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SPECIAL REPORT

MAY 2026

HOLLOW HEARTLAND: REGIONAL CONSEQUENCES OF RUSSIA'S UKRAINE INVASION

LINDSEY CLIFF

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A NOTE ON METHODOLOGY

This study employs a mixed-methods approach, combining subnational quantitative analysis with qualitative contextual interpretation to examine the relationship between war casualties and regional extractive dependence. The unit of analysis for the quantitative component is Russia's federal subjects. There are 85 subjects examined; the cities of Moscow and St. Petersburg were included as subjects, and the regions of Donetsk and Luhansk were omitted since they were not fully under Russian control at the time of the 2021 population census used in this study.

Casualty data is sourced from *Mediazona*, which publishes bi-weekly casualty lists in conjunction with the *BBC* and *Meduza*, including demographic information like region of origin. This study uses a casualty list published on October 22, 2025. The population and labor force by region are originally from the 2021 Rosstat census data, though they were accessed on the third-party statistics database Statbase because the official Rosstat reports have now been removed from the internet. The 2021 census information was chosen as the basis for the population calculations to try to mitigate the risk of misrepresented data, which would be more likely after the onset of the war for political reasons.

In the quantitative analysis, regions are categorized as either "extractive" or "non-extractive." A region is determined to be significantly "extractive" if at least 10% of its Gross Regional Product (GRP) is made up exclusively from natural rents. This threshold was chosen as it is the minimum share of natural resource rents in Gross Domestic Product (GDP) used by the International Monetary Fund in prior studies to identify resource-rich or resource-dependent countries.[1]

Share of GRP from natural rents was identified through two publications. The primary work was Bato Tagarov's 2021 "Analysis of Extractive Industry Concentration in Russia as a Factor Hindering the Sustainable Development of Regions," which identifies the ten most significant extractive regions in Russia and nine regions that expanded the share of natural rents in GRP between 2005 and 2019.[2] This source was complemented by Batumunkuev et al.'s "Territorial Production and Resource Structures of Asian Russia: Assessment, Typology, and Zoning," which includes a table with the share of GRP in natural rents.[3] In a few cases, the Observatory of Economic Complexity's regional database was also consulted to find additional details about production.

ABOUT THE AUTHOR

LINDSEY CLIFF is a Junior Fellow at American Foreign Policy Council. A graduate of Tulane University, she specializes in Russia's military, economic, and political strategy, as well as ethnic minorities in Russia and U.S.-Russian relations.

EXECUTIVE SUMMARY

As Russia's full-scale invasion of Ukraine enters its fifth year, the human and economic tolls of the conflict continue to mount. Although the Kremlin refuses to publish official casualty statistics, independent analyses and regional data reveal an alarming trend: Russia's outlying regions are dying off at far higher rates than the rest of the country. These same regions power Russia's resource economy through oil, natural gas, and timber production. Moscow's recruitment policies and resource-dependent economic model are effectively turning the edges of the Federation into both its economic engine and human reservoir.

This report finds that the war in Ukraine has accelerated the population drain in these outlying extractive regions, weakening the very areas that sustain Russia's resource exports. As working-age men are killed or sent to the front, vital industries will face increasingly severe labor shortages. It outlines why replacing these lost workers will prove difficult, as rising xenophobia and new legal restrictions push migrants away while improving economic conditions in Central Asia reduce the incentive for foreign workers to seek employment in Russia.

Key findings include:

- **Extractive regions in Russia experience significantly higher casualties than non-extractive ones**—82 additional deaths per 100,000 people on average.

- **Labor force losses are even starker: extractive regions have lost more than double the workers per capita compared to other parts of Russia**—238 additional deaths per 100,000 laborers.

- **Russia's ten largest resource-producing regions face the worst losses**—nearly 500 deaths per 100,000 workers, roughly double the rate elsewhere.

- **Russia's pre-existing demographic crisis has been dramatically accelerated**—the war has worsened labor shortages that were already projected to be "the biggest political, social, and economic challenge for Russia" through 2050.

- **Labor substitution faces mounting barriers**, as rising xenophobia, new legal restrictions, and improving economic conditions in Central Asia make it increasingly difficult for Russia to replace lost workers with migrant labor from traditional labor-sending countries.

The strategic implications are clear: localized population loss as a result of the war in Ukraine will limit production in critical extractive industries, becoming a chronic issue for the Russian Federation as labor substitution proves difficult. What remains to be seen is not whether these pressures will constrain Russia, but rather when their impact will begin to truly be felt.

