The Role of Grain Procurement in Understanding Regional Variations of 1933 Holodomor Losses

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Introduction

Holodomor of 1932-33 in Ukraine has been the subject of increasing debates and there has been extensive research about the magnitude and major causes of the massive Famine. The Famine losses in Ukraine in 1932-34 are estimated at 4.5 million, with 3.9 million of excess deaths and 0.6 million of lost births (Rudnytskyi et al. 2015). Our study (Wolowyna et al. 2016) also provides substantial evidence of strong regional differences in the losses from starvation among large regions, or oblasts, of Ukraine. This raises the question of what factors may have accounted for these regional variations. One of the most important factors that are usually associated with the main causes of Holodomor is excessive grain procurements imposed by Stalin regime on peasants. As many publications admitted, the factor of massive grain requisition in 1932-33 did play a role in the Famine, but it is still unclear to what extent. As far as we know, there are two different perspectives on this question.

According to the first perspective, the scale and intensity of the Famine were determined exclusively by the economic specialization of the region and grain procurement quotas; therefore, the number of losses due to the Famine is associated with the amount of grain confiscated by state and the contribution of a region to the total grain collection. Because Ukraine was one of the most important grain producers in the USSR, this republic was the hardest hit by the Famine but Russian regions supplying grain also suffered. Therefore, there was no Ukrainian national factor. Instead, there was a common tragedy due to excessive grain procurements in Ukraine and grain-producing regions in Russia (Kondrashin 2011). One can also assume that grain procurement was the main factor in determining the spatial distribution of the Famine losses within Ukraine.

Next, Davies and Wheatcroft (2004) admit that state grain procurements contributed to the crisis but believe that the Famine was rather an unexpected accident resulted from a series of wrongheaded agricultural policies. They focus more on the agro-technological reasons for the low grain production in 1931-32. They argue that the absolute amounts of grain available in 1931 and 1932 were small due to the complex of factors that led to substantial harvest losses: difficulties in labor and problems of agricultural organization, over-extension of the sown area and soil exhaustion, poor weather.

The second perspective is that the 1932-33 Famine was actually two famines. The grain procurement factor played an important role in the Famine of early and mid-1932 but since the late 1932 and in 1933, the Famine in the Ukraine gained a new quality: it evolved into Holodomor, i.e. terror by Famine carried out by the central government against the peasants in Ukraine and Kuban with a high proportion of ethnic Ukrainians (Graziosi 1994; Kulchytskyi 2007; Applebaum 2017). This interpretation implies that Holodomor in Ukraine was not an accident resulted from grain procurements or other economic factors but a politically engineered attack to suppress Ukrainian nationalism and peasant opposition (Conquest 1986).

The goal of this study is to define the possible determinants of regional differences in the 1933 Holodomor losses within Ukraine with focus on grain procurements. Our primary research question is as follows: what factors may have contributed to regional variations in 1933 excess mortality? The hypothesis is that the regional differences in Famine-induced mortality are explained by the grain procurements.

Unlike most studies on Holodomor, we explore the spatial distribution of the Famine losess at the level of raion, which is the smallest administrative unit in Ukraine. Exploring regional patterns of population losses by raion is important for several reasons. First, contrary to expectations, the highest excess deaths due to the 1932-33 Famine are not found in the southern grain-producing Odesa and Dnipropetrovsk oblasts, but in the north-central Kyiv and Kharkiv oblasts (Wolowyna et al. 2016). Several hypotheses have been suggested to explain the differences in the rural losses among oblasts: historical, ecological, border, and economic (Plokhy 2016; Wolowyna et al. 2016). However, it was concluded that no hypothesis provides a comprehensive explanation for regional distribution of Holodomor losses. Analysis at the raion level can help clarify and enhance existing hypotheses or suggest new ones.

Second, Soviet Ukraine in the 1930s had significant regional socio-economic and political peculiarities that may distinguish the scale and consequences of the Famine among different regions of the country. The fact that mortality rose unequally across the territory suggests that regional and local factors should be incorporated in explanatory analysis. In addition, the strength of the association between Famine losses and various factors may be different. Therefore, quantitative methods are needed to test the most relevant variables as predictors of the Famine loss distribution.

Our study contributes to the existing literature on 1932-33 Famine in Ukraine in two respects.

