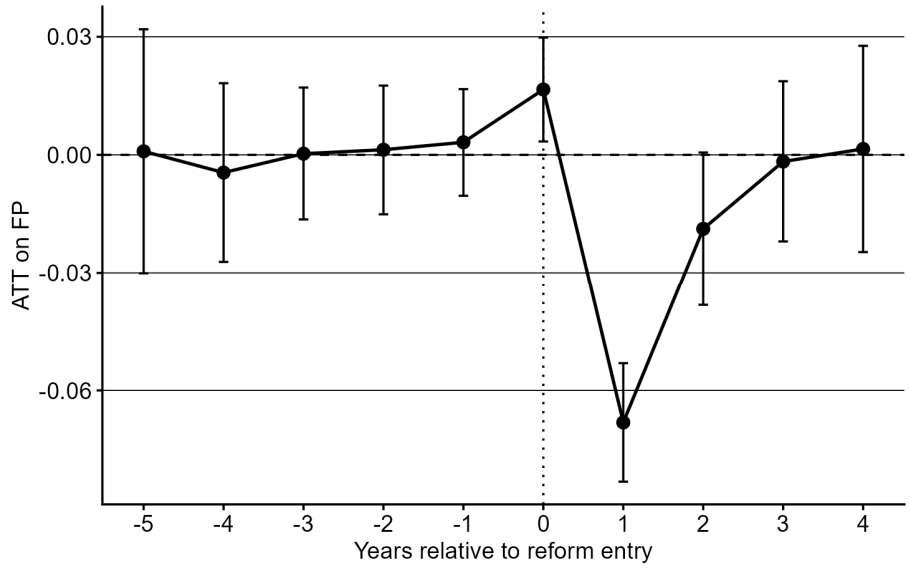


Figure 3. Dynamic Effects of Voluntary Amalgamation on Fiscal Performance (FP)

Notes: 0 = voluntary-amalgamation entry year; vertical bars = 95% confidence intervals.

In the entry year, Fiscal Performance (FP) increases by 1.66 percentage points, indicating a short-run worsening of observed fiscal performance. One year after entry, Fiscal Performance (FP) decreases by 6.81 percentage points, which is the largest estimated improvement in the dynamic specification. After that, the effect becomes weaker: at +2 it is about -1.88 percentage points, while by +3 and +4 the estimates are close to zero. Thus, the Fiscal Performance (FP) improvement is mainly concentrated in the first year after voluntary amalgamation entry. The results for other outcomes are shown in Table 13.

Table 13. Combined Dynamic Event-Study Estimates for Hypothesis 2

Event time	Fiscal Performance (FP)	Transfer Dependence (TD)	Dotation Dependence (DD)	Subvention Dependence (SubD)	Own Revenue Coverage (ORC)
-5	0.0009	-0.0023	-0.0069	0.0046	-0.0092
	(0.0158)	(0.0068)	(0.0065)	(0.0058)	(0.0133)
-4	-0.0045	0.0065	0.0105	-0.0033	0.0027
	(0.0116)	(0.0083)	(0.0094)	(0.0086)	(0.0123)
-3	0.0003	0.0021	0.0005	0.0011	-0.0020
	(0.0085)	(0.0044)	(0.0047)	(0.0045)	(0.0088)
-2	0.0013	-0.0058	0.0033	-0.0083	0.0023
	(0.0083)	(0.0052)	(0.0056)	(0.0052)	(0.0089)
-1	0.0032	0.0024	-0.0029	0.0050	-0.0034
	(0.0069)	(0.0045)	(0.0041)	(0.0047)	(0.0077)
0	0.0166**	0.0049	-0.0026	0.0074*	-0.0184***
	(0.0067)	(0.0041)	(0.0035)	(0.0041)	(0.0070)
1	-0.0681***	0.3033***	0.0367***	0.2656***	-0.2673***
	(0.0076)	(0.0092)	(0.0053)	(0.0094)	(0.0116)
2	-0.0188*	0.3374***	0.0488***	0.2892***	-0.3253***
	(0.0099)	(0.0084)	(0.0070)	(0.0080)	(0.0120)
3	-0.0017	0.3741***	0.0429***	0.3317***	-0.3752***
	(0.0104)	(0.0125)	(0.0105)	(0.0118)	(0.0155)
4	0.0015	0.3874***	0.0526***	0.3352***	-0.3879***
	(0.0133)	(0.0174)	(0.0142)	(0.0126)	(0.0209)

Notes: ATT = average treatment effect on the treated. Standard errors are reported in parentheses. Event time 0 is the voluntary-amalgamation entry year. Stars: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

For Transfer Dependence (TD), the pre-treatment coefficients are close to zero, and the entry-year effect is small at 0.49 percentage points. The main increase appears after entry: Transfer Dependence (TD) rises by 30.33 percentage points at +1, 33.74 percentage points at +2, 37.41 percentage points at +3, and 38.74 percentage points at +4. This indicates a large and persistent increase in transfer dependence after voluntary amalgamation.

Dotation Dependence (DD) also increases after entry, but more moderately: from 3.67 percentage points at +1 to 5.26 percentage points at +4. This outcome should be interpreted more cautiously because its pre-trend diagnostics are weaker. Subvention Dependence (SubD) shows the largest transfer-side change. After a small entry-year increase of 0.74 percentage points, SubD rises by 26.56 percentage points at +1, 28.92 percentage points at +2, 33.17 percentage points at +3, and 33.52 percentage points at +4. This suggests that the post-entry increase in transfer dependence is driven mainly by subventions.

Own Revenue Coverage (ORC) moves in the opposite direction. It decreases by 1.84 percentage points in the entry year and then falls more strongly after entry: by 26.73 percentage points at +1, 32.53 percentage points at +2, 37.52 percentage points at +3, and 38.79 percentage points at +4. This means that treated hromadas covered a smaller share of expenditure outside the selected state-to-local transfer channel after amalgamation.