HOLLOW HEARTLAND: REGIONAL CONSEQUENCES OF RUSSIA'S UKRAINE INVASION

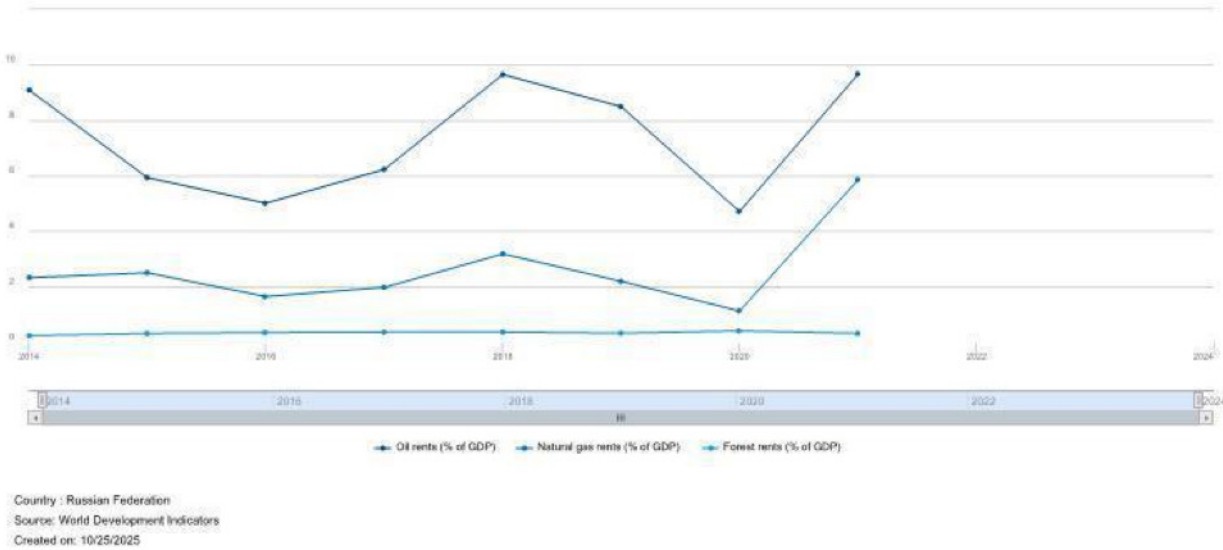
THE ECONOMIC GEOGRAPHY OF RUSSIA'S RESOURCE DEPENDENCE

Russia is heavily reliant on revenues from its oil and natural gas exports to support its economy. Since 2014, despite large fluctuations due to global price volatility and sanctions, revenues from these sectors have accounted for between 30 and 50 percent of federal budget revenues, making them the most consequential industries for the Russian government's financial planning.[4] For example, in 2021, the oil and natural gas sectors made up 45% of the Russian federal budget due to high energy prices.[5] Additionally, rents from the oil and gas sectors combined have accounted for 20 percent of the country's GDP, on average, during that same period (see Figure 1).[6] Lumber extraction has also become a vital industry. Despite a much more modest contribution to both federal budget revenues and the overall GDP, Chinese demand for cheap lumber and plywood has placed the industry at the center of the contemporary "no limits" partnership between the two nations.[7]

Inherently, these industries are geographically fixed, with production only possible in specific regions with suitable conditions. This is not simply a natural phenomenon, however. Soviet policies of economic regionalization tasked subjects with producing or extracting particular goods based on the Marxist-Leninist concept of geographic determinism.[8] Over time, the resulting infrastructure became so entrenched that, after the fall of the Soviet Union, regions were not able to escape their once-forced roles, leading to a new form of economic determinism that continues to shape the country's modern economics.[9]