First, we collected a set of socioeconomic and other contextual indicators at the oblast and raion levels from different archival sources and published statistics of the 1920-30s (Upravlinnia spravamy RNK USRR 1933; Hospodarstvo Ukrainy 1930; Derzhplan 1930). We represented visually these statistics by creating a series of maps that are integrated into the GIS Project "MAPA: Digital Atlas of Ukraine". This project is currently being developed by the Ukrainian Research Institute at Harvard University (S. Plokhii and K. Bondarenko). Mapping both, the Holodomor losses and a variety of contextual factors, provides a great opportunity to represent cartographically the dramatic impact that the 1932-33 Famine had on Ukraine and help better understand the potential importance of different factors for regional distributions of the Famine losses.

Second, we analyzed geographical distributions of the 1933 Holodomor losses in Ukraine and explored possible associations between Famine-induced mortality and various factors by linking relative excess deaths to regional socio-economic indicators. We run a two-level regression model (raion and oblast) that allowed us: a) to measure the effects of the grain procurements on regional variations of 1933 excess deaths; b) to measure the size effects of other raion-level and oblast-level variables (fixed effects), and c) to define the proportion of the variation in excess deaths due to differences between oblasts.

Territory

The territorial-administrative division of Ukraine changed several times during the 1930s. Specifically, during the 1926-1930 period UkrSSR was divided into 40 okruhy and 603 raions; in 1930 okruhy were eliminated and the number of raions was reduced to 495. In 1932 seven oblasts were created: Vinnytsia, Kyiv, Chernihiv, Kharkiv, Donetsk, Dnipropetrovsk, Odesa and Moldavian ASSR. This structure of oblasts persisted until 1937, with successive changes in the numbers of raions during this period. Estimation of the 1933 Famine losses has been done for 391 raions within 8 regions that correspond to the territorial-administrative structure as of April 1933. Compared to the current borders

of Ukraine this excludes its Western regions and the Autonomous Republic of Crimea and includes the Moldavian ASSR.

Data and methods

Thanks to the availability of detailed mortality data, we were able to estimates direct Holodomor losses in terms of excess deaths for 391 raions of Ukraine in 1933. Direct losses or excess deaths (to be used interchangeably) are defined as the difference between all deaths in 1933 and expected number of deaths that would have occurred had there been no Famine. The estimation of excess deaths is based on population reconstructions of raions for the pre-Famine period 1926-1930 and in the year of the Famine 1933 and draws on our previous works on estimation of the 1932-1934 Famine losses for Soviet Ukraine at the national and regional levels: total and eight regions (Rudnytskyi et al. 2015 and Wolowyna et al. 2016). It should be emphasized that we estimated population losses by raion for 1933 only because our data are limited to this year, and we focus on rural population losses only. Of the total 3.9 million excess deaths in 1932-34, 3.6 million occurred in rural areas, and 91% of them occurred in 1933.

A set of various socioeconomic and other contextual indicators was collected and calculated from different archival sources and published statistics of the 1920-30s. It includes:

a) density of rural population as of January 1st, 1933 (100s per km²); b) proportion of Ukrainians according to 1926 Census; c) collectivization, i.e. proportion of collectivized households as of November-December 1932; d) planned grain procurements per capita, 1930, 1931, 1932, tons; e) actual grain procurements per capita, 1930, 1931, 1932, tons; f) fulfillment of grain procurement plan, 1930, 1931, 1932; g) proportion of wheat growing area, 1932; h) structure of wheat sowing areas in 1932: independent farmers' share, collective farms' share; state farms' share; i) black board index: 1 – raion had at least one of the following blacklisted entities: individual farm, collective farm, state farm, village, blacklisted raion; 0 – no any blacklisted entity; j) distance from the raion center to the nearest railway station (ln).

In addition, we collected data at the oblast-level that include the following indicators: a) rail network density per km², 1928; b) the number of terror acts per 1,000 peasants, October 1931-March 1932; c) number of fines in kind (food fines) per 1,000 peasants, December 1932; d) number of brigades requisitioning grain from independent farmers per 1,000 peasants, December 1932; i) number of persons arrested for sabotage and resistance to grain procurements as of January 1st, 1933 per 1,000 peasants. Table 1 provides summary statistics for the variables used in our analysis.