Overall, the dynamic results show that the Fiscal Performance (FP) improvement is concentrated mainly in the first year after voluntary amalgamation entry. At the same time, transfer dependence rises strongly and persistently, mostly through subventions, while Own Revenue Coverage (ORC) declines. Therefore, voluntary amalgamation is associated with better observed Fiscal Performance (FP), but within a more transfer-dependent budget structure.

5.3. H2 Robustness Checks

After the main simple and dynamic ATT estimates, we examine the robustness of the H2 results. Table 14 focuses on Fiscal Performance (FP), the main outcome of the hypothesis. It checks whether the Fiscal Performance (FP) estimate is sensitive to stricter winsorization of fiscal ratio variables or to the exclusion of individual voluntary-amalgamation cohorts from the sample.

Table 14. Additional Robustness Checks for Fiscal Performance (FP)

Check	ATT	Pre-p
Main ratio specification	-0.0175***	0.622
	(0.0063)	
Strict 2.5/97.5 winsorization	-0.0156***	0.553
	(0.0055)	
Leave-one-out: no 2015 cohort	-0.0231***	0.605
	(0.0078)	
Leave-one-out: no 2016 cohort	-0.0168**	0.614
	(0.0084)	
Leave-one-out: no 2017 cohort	-0.0078	0.641
	(0.0073)	
Leave-one-out: no 2018 cohort	-0.0161**	0.592
	(0.0071)	
Leave-one-out: no 2019 cohort	-0.0231***	0.465
	(0.0071)	

Notes: ATT = average treatment effect on the treated. Standard errors are reported in parentheses. Pre-p reports the Callaway–Sant'Anna pre-trend p-value where available. Stars: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Leave-one-out rows exclude one cohort at a time.

The main estimate is -0.0175, so voluntary amalgamation entry is associated with about 1.75 percentage points lower Fiscal Performance (FP), and the result remains very similar under stricter winsorization: -0.016, or 1.56 percentage points lower FP. The leave-one-cohort-out checks remain negative in all cases, ranging from -0.78 to -2.31 percentage points. However, after the 2017 cohort is excluded, the results become insignificant. Overall, these checks support the direction of the main H2 result, but they also show that the Fiscal Performance (FP) effect is somewhat sensitive to cohort composition. Therefore, the robustness evidence supports H2 cautiously rather than fully confirming a uniform reform effect across all cohorts.

Next let's have a look at how sensitive our models are to the change of baseline population control. Table 15 shows whether the H2 estimates are sensitive to the population control used in the Callaway–Sant'Anna specifications.

Table 15. Population-Control Robustness Checks for Hypothesis 2

Outcome	Check	ATT	Pre-p
Fiscal Performance (FP)	Population control: reconstructed population	-0.0175*** (0.0065)	0.622
Fiscal Performance (FP)	Population control: oblast-share reconstructed population	-0.0176*** (0.0064)	0.631
Transfer Dependence (TD)	Population control: reconstructed population	0.2271*** (0.0062)	0.390
Transfer Dependence (TD)	Population control: oblast-share reconstructed population	0.2270*** (0.0060)	0.392
Dotation Dependence (DD)	Population control: reconstructed population	0.0283*** (0.0055)	0.087
Dotation Dependence (DD)	Population control: oblast-share reconstructed population	0.0280*** (0.0054)	0.087
Subvention Dependence (SubD)	Population control: reconstructed population	0.1988*** (0.0069)	0.178
Subvention Dependence (SubD)	Population control: oblast-share reconstructed population	0.1989*** (0.0057)	0.180
Own Revenue Coverage (ORC)	Population control: reconstructed population	-0.2192*** (0.0098)	0.839
Own Revenue Coverage (ORC)	Population control: oblast-share reconstructed population	-0.2189*** (0.0093)	0.849

Notes: ATT = average treatment effect on the treated. Standard errors are reported in parentheses. The first specification uses the baseline population control, log(pop_cast_av), while the second uses the alternative population-share control, log(pop_share_av). Pre-p reports the Callaway–Sant'Anna pre-trend p-value where available. Stars: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The results are almost unchanged when the baseline population control is replaced with the alternative population-share control. For Fiscal Performance (FP), the estimate is -0.0175 in the baseline version and -0.0176 in the alternative version, corresponding to approximately 1.75–1.76 percentage points lower Fiscal Performance (FP) after voluntary amalgamation entry. Since lower Fiscal Performance (FP) indicates better observed fiscal performance, the population-control check does not change the interpretation of the FP result.

The same pattern is observed for the other ratio outcomes. Transfer Dependence (TD) is about 22.7 percentage points higher in both specifications. Dotation Dependence (DD) increases by about 2.8 percentage points, while Subvention Dependence (SubD) increases by about 19.9 percentage points. Own Revenue Coverage (ORC) decreases by about 21.9 percentage points in both specifications. Therefore, this robustness check suggests that the main H2 estimates are not sensitive to the specific reconstructed population control used in the baseline model.

The remaining robustness checks are reported in Appendix A. The pre-treatment TWFE placebo test for 2013–2014 does not show a statistically significant false pre-reform effect for FP, Subvention Dependence (SubD), or Own Revenue Coverage (ORC). For Fiscal Performance (FP), the placebo estimate is small and statistically insignificant, which suggests that hromadas entering voluntary amalgamation later did not already differ clearly in fiscal performance before the reform. However, the placebo test shows small statistically significant pre-treatment differences for Transfer Dependence (TD) and Dotation Dependence (DD) (-0.0099 and -0.0045, respectively). Therefore, the transfer-dependence outcomes, especially Transfer Dependence (TD) and Dotation Dependence (DD), should be interpreted more cautiously (Appendix A, Table 22).