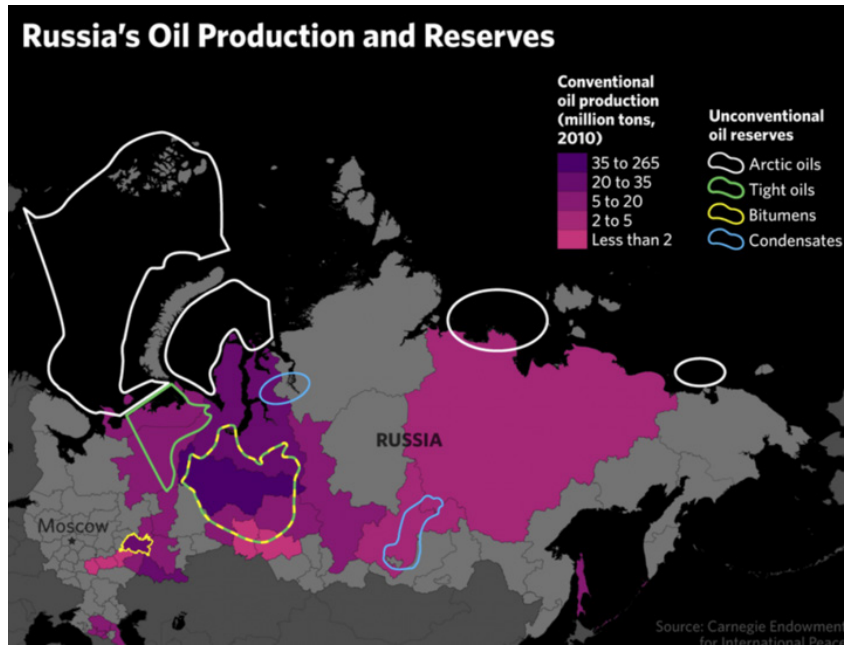
Russia's oil industry is concentrated in Western Siberia in the Volga-Ural basin and the North Caucasus (see Figure 2).[10] Its natural gas industry—the world's second largest, behind the United

Figure 1. Oil, Natural Gas, and Lumber Rents as Share of Russia's GDP



Source: World Bank, *World Development Indicators.*

Figure 2. Oil Production and Reserves Distributed Across the Russian Federation



Source: Sait Yilmaz and Muzaffer Ertürk, "The Troubled Road in Russia."

Figure 3. Natural Gas Production Distributed Across the Russian Federation

Source: Ivanov, "Justification for the Conversion of a Combine Harvester to Operate on Compressed Natural Gas."

States—is situated, in significant part, in Western Siberia, along with North and Central Siberia (see Figure 3).[11]

These energy sectors have created single-industry regions. The 2009 Report of the United Nations Human Development Programme (UNHDP) identified 9 Russian regions in which the energy sector accounted for 16-27% of employment, as "single-industry."[12] These included Tyumen, Nenets Autonomous District, Sakhalin Region, Republic of Bashkortostan, Samara Region, and Perm Territory, among others. Single-industry towns still dominate these extractive regions, a remnant of Soviet-era policy of creating monogoroda, or company towns. For example, in the Kemerovo region, the Russian government classifies 24 out of 49 towns as single-industry.[13] In Kemerovo, the 2009 UNHDP report found that 38% of industrial output was tied to the energy sector.[14] In other regions, the trend was even more pronounced, with as much as 98% of industrial output accounted for in fuel.[15] Thus, the welfare of these regions is highly impacted by the existence of the fuel industry.

Russia's forested land, meanwhile, is primarily located in the Northwest and Far East of the country (see Figure 4),[16] with the Yenisei River basin alone making up for about 50% of the total timber harvest.[17] Russia holds approximately 20% of global forested lands, more than even Brazil with its Amazon Rainforest.[18] Despite this, the lumber industry contributes only a meager 3% to

Figure 4. Forest Coverage of the Russian Federation

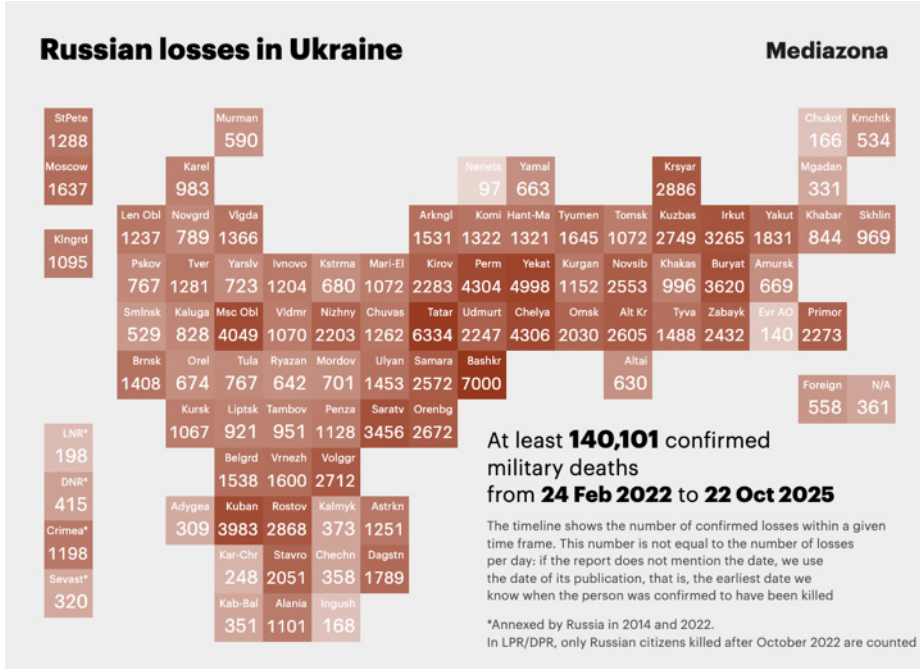
Source: Kudriashova, "Mass Timber in Russia?"