Variable	Range (min-max)	Mean	Obs.	
Outcome variable				
1933 rural excess deaths, by raion	0.001- 0.540	0.145	391	
Explanatory variables, level 1 (raion)				
Density of rural population, Jan. 1 st , 1933	0.14 – 1.159	0.604	391	
Ukrainians, 1926	0.015 -0.996	0.846	391	
Collectivization, OctDec. 1932	0.157 – 1.000	0.713	391	
Planned grain procurements, 1931 relative to 1930	0.070 – 7.000	1.345	374	
Planned grain procurements, 1932 relative to1930	0.060 – 3.150	0.681	374	
1930 grain procurement plan per capita, tons	0.005 - 1.479	0.303	372	
1931 grain procurement plan per capita, tons	0.003 - 1.455	0.314	373	

Table 1. Summary statistics of the variables

1932 grain procurement plan per capita, tons	0.007 – 1.114	0.209	386
1930 actual grain procurements per capita, tons	0.006 – 1.647	0.295	384
1931 actual grain procurements per capita, tons	0.006 – 1.371	0.285	384
1932 actual grain procurements per capita, tons	0.008 – 0.913	0.170	386
Fulfillment of 1930 grain procurement plan	0.633 – 1.888	1.013	373
Fulfillment of 1931 grain procurement plan	0.579 – 2.010	0.947	373
Fulfillment of 1932 grain procurement plan	0.218 – 1.170	0.894	386
Crop area used for wheat, 1932	0.001 -0.520	0.223	386
Wheat crop area for independent farmers, 1932	0.000 -0.815	0.183	386
Wheat crop area for collective farms, 1932	0.179 – 0.998	0.727	386
Wheat crop area for state farms, 1932	0.000 – 0.805	0.089	386
Black board index	0.000 – 1.000	0.500	391
Distance from the raion center to the nearest railway			
station, In	0.000 – 4.718	2.468	325
Level 2 varia	bles (oblast)		-
ID of region (oblast)	1 - 8	4.5	391
Rail network density per km ² ,1928	0.024 -0.046	0.031	391
Terror acts per 1,000 peasants, October 1931-March			
1932	0.028 – 0.091	0.051	355
Fines in kind per 1,000 peasants, December 1932	0.008 – 0.557	0.194	391
Brigades requisitioning grain from independent farmers per 1.000 peasants. December 1932	0.019 – 0.084	0.047	331
Persons arrested for sabotage and resistance to grain			
procurements per 1,000 peasants, January 11 1933	0.492 – 1.221	0.774	391

To detect the possible determinants of the regional distributions of 1933 rural excess deaths we proceed as follows. As a first step, our estimates of 1933 direct losses and all indicators were mapped using ArcGIS. Next, the spatial patterns of excess mortality and other indicators were identified. In analysis of excess deaths, we relied on hot spot analysis which is often used to identify statistically significant spatial clusters of high values (hot spots) and low values (cold spots). Hot spots and cold spots were detected using Getis-Ord Gi* statistic as a measure of spatial autocorrelation.

After inspection of the maps a multilevel regression model was run. Generally speaking, multilevel modeling enables researches to control for clustering and to investigate clustering. When observations are clustered or nested within geographic units or groups, multilevel modeling enables us not only to measure the effects of the level 1 explanatory variables on our outcome variable but also to examine the extent of between-group variability, and to measure the effects of group-level characteristic on the outcome variable.

Our data have a two-level structure with raion at level 1, nested within oblasts at level 2. Our outcome variable is 1933 excess deaths by raion. We consider 20 explanatory variables at raion level and five variables at oblast level. We start with the simple multilevel model with fixed intercept which allows for oblast effect on excess deaths by raion, but without explanatory variables. In this 'empty' two-level model the residuals are split into two components: the oblasts-level residuals and the raion-level residuals. Thus, the total variance is partitioned into two parts: the between-oblast variance and the within-oblast between-raion variance. We calculated the variance partition coefficient (VPC), which measures the proportion of total variance due to differences between oblasts, and tested the

significance of oblast effects. Then, we added the raion-level explanatory variables and run random intercept model.

This model can be written in the form of two equations: $y_{ij} = \beta_{0j} + \beta_1 x_{ij} + e_{ij},$ $\beta_{0j} = \beta_0 + u_j$

where β_0 is the overall mean of y (across all oblasts); however, the intercept for a given oblast j is $\beta_0 + u_j$.

 u_j is the oblast-level residual and e_{ij} is the raion-level residual. Residuals at both levels are assumed to follow normal distributions with zero means.