The transfer-side checks are more stable than the FP checks. TD stays positive and statistically significant under stricter winsorization and in all leave-one-cohort-out specifications. SubD also remains positive and statistically significant in these checks, which means that the post-amalgamation increase in transfer dependence is mostly related to subventions. DD is positive and close in size across specifications, but it should be read more cautiously because some pre-treatment diagnostics are weaker. ORC is negative and statistically significant across the checks, so treated hromadas covered a smaller share of expenditure outside the selected state-to-local transfer channel after amalgamation (Appendix A, Tables 23–24).

After amalgamation, treated hromadas have lower FP per capita and higher transfers, dotations, subventions, and own revenue per capita. These results suggest that amalgamation increased the fiscal scale of hromada budgets per resident. The ratio-based results show that the structure of these budgets became more transfer-dependent (Appendix A, Table 25).

Taken together, the robustness checks give cautious support to the main H2 result. FP decreases in the main specification and remains negative under stricter winsorization, which points to better observed deficit-based fiscal performance. However, the FP result becomes insignificant when the 2017 cohort is excluded, so it is somewhat sensitive to cohort composition. The transfer-side pattern is more stable: transfer dependence increases mainly through subventions, and Own Revenue Coverage (ORC) decreases. Still, the placebo test shows small pre-treatment differences for Transfer Dependence (TD) and Dotation Dependence (DD), so the transfer-dependence results should also be read cautiously.

5.4. Wartime Exposure and Fiscal Performance

Table 16 reports a broad calendar-year comparison between hromadas that ever entered potential wartime exposure and those that never did, using 2021 as the reference year.

Table 16. Broad DiD Comparison for Ever-Potential Exposure

	Fiscal Performance (FP)	**Transfer Dependence (TD)**	**Dotation Dependence (DD)**	**Subvention Dependence (SubD)**	**Own Revenue Coverage (ORC)**
Ever potential exposure × 2020	-0.013*	0.016	0.002	0.013	-0.008
	(0.007)	(0.013)	(0.004)	(0.011)	(0.014)
Ever potential exposure × 2022	-0.041***	0.028***	0.003	0.025***	-0.006
	(0.013)	(0.007)	(0.002)	(0.006)	(0.012)
Ever potential exposure × 2023	-0.028**	0.028***	0.025**	0.006	0.001
	(0.014)	(0.010)	(0.010)	(0.005)	(0.011)
Ever potential exposure × 2024	-0.044***	0.051***	0.068***	-0.014***	-0.025**
	(0.012)	(0.011)	(0.011)	(0.005)	(0.011)
Ever potential exposure × 2025	-0.056***	0.077***	0.087***	-0.009	-0.059***
	(0.011)	(0.012)	(0.011)	(0.006)	(0.014)
Log reconstructed population	-0.061***	0.019	0.007	0.009	0.009
	(0.009)	(0.012)	(0.012)	(0.006)	(0.014)
N	8624	8624	8624	8624	8624
Hromada fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors are reported in parentheses. Fiscal ratio variables are winsorized at the 1st and 99th percentiles. Lower Fiscal Performance (FP) values indicate better observed deficit-based fiscal performance. Stars: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The Fiscal Performance (FP) coefficients are negative and statistically significant from 2022 onward: -0.041 in 2022, -0.028 in 2023, -0.044 in 2024, and -0.056 in 2025. Since lower Fiscal Performance (FP) values indicate better observed fiscal performance, ever-potentially exposed hromadas show lower observed FP during the war years. Transfer Dependence (TD) is positive and statistically significant from 2022 onward, while Dotation Dependence (DD) becomes positive and significant from 2023 onward. Subvention Dependence (SubD) does not show a stable pattern: it is positive and significant in 2022, insignificant in 2023, negative and significant in 2024, and insignificant in 2025. Own Revenue Coverage (ORC) becomes negative and significant in 2024 and 2025. However, the 2020 Fiscal Performance (FP) coefficient is already slightly negative and weakly significant, so this broad comparison is not fully clean before the full-scale war. Therefore, the next tables report the main intensive-exposure estimates.

Table 17 reports the TWFE estimates for Potential Exposure Share (PotShare), which measures the share of the year when a hromada was classified as potentially exposed to wartime risk. A 10-percentage-point increase in PotShare is associated with 0.64 percentage points lower Fiscal Performance (FP). This means a lower observed deficit-based FP indicator.Transfer Dependence (TD) increases by 0.24 percentage points. Its decomposition shows that the increase is mainly reflected in Dotation Dependence (DD), which rises by 0.51 percentage points, while Subvention Dependence (SubD) decreases by 0.25 percentage points. Own Revenue Coverage (ORC) is small and statistically insignificant, so there is no clear ORC pattern in this specification.

Table 17. TWFE Estimates for Potential Exposure Share (PotShare)

	Fiscal Performance (FP)	**Transfer Dependence (TD)**	**Dotation Dependence (DD)**	**Subvention Dependence (SubD)**	**Own Revenue Coverage (ORC)**
Potential exposure share (PotShare)	-0.064***	0.024**	0.051***	-0.025***	0.007
	(0.012)	(0.012)	(0.011)	(0.006)	(0.014)
Log reconstructed population	-0.063***	0.011	-0.003	0.011**	0.019
	(0.010)	(0.012)	(0.012)	(0.006)	(0.015)
N	8624	8624	8624	8624	8624
Within R2	0.010	0.001	0.009	0.004	0.001
Hromada fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors are reported in parentheses. Fiscal ratio variables are winsorized at the 1st and 99th percentiles. Lower Fiscal Performance (FP) values indicate better observed deficit-based fiscal performance. Stars: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 18 reports the TWFE estimates for Active Exposure Share (ActiveShare), which measures the share of the year when a hromada was classified as an active-warzone territory. A 10-percentage-point increase in ActiveShare is associated with 1.58 percentage points lower Fiscal Performance (FP). This means a lower observed deficit-based FP indicator, not necessarily improved fiscal responsibility. Transfer Dependence (TD) increases by 1.25 percentage points. Its decomposition shows that the increase is mainly reflected in Dotation Dependence (DD), which rises by 0.99 percentage points.