the Russian GDP.[19] Thus, the timber industry remains largely untapped, and was a potential area for economic investment and expansion prior to the war.[20]

As previously stated, lumber rents make up a relatively small portion of Russia's GDP. However, the industry remains critical to Russia's relationship with China and as such, the government has an interest in sustaining the industry. Russia provides 30% of China's lumber, making it by far the single largest shareholder.[21] China is also the largest buyer of Russian lumber, consuming about 60% of Russian exports.[22] This lumber relationship serves to strengthen the partnership between the two countries—and is particularly vital for a Russia that is now shunned by a significant portion of the international system.

Yet, despite the presence of critical industries, the host regions remain systemically impoverished and disenfranchised. The single enterprise town, still dominating much of the economic landscape of Siberia and the Volga-Ural basin, leaves communities uniquely vulnerable to fluctuations in the global price of the commodity they produce.[23] Even during periods of high energy and timber revenues, profits are not reinvested in the communities extracting the resources, either through collective programs or increased wages.[24] The Russian economist Natalia Zubarevich describes these industrial and resource-dependent regions as a "Second Russia" that faces chronic underdevelopment despite its strategic importance to the Russian economy.

Figure 5: Russian Total Military Deaths by Region



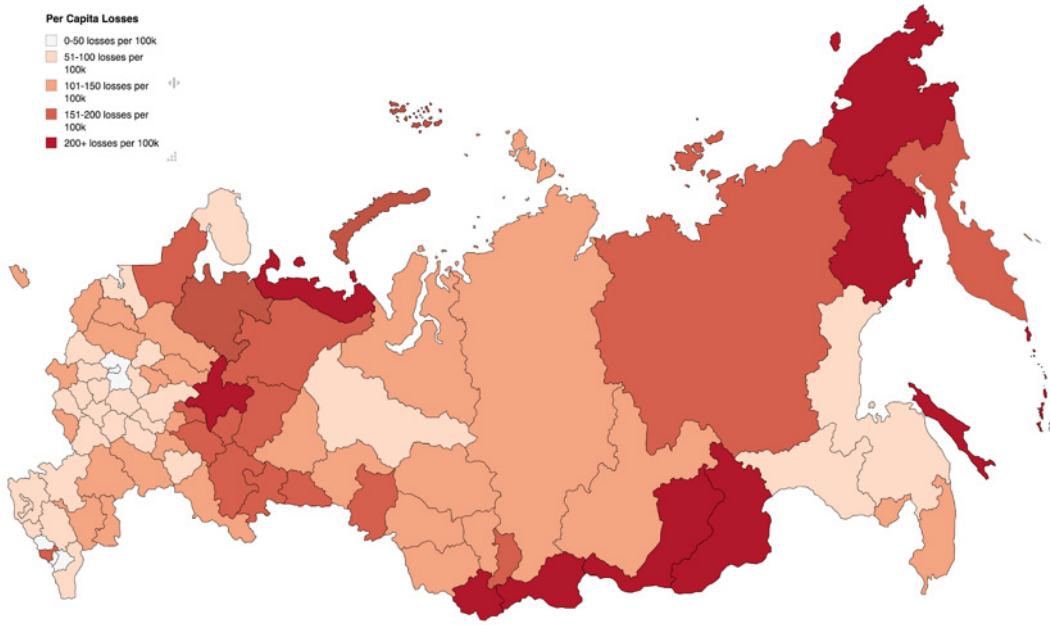
Source: *Mediazona*, "Russia's Latest Casualties in Ukraine War."