Preliminary results

A. Mapping the Holodomor losses, socio-economic and other indicators

Map 1 visualizes our estimates of the 1933 Famine losses by raion in Ukraine. Our results revealed that the distribution of excess deaths is not uniform across regions. Wide regional variations are observed not only between but also within oblasts. There are no clear north-south or west-east gradients in the distribution of the relative direct losses. For instance, Kyiv oblast (together with Kharkiv oblast) suffered the highest excess deaths, but the most Famine-stricken areas were concentrated in the southern half of the oblast. By contrast, the number of excess deaths in the northern half of Kyiv oblast was substantially lower. The highest excess deaths are mainly found in the central forest-steppe zone.



Map 1. Rural excess deaths per 1,000 population, by raion, Ukraine, 1933 Source: MAPA. Digital Atlas of Ukraine.

We also found that geographical variation in mortality in 1933 was much stronger than before the Famine and the spatial pattern of mortality in 1933 was very different from that in a pre-Famine period. The areas that suffered the largest direct losses in 1933 were not exactly the areas of traditionally high levels of mortality. In 1927-29, the highest crude death rate was observed in Polissia zone, while in 1933 Polissia zone, that is Chernihiv oblasts and the northern part of Kyiv oblast, suffered much lower mortality than the rest of the country.

The map 1 shows that something unique was happening in Kyiv and Kharkiv regions. One cannot explain that without integrating into the analysis social-economic factors that shaped the Holodomor history. Below we present several selected maps showing rural population density; ethnic composition of population; level of collectivization, geography of wheat cultivation, collective farms' share of wheat growing area and independent farmers' share of all crops area, changes in grain procurement plans, fulfillment of the plans during the 1930-32 period.

A comparative analysis of the regional distributions of the 1933 Famine losses, rural density and ethnic composition suggest some remarks (Maps 1, 2, 3). There are some similarities between the Famine loss distribution and concentration of rural population. Although this might be a spurious relationship, it can also simply imply that it was easier to search for hidden grain across densely populated territories compared to sparsely populated areas (although this raises a question of transport possibilities). Then, the highest numbers of relative excess deaths are concentrated in Kyiv and Kharkiv oblasts where ethnic Ukrainians constitute more than 90% of rural population. It should be pointed, however, that the raions of Chernihiv oblast having also a high percentage of Ukrainians suffered much lower numbers of excess deaths.







Source: MAPA. Digital Atlas of Ukraine.

Apparently, there is some link between the level of collectivization and geography of the wheat sown area as the government wanted to get control over the main-growing regions (Map 4 and Map 5), but geography of wheat and spatial distribution of excess deaths are different (Map 1 and Map 5). To sum up briefly what can be derived from these maps is that the raions with the highest excess deaths located in Kyiv and Kharkiv oblasts were more likely to be densely populated, had a high percentage of Ukrainians and did not have a high percentage of sown area used for wheat.

Maps 8 to 11 show that there had been quite complex dynamics of grain procurements quotas between 1930 and 1932. An examination of planned and actual grain procurements during that period indicates that they experienced two changes: a) an increase in quotas for 1931 compared to 1930 (Map 8); b) a decline in quotas for 1932 compared to 1931 (Map 9). However, these changes were not uniform across regions. Our analysis shows several characteristics of this dynamics.

First, it should be noted that the harvest in 1930 was very successful probably due to at least two reasons: an early and warm spring and an increase in the sown area, including winter wheat, in 1930 compared to 1929. The 1930 plan was in general fulfilled and even over fulfilled in the majority of

raions in Kyiv and Kharkiv oblasts (the raions in blue color, Map 10). The plan for the next year's crop, 1931, foresaw a further increase, but there was no proportional increase in the sown area. The increase in quotas for the whole country was on average by 9%, but the sown area increased only by 3% (with an increase in the proportion for winter wheat). The result was an increase in the amount of type of grain that the government was planning to take for itself, while the sowing area remained the same.