Table 18. TWFE Estimates for Active Exposure Share (ActiveShare)

	Fiscal Performance (FP)	**Transfer Dependence (TD)**	**Dotation Dependence (DD)**	**Subvention Dependence (SubD)**	**Own Revenue Coverage (ORC)**
Active exposure share (ActiveShare)	-0.158***	0.125***	0.099***	0.020*	-0.068*
	(0.029)	(0.030)	(0.028)	(0.012)	(0.035)
Log reconstructed population	-0.052***	0.006	-0.012	0.015***	0.019
	(0.009)	(0.012)	(0.012)	(0.006)	(0.014)
N	8624	8624	8624	8624	8624
Within R2	0.014	0.007	0.009	0.002	0.002
Hromada fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors are reported in parentheses. Fiscal ratio variables are winsorized at the 1st and 99th percentiles. Lower Fiscal Performance (FP) values indicate better observed deficit-based fiscal performance. Stars: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Subvention Dependence (SubD) rises by 0.20 percentage points and is only weakly significant. Own Revenue Coverage (ORC) decreases by 0.68 percentage points and is also weakly significant.

Table 19 reports the TWFE estimates for Any Potential Exposure (AnyPot), which indicates whether a hromada had any potential wartime exposure in a given year. Unlike Potential Exposure Share (PotShare), this variable captures the presence of potential exposure rather than its duration. Hromadas with AnyPot have 5.1 percentage points lower Fiscal Performance (FP) than hromadas without potential exposure. This means a lower observed deficit-based FP indicator, not necessarily improved fiscal responsibility.

Table 19. TWFE Estimates for Any Potential Exposure (AnyPot)

	Fiscal Performance (FP)	**Transfer Dependence (TD)**	**Dotation Dependence (DD)**	**Subvention Dependence (SubD)**	**Own Revenue Coverage (ORC)**
Any potential exposure (AnyPot)	-0.051***	0.026***	0.026***	0.001	-0.001
	(0.009)	(0.010)	(0.008)	(0.005)	(0.011)
Log reconstructed population	-0.059***	0.011	-0.008	0.015***	0.018
	(0.009)	(0.012)	(0.012)	(0.006)	(0.014)
N	8624	8624	8624	8624	8624
Within R2	0.010	0.002	0.004	0.001	0.001
Hromada fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors are reported in parentheses. Fiscal ratio variables are winsorized at the 1st and 99th percentiles. Lower Fiscal Performance (FP) values indicate better observed deficit-based fiscal performance. Stars: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Transfer Dependence (TD) is 2.6 percentage points higher. The decomposition of TD shows that this increase is reflected in Dotation Dependence (DD), which also rises by 2.6 percentage points. Subvention Dependence (SubD) and Own Revenue Coverage (ORC) are statistically insignificant.

Table 20 reports the TWFE estimates for Any Active Exposure (AnyActive), which indicates whether a hromada had any active-warzone exposure in a given year. Unlike Active Exposure Share (ActiveShare), this variable captures the presence of active exposure rather than its duration. Hromadas with AnyActive have 10.6 percentage points lower Fiscal Performance (FP) than hromadas without active exposure. This again means a lower observed deficit-based FP indicator, not necessarily improved fiscal responsibility.

Table 20. TWFE Estimates for Any Active Exposure (AnyActive)

	Fiscal Performance (FP)	**Transfer Dependence (TD)**	**Dotation Dependence (DD)**	**Subvention Dependence (SubD)**	**Own Revenue Coverage (ORC)**
Any active exposure (AnyActive)	-0.106***	0.032**	0.007	0.027***	0.022
	(0.019)	(0.016)	(0.016)	(0.009)	(0.021)
Log reconstructed population	-0.052***	0.007	-0.012	0.015***	0.018
	(0.009)	(0.012)	(0.012)	(0.006)	(0.014)
N	8624	8624	8624	8624	8624
Within R2	0.016	0.001	0.001	0.003	0.001
Hromada fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors are reported in parentheses. Fiscal ratio variables are winsorized at the 1st and 99th percentiles. Lower Fiscal Performance (FP) values indicate better observed deficit-based fiscal performance. Stars: * p < 0.10, ** p < 0.05, *** p < 0.01.

Transfer Dependence (TD) is 3.2 percentage points higher. The decomposition of TD shows that this increase is reflected mainly in Subvention Dependence (SubD), which rises by 2.7 percentage points, while Dotation Dependence (DD) is not statistically significant. Own Revenue Coverage (ORC) is also statistically insignificant in this specification.

5.5. H3 Robustness Checks

Table 21 checks whether the main Fiscal Performance (FP) results are sensitive to stricter winsorization of the FP ratio. For Potential Exposure Share (PotShare), the estimate changes from -0.0640 in the main specification to -0.0508 under stricter winsorization. For Active Exposure Share (ActiveShare), the estimate changes from -0.1582 to -0.1192.