She notes that the lack of opportunity for advancement contributes to widespread economic pessimism and fatalism among residents.[25]

However, some resource-dependent regions actually have higher average income per capita than do urban centers such as Moscow and St. Petersburg. For example, in 2021, Moscow had an average per capita income of 86,453 rubles.[26] That same year, three extractive regions, the Chukotka Autonomous District, the Yamalo-Nenets Autonomous District, and the Nenets Autonomous District, all achieved higher average income with earnings of 104,178, 104,323, and 92,620 rubles per capita, respectively.[27] Many other extractive regions, however, lagged considerably behind, including Tuva (20,435 rubles), Kemerovo (28,174 rubles), and Irkutsk (30,270 rubles).[28]

Thus, two seemingly contradictory realities exist at the same time. Extractive regions as a whole are passed over for investment, their populations condemned to occupy the "Second Russia," yet some are able to capture relatively high incomes. These high average income per capita statistics, in turn, may mask extreme income inequality in these regions.

Figure 6: Russian Per Capita Losses by Region



Source: Quantitative Analysis using STATA, visual created using MyChart mapping tool.

THE DISPROPORTIONATE HUMAN COST OF WAR

On February 22, 2022, Russian President Vladimir Putin launched his full-scale invasion of Ukraine, the largest open conflict in Europe since World War II. The war has thus far seen massive destruction of property and a staggering number of casualties, both military and civilian. It is difficult to determine exactly how many Russian military personnel in total have been killed in the war, since the Russian government guards these statistics as a state secret. However, informed estimates put Russian casualties around one million by June of 2025, approximating 250,000 deaths and an additional 700,000 injured.[29]

Mediazona publishes more conservative bi-weekly casualty lists. The platform maintains "stringent" standards for death confirmation, requiring publication in an official Russian source or media outlet, a post by a relative, a photograph of the deceased, a funeral date, or a photograph of a gravestone.[30] These standards likely lead to an underestimation of the true human impact, with soldiers from more distant or private communities, or those with few family members or community ties, being less likely to be counted. Yet, even under these conditions, which are biased against counting soldiers from peripheral regions, the disproportionate impact on these communities is clear. The site uses demographic information to map total losses across the Russian Federation (see Figure 5), using the earlier-mentioned 2021 Rosstat population data, a new map depicting per capita population loss was also created (see Figure 6).

Interestingly, Moscow city had the lowest per capita loss at just 12 individuals per 100,000, and Tuva, a region that primarily exports extracted ore,[31] had the highest, around 450 casualties per 100,000. The map also bears a striking resemblance to the above maps of the geographic distribution of extractive industry (see Figures 2, 3, and 4). A statistical analysis confirmed the relationship between population loss and extraction. The test revealed that extractive regions see an average of 82 additional deaths per 100,000 people as compared to non-extractive ones. A similar test was conducted using labor force census data, resulting in the finding that labor force losses are even more acute. Extractive regions have lost more than double the workers per capita as non-extractive regions: 238 additional labor losses. Further, a test examining only Russia's ten largest resource-producing regions found that these regions see approximately 490 casualties per 100,000 workers, roughly double the average of the rest of the country. (For details on the calculations, statistical significance, and visuals, see Appendix 1).

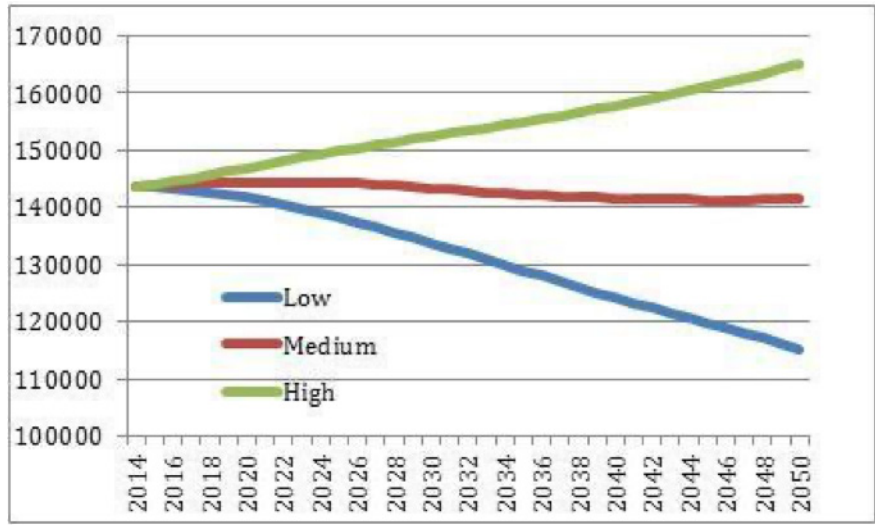
While some of these casualties are conscripts, the majority are volunteers.[32] Among those mobilized, confirmed casualties seem to be more evenly distributed, suggesting that disproportionate volunteerism serves as a driver of the geographic variation in casualty rates.[33]