Second, the regional distribution of the increase in the 1931 plan was very uneven; the largest increases in grain quotas were not in the main grain producing areas. As can be seen in map 8, the majority of raions in Kharkiv, Vinnytsia and Kyiv oblasts in red color experienced significant increases in the 1931 plan compared to the previous year, while the majority of raions in Odesa oblast and some raions of Dnipropetrovsk oblast (prime grain growing areas) in blue color experienced respective decreases. This is important, because the 1931 plan for Kharkiv oblast had the largest increase. In absolute terms, this oblast yielded larger quantities of grain for 1931 than Odesa oblast. In other words, Kharkiv oblast made up the grain that Odesa oblast should have produced. Odesa oblast produced 1,661 thousand tons in 1930 and 980.7 thousand tons in 1931, while respective yields for Kharkiv oblast were 1,171 thousand tons and 1,531 thousand tons.

Third, it is worth mentioning here that both plans, 1930 and 1931, were not revised compared to the plan in 1932 that was reduced in three stages during August-December of 1932. The final plan in 1932 was lower by about 35% compared to the previous year. A number of raions in Kyiv and Vinnytsia oblasts attained their reduced plans, while part of raions in Kharkiv oblast and most of raions in Odesa oblast did not meet the plans. In absolute terms, the 1932 actual grain procurement in Ukraine was significantly lower than in 1931 (by 45%), especially in Kharkiv and Kyiv oblasts, that were already experiencing acute famine.

B. Hot spot analysis and multilevel regression model

Hot spot analysis is a way to find out whether the raions with high or low values of excess deaths cluster spatially. This can be a way to check if our data on mortality are clustered. If so, we cannot run a single-level regression model. Instead, multilevel model is a reasonable solution. The results, i.e. cluster map with hot spots and cold spots, are presented in Figure 12. All of the hot spots (clusters of highest mortality) are located in the central forests-steppe zone of Kyiv, Kharkiv and partly Vinnytsia oblasts. Clusters of low mortality are observed in the following three regions: Chernihiv, Donetsk and Vinnytsia oblasts.



Population Losses, 1932-1934

Hot Spot Analysis: Rural Direct Famine Losses, 1933, per 1000; raions



Map 12. Cluster map of 1933 excess deaths in Ukraine: hot spot analysis.

Source: MAPA. Digital Atlas of Ukraine. http://harvard-

cga.maps.arcgis.com/apps/webappviewer/index.html?id=d9d046abd7cd40a287ef3222b7665cf3

Following our interest in examining the relationship between 1933 excess deaths and different variables we employed a two-level regression model. As was noted before, first we run an empty two-level model with fixed intercept and without explanatory variables (Table 1).

Fixed part:	Est. (s.e.)
Constant	0.132 (0.018)
Random part:	
Level 2 (oblast), n=8	
between-oblast variance	0.0024
Level 1(raion), n=391	
Within-oblast between-raion variance	0.0064
VPC - variance partition coefficient	0.273

Table 1. Results for the 'null' multilevel model (without explanatory variables)

The overall mean excess mortality (across oblasts) is 0.132 (or 132 per 1,000 rural population). The between-oblast (level 2) variance is estimated at 0.0024 while the between-raion (level 1) variance is estimated at 0.0064. The variance partition coefficient is 0.273 which indicates that 27.3% of the variance in excess deaths can be attributed to differences between oblasts or can be explained by oblast effects. We also tested oblast effects for significance using a likelihood ratio test (LR = 109.45 on 1 degree of freedom) and found evidence of oblast effects on excess deaths distribution across raions.

The results for multilevel multivariable regression (random intercept model) are presented in Table 2. Compared to the 'null' model, adding in a set of the explanatory variables to our second model reduced both, between-oblast and between-raion variances. The total variance in the first model is 0.0088 and the total residual in the second model, after accounting for explanatory variables, is 0.0052. That means that all our variables explain 0.41 or 41% of the original variance in excess mortality ((0.0088-0.0052)/0.0088=0.41). The variance partition coefficient for the second model is 0.095. Thus, after controlling for our explanatory variables, 9.5% of the total variance in excess deaths by raion is still due to differences between oblasts, which is much lower than 27.3% in a null model.

This model summarizes the combined influence of the variables at both levels. Among the raionlevel variables, proportion of Ukrainians, level of collectivization, proportion of land used for wheat, fulfillment of 1931 grain procurement plan, 1931 and 1932 actual grain procurements are found to be significantly associated with 1933 excess mortality due to the Famine. Of all independent variables of the oblast level, fines in kind was the only indicator identified as having a significant influence on excess deaths.