Table 21. Strict Winsorization Robustness for Fiscal Performance (FP)

Model	Estimate	N
Main Fiscal Performance (FP), potential exposure share	-0.0640*** (0.0115)	8,624
Strict Fiscal Performance (FP) winsorization, potential exposure share	-0.0508*** (0.0083)	8,624
Main Fiscal Performance (FP), active exposure share	-0.1582*** (0.0294)	8,624
Strict Fiscal Performance (FP) winsorization, active exposure share	-0.1192*** (0.0194)	8,624

Notes: Standard errors are reported in parentheses. Main specifications use 1st/99th percentile winsorization; strict specifications use 2.5th/97.5th percentile winsorization. Lower Fiscal Performance (FP) values indicate better observed deficit-based fiscal performance. Stars: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Thus, the magnitude decreases in both cases, but the coefficients remain negative and statistically significant. This suggests that the main FP pattern is not driven only by extreme fiscal observations.

Other robustness checks are reported in Appendix B. The alternative population-control checks show that the main ratio results remain very close when the baseline average population control is replaced with minimum or maximum population controls (Appendix B, Tables 26–27). The Callaway–Sant'Anna first-exposure checks point in the same broad direction for Fiscal Performance (FP), Transfer Dependence (TD), and Dotation Dependence (DD): first exposure is associated with lower FP. Since FP is defined as the expenditure-revenue gap relative to expenditure, lower FP means a smaller observed deficit-based gap, but not necessarily stronger fiscal responsibility. First exposure is also associated with higher transfer dependence, mainly through dotations. However, Subvention Dependence (SubD) is not statistically significant in these checks, while Own Revenue Coverage (ORC) decreases (Appendix B, Table 28). The leave-one-

oblast-out checks show that the FP result remains negative and statistically significant after excluding exposed oblasts one at a time, so the FP result does not appear to be driven by a single exposed region (Appendix B, Tables 29–30). Finally, the per capita models are treated only as supplementary normalization checks. They support the negative FP pattern, but the transfer-side results differ from the ratio-based models, especially for ActiveShare (Appendix B, Table 31).

Overall, H3 is not supported in its direct Fiscal Performance (FP) prediction. The hypothesis expected higher wartime exposure to be associated with weaker fiscal performance, but the estimates show lower FP instead. Since FP is a deficit-based indicator of fiscal performance, this means better observed fiscal performance in this specific measure, not necessarily stronger fiscal responsibility.

The negative FP association is the most stable H3 result: it appears across potential, active, AnyPot, and AnyActive specifications and remains negative in the main robustness checks. The transfer-side results are less uniform. Transfer Dependence (TD) generally increases, but the decomposition differs across models: Dotation Dependence (DD) is more important in the intensive and first-exposure checks, while Subvention Dependence (SubD) is mainly visible in the AnyActive model. Own Revenue Coverage (ORC) is negative or insignificant depending on the specification. Therefore, H3 should be rejected in its direct FP form, while the broader fiscal pattern suggests lower observed FP under wartime exposure together with higher but compositionally unstable transfer dependence.

Chapter 6

CONCLUSIONS AND POLICY RECOMMENDATIONS

This thesis examined fiscal responsibility of Ukrainian hromadas through deficit-based Fiscal Performance (FP) and fiscal-dependence indicators. Following Tripathi and Grigoriadis (2023), FP is used as the main empirical outcome for fiscal responsibility: higher FP means weaker deficit-based fiscal performance, while lower FP means better deficit-based fiscal performance. Since the data do not observe bailout expectations, discretionary rescues, or direct bailout episodes, the thesis does not test the soft budget constraint mechanism directly. Instead, it examines whether transfer dependence, voluntary amalgamation, and wartime exposure are associated with weaker or stronger fiscal responsibility as measured through FP.

The first hypothesis expected higher transfer dependence to be associated with weaker fiscal performance. The results do not support this prediction robustly. In the baseline models, different transfer types have different signs: Dotation Dependence (DD) is associated with lower FP, while Subvention Dependence (SubD) is associated with higher FP in the main ratio specifications. However, after applying Driscoll–Kraay standard errors, the main transfer-dependence coefficients lose statistical significance. Thus, the thesis does not find stable evidence that state-to-local transfer dependence is systematically associated with weaker fiscal responsibility.

This result also limits the soft budget constraint interpretation. If higher transfer dependence were consistently associated with weaker FP, this would be more consistent with the expected transfer-dependence channel of soft budget constraints. However, this pattern is not robust in the Ukrainian hromada-level

results. Therefore, H1 does not provide clear empirical support for interpreting transfer dependence as evidence of softer budget constraints.

The second hypothesis expected voluntary amalgamation to improve fiscal performance. The results provide cautious support for this hypothesis. Voluntary amalgamation is associated with lower FP, which means better observed deficit-based fiscal performance and, in the logic of this thesis, higher fiscal responsibility. However, this result is not fully uniform. The improvement is concentrated mainly in the first year after entry and is somewhat sensitive to the 2017 cohort.

The H2 result should be interpreted together with fiscal-dependence indicators. Better FP after voluntary amalgamation appears together with higher Transfer Dependence (TD), mainly through Subvention Dependence (SubD), and lower Own Revenue Coverage (ORC). Therefore, voluntary amalgamation is associated with better deficit-based fiscal responsibility, but not with stronger local self-financing. The results suggest that the reform improved observed FP while also increasing the role of state-to-local transfer channels in hromada budgets.

The third hypothesis expected higher wartime exposure to be associated with weaker fiscal performance. This hypothesis is not supported in its direct FP prediction. More exposed hromadas show lower FP across the main wartime-exposure specifications, and this pattern remains in the main robustness checks. Since lower FP means better deficit-based fiscal performance, the direct result goes against the expected direction of H3.

However, this wartime result should be interpreted cautiously. Wartime exposure reflects external shocks rather than ordinary local fiscal management. During the full-scale invasion, lower FP may reflect state support, spending reductions or emergency fiscal adjustment.

This thesis has several limitations. First, it does not observe bailout expectations, discretionary rescue decisions, or informal negotiations between hromadas and the central government. Therefore, the thesis cannot test soft budget constraints directly and instead uses Fiscal Performance (FP) and fiscal-dependence indicators to evaluate observable fiscal responsibility patterns.

Second, the fiscal data are harmonized to contemporary hromada boundaries, so pre-amalgamation observations are reconstructed rather than directly observed for the current hromada units. This makes the panel comparable over time, but it may introduce measurement limitations.

Third, population values are partly reconstructed, especially outside the directly observed years, which may affect per-capita indicators and population controls.

Fourth, wartime exposure is measured through official territorial status, which may not fully capture the intensity of damage, displacement, occupation, or local economic disruption. For this reason, the wartime results should be interpreted as associations with official exposure status, not as a complete measure of the fiscal impact of the war.

These limitations shape the policy implications of the thesis. The policy implications are modest and mainly concern the interpretation of fiscal indicators. First, Transfer Dependence (TD) should not be used as a standalone indicator of weak fiscal responsibility. Since H1 does not find a robust association between TD and weaker FP, higher TD alone is not sufficient evidence of lower fiscal responsibility.

Second, the fiscal effects of voluntary amalgamation should be reported through both FP and fiscal-dependence indicators. Lower FP after voluntary amalgamation can be described as better deficit-based fiscal responsibility, but it should not be treated as evidence of stronger local self-financing when it is accompanied by higher TD, higher SubD, and lower ORC.

Third, wartime FP should be interpreted with particular caution. Lower FP among exposed hromadas should not automatically be treated as stronger fiscal discipline, because wartime outcomes may reflect emergency support, constrained budget execution or other crisis-related fiscal adjustments.

Fourth, future policy analysis should incorporate more direct indicators of bailout mechanisms. To distinguish more clearly between soft and hard budget constraint patterns in Ukraine, future research should use data on discretionary transfers, emergency financial assistance, arrears, and repeated fiscal support to hromadas. Such data would make it possible to separate ordinary intergovernmental transfers from potential bailout mechanisms and to assess SBC/HBC patterns more directly.

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APPENDIX A. H2 ROBUSTNESS CHECKS

Table 22. Pre-Treatment TWFE Placebo Checks for Hypothesis 2

Outcome	Spec	ATT
FP	2013-14 TWFE	0.0088
		(0.0082)
TD	2013-14 TWFE	-0.0099***
		(0.0035)
DD	2013-14 TWFE	-0.0045*
		(0.0027)
SubD	2013-14 TWFE	-0.0053
		(0.0034)
ORC	2013-14 TWFE	0.0026
		(0.0070)

Notes: The placebo check uses only 2013-2014 and treats 2014 as a false post-treatment year for future-treated hromadas. Each ATT cell reports the estimate with significance stars and the standard error in parentheses. Stars: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. This is an auxiliary diagnostic, not a Callaway-Sant'Anna placebo.

Table 23. Additional Robustness Checks for TD and DD

Outcome	Check	ATT	Pre-p
TD	Main	0.2271***	0.390
		(0.0063)	
TD	Strict wins.	0.2266***	0.397
		(0.0070)	
TD	Leave-one-out: no 2015 cohort	0.2181***	0.324
		(0.0069)	
TD	Leave-one-out: no 2016 cohort	0.2297***	0.290
		(0.0070)	
TD	Leave-one-out: no 2017 cohort	0.2099***	0.225
		(0.0084)	
TD	Leave-one-out: no 2018 cohort	0.2318***	0.513
		(0.0072)	
TD	Leave-one-out: no 2019 cohort	0.2416***	0.463
		(0.0076)	
DD	Main	0.0283***	0.087
		(0.0055)	
DD	Strict wins.	0.0284***	0.090
		(0.0051)	
DD	Leave-one-out: no 2015 cohort	0.0302***	0.124
		(0.0056)	
DD	Leave-one-out: no 2016 cohort	0.0263***	0.099
		(0.0058)	
DD	Leave-one-out: no 2017 cohort	0.0271***	0.040
		(0.0067)	
DD	Leave-one-out: no 2018 cohort	0.0278***	0.038
		(0.0061)	
DD	Leave-one-out: no 2019 cohort	0.0322***	0.259
		(0.0062)	

*Notes: Each ATT cell reports the estimate with significance stars and the standard error in parentheses. Stars: * p < 0.10, ** p < 0.05, *** p < 0.01. Main = main ratio specification; Strict wins. = 2.5/97.5 winsorization; leave-one-out rows exclude one reform cohort at a time. Pre-p reports the Callaway-Sant'Anna pre-trend p-value where available.*

Table 24. Additional Robustness Checks for SubD and ORC

Outcome	Check	ATT	Pre-p
SubD	Main	0.1988*** (0.0063)	0.178
SubD	Strict wins.	0.1978*** (0.0059)	0.211
SubD	Leave-one-out: no 2015 cohort	0.1882*** (0.0066)	0.165
SubD	Leave-one-out: no 2016 cohort	0.2028*** (0.0068)	0.281
SubD	Leave-one-out: no 2017 cohort	0.1829*** (0.0070)	0.161
SubD	Leave-one-out: no 2018 cohort	0.2038*** (0.0063)	0.197
SubD	Leave-one-out: no 2019 cohort	0.2095*** (0.0061)	0.120
ORC	Main	-0.2192*** (0.0088)	0.839
ORC	Strict wins.	-0.2165*** (0.0076)	0.817
ORC	Leave-one-out: no 2015 cohort	-0.2045*** (0.0104)	0.778
ORC	Leave-one-out: no 2016 cohort	-0.2220*** (0.0096)	0.819
ORC	Leave-one-out: no 2017 cohort	-0.2106*** (0.0107)	0.708
ORC	Leave-one-out: no 2018 cohort	-0.2251*** (0.0093)	0.937
ORC	Leave-one-out: no 2019 cohort	-0.2306*** (0.0096)	0.588

Notes: Each ATT cell reports the estimate with significance stars and the standard error in parentheses. Stars: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Main = main ratio specification; Strict wins. = 2.5/97.5 winsorization; leave-one-out rows exclude one reform cohort at a time. Pre-p reports the Callaway-Sant'Anna pre-trend p-value where available.