The results from the Table 2 show the coefficients of the explanatory variables (with their 95% confidence intervals). Each coefficient can be interpreted as the change in excess mortality for a 1-unit change in a corresponding explanatory variable, controlling for all other variables. As can be seen, a proportion of Ukrainians has a direct association with the Famine-induced mortality: for each a 1-unit increase in proportion of Ukrainians excess mortality rises by 0.106 or 106 deaths per 1,000 rural population. Collectivization is also significantly associated with mortality: direct losses increase by 0.099 or 99 deaths per 1,000 with each 1 unit increase of collectivization. There is also a strong association between losses and proportion of land used for wheat. The effect of this factor is very large in terms of magnitude: 0.236 or 236 per 1,000.

Dependent variable – 1933 excess deaths	Coef. (95% Conf. Interval)
Fixed part:	
Raion-level variables	
Ukrainians	0.106 (0.050 - 0.163)
Collectivization*	0.099 (0.031 - 0.167)
Crop area used for wheat	0.236 (0.088 - 0.383)
1931 actual grain procurements per capita	0.007 (0.001 – 0.014)
Fulfillment of 1931 grain procurement plan	-0.154 (-0.2400.067)
1932 actual grain procurements per capita	-0.256 (-0.3940.118)
Oblast-level variables	
Fines in kind (food fines)	0.172 (0.032 – 0.313)
Random part:	
Level 2 (oblast), n=8	0.0005
between-oblast variance	
Level 1(raion), n=391	
Within-oblast between-raion variance	0.0047
VPC - variance partition coefficient	0.095

Table 2. Results for the multilevel model

*Because two indicators, proportion of collectivized households and proportion of collective farms' wheat crop area highly correlate (r=0.8), only proportion of collective farms' wheat crop area was used as a proxy for a level of collectivization.

Controlled for distance from the raion center to the nearest railway station, rail network density, fulfillment of 1930 and 1932 grain procurement plan, ratio of planned grain procurement quotas 1931 to 1930 and number of persons arrested for sabotage and resistance to grain procurements.

Next, the link between 1933 excess deaths and grain procurements in 1930 to 1932 is not straightforward one. On the one hand, the higher actual grain procurements in 1931, that is an amount of grain collected by state in account of procurement, the higher the 1933 direct losses. On the other hand, the negative coefficient for fulfillment of the 1931 grain procurement plan means that the raions with lower output fulfillment were more likely to suffer higher losses. Moreover, the association between mortality due to the Famine and actual grain procurements in 1932 is not in the direction that one may assume. It is negative. The lowering effect of 1932 grain procurements is quite large in magnitude and significant.

Several conclusions based on this information can be made. First, there is a positive association between losses and excessive grain procurements in 1931 and a negative association between losses and reduced grain procurements in 1932. Second, this is inconsistent with the explanation that the level of losses was determined exclusively by the grain procurement factor. If grain requisition in 1932 was the only reason for the Famine intensity, this should have been reflected in higher mortality. The question then arises as to why this happened and how it was possible that the raions with higher 1933 excess deaths actually did not contribute the highest amount of grain to the total grain collection in 1932. The possible explanation is that the raions with the highest losses were the ones that lagged far behind in fulfillment of their original 1932 quotas and were targeted with additional harsh confiscation measures in order to force peasants to attain theirs plans. One of these repressive policies was fines in kind. The effect of this variable is large in magnitude and highly significant. With each one unit

increase in the number of fines in kind the level of excess mortality due to the Famine in 1933 increased by 0.172 or 172 deaths per 1,000 rural population (conditioning on all other explanatory and controlling variables).

Discussion and preliminary conclusions

We found substantial differences in the distribution of 1933 excess mortality in Ukraine at the raion level. The explanation for these variations is complex involving the interplay between different factors. The fact that the majority of the Famine mortality 'hotspots' is located in Kyiv and Kharkiv oblast suggests that there are some important oblast-level factors responsible for the spatial distribution of the Famine losses. The link between the 1933 Famine losses and grain procurements is not a straightforward one, because Kyiv and Kharkiv oblasts exhibiting the highest excess deaths received a substantial reduction of 1932 quotas and produced much less grain than in the previous years. Their actual grain procurements in 1932 appeared to be lower when compared to Odesa and Dnipropetrovsk oblasts.