Table 25. Supplementary Per Capita Simple ATT Checks for Hypothesis 2

Outcome	ATT	Pre-p
FP pc	-0.1175***	0.937
	(0.0173)	
Transfers pc	1.1292***	0.167
	(0.0215)	
Dotations pc	0.2605***	0.013
	(0.0117)	
Subventions pc	1.0635***	0.119
	(0.0204)	
Own rev. pc	0.3307***	0.112
	(0.0145)	

Notes: Each ATT cell reports the estimate with significance stars and the standard error in parentheses. Stars: * p < 0.10, ** p < 0.05, *** p < 0.01. Per capita outcomes are measured in thousand UAH per resident and transformed using IHS after winsorization. Population is not included as a control because it is already used as the denominator. Pre-p reports the Callaway-Sant'Anna pre-trend p-value where available.

APPENDIX B. H3 ROBUSTNESS CHECKS

Table 26. Alternative Population-Control Robustness for PotShare

Outcome	Pop	Estimate	N
Fiscal Performance (FP)	Baseline reconstructed population	-0.0640*** (0.0115)	8,624
Transfer Dependence (TD)	Baseline reconstructed population	0.0241** (0.0120)	8,624
Dotation Dependence (DD)	Baseline reconstructed population	0.0511*** (0.0109)	8,624
Subvention Dependence (SubD)	Baseline reconstructed population	-0.0251*** (0.0062)	8,624
Own Revenue Coverage (ORC)	Baseline reconstructed population	0.0075 (0.0143)	8,624
Fiscal Performance (FP)	Minimum population estimate	-0.0635*** (0.0117)	8,624
Transfer Dependence (TD)	Minimum population estimate	0.0251** (0.0120)	8,624
Dotation Dependence (DD)	Minimum population estimate	0.0527*** (0.0110)	8,624
Subvention Dependence (SubD)	Minimum population estimate	-0.0258*** (0.0062)	8,624
Own Revenue Coverage (ORC)	Minimum population estimate	0.0076 (0.0144)	8,624
Fiscal Performance (FP)	Maximum population estimate	-0.0640*** (0.0115)	8,624
Transfer Dependence (TD)	Maximum population estimate	0.0241** (0.0120)	8,624
Dotation Dependence (DD)	Maximum population estimate	0.0511*** (0.0109)	8,624
Subvention Dependence (SubD)	Maximum population estimate	-0.0251*** (0.0062)	8,624
Own Revenue Coverage (ORC)	Maximum population estimate	0.0075 (0.0143)	8,624

Table 27. Alternative Population-Control Robustness for ActiveShare

Outcome	Pop	Estimate	N
Fiscal Performance (FP)	Baseline reconstructed population	-0.1582*** (0.0294)	8,624
Transfer Dependence (TD)	Baseline reconstructed population	0.1251*** (0.0305)	8,624
Dotation Dependence (DD)	Baseline reconstructed population	0.0995*** (0.0281)	8,624
Subvention Dependence (SubD)	Baseline reconstructed population	0.0202* (0.0122)	8,624
Own Revenue Coverage (ORC)	Baseline reconstructed population	-0.0683* (0.0350)	8,624
Fiscal Performance (FP)	Minimum population estimate	-0.1610*** (0.0296)	8,624
Transfer Dependence (TD)	Minimum population estimate	0.1256*** (0.0305)	8,624
Dotation Dependence (DD)	Minimum population estimate	0.0990*** (0.0281)	8,624
Subvention Dependence (SubD)	Minimum population estimate	0.0210* (0.0121)	8,624
Own Revenue Coverage (ORC)	Minimum population estimate	-0.0672* (0.0352)	8,624
Fiscal Performance (FP)	Maximum population estimate	-0.1582*** (0.0294)	8,624
Transfer Dependence (TD)	Maximum population estimate	0.1251*** (0.0305)	8,624
Dotation Dependence (DD)	Maximum population estimate	0.0995*** (0.0281)	8,624
Subvention Dependence (SubD)	Maximum population estimate	0.0202* (0.0122)	8,624
Own Revenue Coverage (ORC)	Maximum population estimate	-0.0683* (0.0350)	8,624

Notes: Baseline reconstructed population = pop_cast_av; minimum/maximum population estimates are alternative population controls. Lower Fiscal Performance (FP) values indicate better observed deficit-based fiscal performance. Stars: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 28. Callaway-Sant'Anna Robustness for First Exposure Timing

Outcome	Exposure	ATT
Fiscal Performance (FP)	First potential exposure year	-0.0487*** (0.0102)
Transfer Dependence (TD)	First potential exposure year	0.0567*** (0.0098)
Dotation Dependence (DD)	First potential exposure year	0.0623*** (0.0080)
Subvention Dependence (SubD)	First potential exposure year	-0.0037 (0.0045)
Own Revenue Coverage (ORC)	First potential exposure year	-0.0335*** (0.0103)
Fiscal Performance (FP)	First active exposure year	-0.0835*** (0.0159)
Transfer Dependence (TD)	First active exposure year	0.1445*** (0.0168)
Dotation Dependence (DD)	First active exposure year	0.1357*** (0.0126)
Subvention Dependence (SubD)	First active exposure year	-0.0005 (0.0054)
Own Revenue Coverage (ORC)	First active exposure year	-0.1147*** (0.0155)

Notes: These are robustness checks for first exposure timing, not the main specification for continuous exposure intensity. ATT = average treatment effect on the treated. Standard errors are reported in parentheses. Stars: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 29. Leave-One-Oblast-Out Robustness for FP, PotShare

Oblast	Estimate	N
Дніпропетровська	-0.0638***	8,109
	(0.0121)	
Донецька	-0.0654***	8,350
	(0.0116)	
Запорізька	-0.0621***	8,223
	(0.0124)	
Київська	-0.0642***	8,210
	(0.0116)	
Миколаївська	-0.0676***	8,312
	(0.0118)	
Одеська	-0.0649***	8,078
	(0.0126)	
Сумська	-0.0720***	8,318
	(0.0129)	
Харківська	-0.0623***	8,288
	(0.0133)	
Херсонська	-0.0511***	8,330
	(0.0109)	
Чернігівська	-0.0670***	8,282
	(0.0118)	

Notes: The check re-estimates the main FP model after excluding one exposed oblast at a time. Lower Fiscal Performance (FP) values indicate better observed deficit-based fiscal performance. Stars: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 30. Leave-One-Oblast-Out Robustness for FP, ActiveShare

Oblast	Estimate	N
Дніпропетровська	-0.1665***	8,109
	(0.0302)	
Донецька	-0.1530***	8,350
	(0.0357)	
Запорізька	-0.1706***	8,223
	(0.0351)	
Київська	-0.1566***	8,210
	(0.0294)	
Луганська	-0.1366***	8,468
	(0.0293)	
Миколаївська	-0.1697***	8,312
	(0.0315)	
Одеська	-0.1576***	8,078
	(0.0294)	
Сумська	-0.1810***	8,318
	(0.0308)	
Харківська	-0.1513***	8,288
	(0.0300)	
Чернігівська	-0.1543***	8,282
	(0.0294)	

Notes: The check re-estimates the main FP model after excluding one exposed oblast at a time. Lower Fiscal Performance (FP) values indicate better observed deficit-based fiscal performance. Stars: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 31. Supplementary Per Capita Normalization Checks for Hypothesis 3

Outcome	Exposure	Estimate	N
Fiscal Performance per capita	Potential exposure share (PotShare)	-0.2794*** (0.0586)	8,624
Fiscal Performance per capita	Active exposure share (ActiveShare)	-0.5786*** (0.1046)	8,624
Transfers per capita	Potential exposure share (PotShare)	0.3950*** (0.0423)	8,624
Transfers per capita	Active exposure share (ActiveShare)	-0.0005 (0.0804)	8,624
Dotations per capita	Potential exposure share (PotShare)	0.6177*** (0.0483)	8,624
Dotations per capita	Active exposure share (ActiveShare)	0.1732 (0.1092)	8,624
Subventions per capita	Potential exposure share (PotShare)	0.1505*** (0.0363)	8,624
Subventions per capita	Active exposure share (ActiveShare)	-0.1896*** (0.0609)	8,624
Own revenue per capita	Potential exposure share (PotShare)	0.2733*** (0.0414)	8,624
Own revenue per capita	Active exposure share (ActiveShare)	-0.6261*** (0.0941)	8,624

Notes: Per capita outcomes are measured in thousand UAH per resident and transformed using IHS after winsorization. Standard errors are reported in parentheses. Stars: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

APPENDIX C. NIGHTTIME-LIGHT POPULATION DENOMINATOR FOR ROBUSTNESS CHECKS

Table 32 reports the baseline nighttime-light elasticity regression used to construct the post-2022 population denominator.

Table 32. Baseline Nighttime-light Elasticity Regression

VARIABLES	Baseline model used for β
Log nighttime lights, 2021	0.341***
	(0.018)
Log area	0.101***
	(0.017)
Settlement hromada	-0.743***
	(0.035)
Rural hromada	-1.161***
	(0.036)
Observations	1469
R2	0.734
Adjusted R2	0.734

Notes: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Because annual hromada-level population data are unavailable for the full wartime period, population after 2022 is approximated using changes in nighttime-light intensity. The elasticity is estimated with the following cross-sectional specification (12):

$$\ln(pop_i) = \beta_0 + \beta_1 \ln\left(NTL_{i,2021}\right) + \beta_2 \ln(Area_i) + \gamma Type_i + \varepsilon_i \quad (12)$$

where $pop_i$is hromada population as of January 1, 2022, $NTL_{i,2021}$is total nighttime-light intensity in 2021, $Area_i$is hromada area, and $Type_i$controls for hromada type. The estimated elasticity equals 0.341.

Post-2022 population is then extrapolated as (13):

$$\widehat{pop}_{i,t} = pop_{i,Jan.1\ 2022} \times \left(\frac{NTL_{i,t}}{NTL_{i,2021}}\right)^{0.341}, t = 2023,2024,2025 \quad (13)$$

APPENDIX D. MULTICOLLINEARITY CHECKS FOR H1

Table 33. Variance Inflation Factor Checks for Hypothesis 1

Model	Variable	VIF
Transfer Dependence ratio model	Transfer Dependence (TD)	1.000
Transfer Dependence ratio model	Log reconstructed population	1.000
Split-transfer ratio model	Dotation Dependence (DD)	1.020
Split-transfer ratio model	Subvention Dependence (SubD)	1.015
Split-transfer ratio model	Log reconstructed population	1.010
Fiscal Performance per capita, TD model	Transfer Dependence (TD)	1.000
Fiscal Performance per capita, split-transfer model	Dotation Dependence (DD)	1.013
Fiscal Performance per capita, split-transfer model	Subvention Dependence (SubD)	1.013