Our findings suggest that the origins of the regional distribution of 1933 excess deaths started much earlier than in 1933: the period 1930-32 is crucial for understanding what was happening in 1933. The plan of 1931 was based on the successful harvest in 1930 and high expectations for the next harvest, but this relative success was not repeated because of a smaller harvest in 1931. The regional distribution of the increase in the 1931 plan was very uneven and unjustified because the quotas were increased substantially for the non-main grain areas of Kharkiv, Vinnytsia and Kyiv oblasts while they were reduced for prime grain growing Odesa region and partly for Dnipropetrovsk oblast. This raises an obvious question about the reasons why Odesa oblast received such a substantial reduction in 1931 grain procurement quota and why Kharkiv, Kyiv and Vinnytsia were overloaded by 1931 quotas. There might be different factors, e.g. weather shock because of early cold spells in spring of 1931 that delayed spring sowing and unusually hot temperature in July of 1931 but this hypothesis needs to be tested.

The enhanced quotas for Kyiv and Kharkiv oblasts in 1931 turned out to be unrealistic, and most of the raions lagged behind in fulfilling their 1931 procurement plans. This resulted in an absolute shortage of food by the end of 1931 and an early start to the Famine in 1932 in the three abovementioned oblasts. It is likely that 1932 was the first year to show a pronounced increase in mortality in the forest-steppe raions of Kyiv and Kharkiv oblasts, but this cannot be proven due to data limitations. Even though these raions received a large reduction in their 1932 plans, they did not recover because in 1932 they were targeted by harsh repressive measures. One can assume that, given the government's requirement of 100% fulfillment in these raions and considering the reduction in their plans, these raions experienced drastic requisitions from all grain reserves. This implies that even though less grain was extracted in account of grain procurement in 1932, the food availability was very law due to almost complete confiscation of all produce of collective farms and independent farmers.

This study found that the proportion of Ukrainians, the level of collectivization, the proportion of land used for wheat, and the actual grain procurements in 1931 and 1932 had a substantial impact on Famine induced mortality in 1933. The findings also show that fines in kind had momentous effect on mortality. The raions with the highest excess mortality in 1933 were likely to share the following common characteristics: a) the most homogeneous in terms of ethnic composition with a high percentage of ethnic Ukrainians; b) more collectivized; c) more likely to be specialized in the growth of wheat: had a high proportion of wheat in total crop area; d) received excessive grain procurement quotas in 1931 compared to 1930 and reduced quotas in 1932; i) contributed more grain in 1931 and

much less in 1932; e) lagged behind in fulfillment of the original 1932 quotas and targeted by severe repressions like fines in kind.

Thus, the assertion that the scale of losses was determined exclusively by the grain specialization of the region and the contribution to grain procurement is not confirmed. As a singular event, the increase in the 1931 procurements itself could not have led to such serious famine that followed in 1933 given a reduced plan in 1932. One should distinguish between the famine resulting from grain procurements coupled with a total non-grain food requisition.

In order to push the peasants to fulfill the reduced plan of 1932, the Soviet authorities implemented in Ukraine a system of the most severe and massive repressions. The key elements of such a system were: a) the withdrawal of grain from peasants given to them for labor days and intended for personal consumption, and the introduction of fines in kind; b) the removal of all available funds including seed reserves and emergency reserves, from those collective farms which lagged behind and failed to attain their quotas, in account for the grain procurement; c) implementation of so-called "counter plans" that were additional plans when districts and collective farms that had fulfilled their plans had to continue to give away grain in order to cover the norms of those who had not fulfilled their plans. Thus, in collective farms with fulfilled plans, all the remaining grain was taken away; d) black lists; e) blockade of borders and restriction on movement of peasants.

Analysis of repression measures at the oblast-level shows that the highest relative numbers of such repressive measures like fines in kind and brigades requisitioning grain from independent farmers (as of December 1932) are found in Kyiv and Kharkiv oblasts that suffered the largest population losses. These oblasts also had the highest relative rates of peasant protest activity, like terror acts during October 1931-March 1932, and the highest numbers of mass peasant exodus in February 1933. All massive repressions taken by the authorities in the second half of 1932 intensified the Famine that had already started in the forest-steppe raions of these oblasts, plunging the local rural population into ruin.

The key takeaway is that not only grain procurements accounted for the spatial distributions of mortality intensity in 1933. Other factors like nationality, collectivization and severe repressive policies against peasants had significant positive association with excess deaths. Therefore, a political dimension of the Famine cannot be neglected. More research is needed in order to understand and disentangle a complex interaction of regional factors contributing to the Famine distinctions within Ukraine.

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