This is so for understandable reasons. For soldiers from poor extractive regions who have volunteered since the onset of the war, the military's high wages and signing bonuses have proven enticing. *The Moscow Times* reported in 2024 that the monthly salary for Russian servicemen had been increased to the equivalent of $2,166, nearly two-and-a-half times higher than the average Russian salary.[34] Signing bonuses are determined by region, but some of the highest are offered in extractive regions. For instance, the Yamalo-Nenets Autonomous District, which is one of the single largest oil-producing regions where fuel accounts for 88% of industrial output,[35] offered a "sum 14 times higher than Russia's average salary" in 2024.[36] Notably, the fall of 2025 saw extreme bonus cuts in several regions as the Russian economy struggled to fund the war. Perhaps most illustratively, the region of Samara has reduced the signing bonus from 3.6 million rubles to just 400,000.[37]

Of course, personal monetary gain is not enough for some. After all, a dead man cannot collect his paycheck. However, the government offers generous benefits to the families of soldiers killed in service, thereby enticing men to volunteer with the promise that their dependents will be better off. In November of 2024, the government's one-time payment to families of those killed in the line of duty reached the equivalent of $49,000—over two years' worth of earnings for the average Russian.[38] This sum would make a significant positive impact on the lives of those in the "Second Russia," enabling them to either increase their standard of living there or relocate to an urban center with more economic diversity.

Like signing bonuses, these one-time payments to families have also seen reductions since October 2025. In Khakassia, the sum was reduced from 1.1 million rubles to just 100,000, and all over Russia, families report delays in receiving benefits.[39] Given that the most common age of

Figure 7: Population Projections



Source: Rosstat, reported and published in Aleksashenko. "The Russian Economy in 2050."

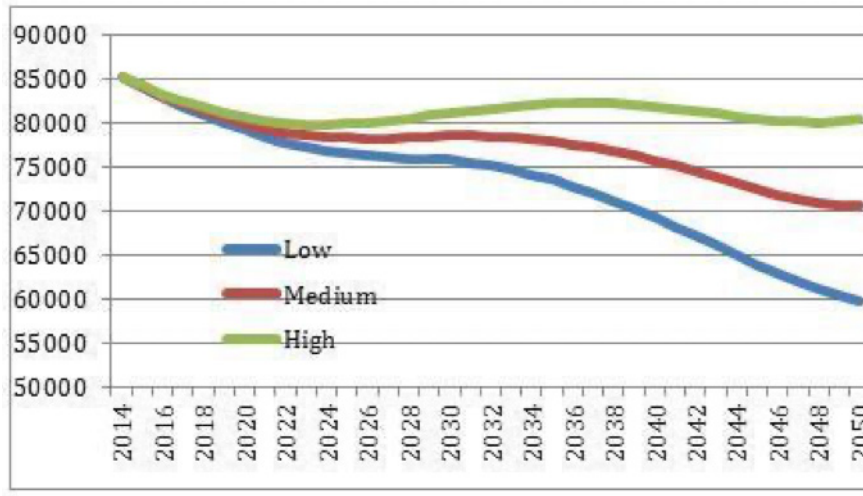
volunteers killed in action is 45-47, soldiers likely have children to provide for.[40] Higher military wages, signing bonuses, and death benefits are likely appealing to fathers in regions with poor economic outlooks.

Activists have also reported that the Kremlin targets ethnic minorities that populate peripheral regions with propaganda, painting the military as an avenue to prove one's strength and virility while simultaneously demonstrating allegiance to the Russian state. For instance, a 2023 propaganda campaign used the slogan "you're a man, be a man" to encourage volunteering.[41] These themes of masculinity are particularly salient in peripheral regions dominated by traditional culture. Buryat activist Maria Vyushkova has noted that the Kremlin frequently exploits her people's traditional culture in its propaganda efforts, tailoring its message to best appeal within the cultural context of Buryatia. She illustrates this point by sharing the story of a man who moved from Moscow to Yakutsk, the capital of the extractive region of Sakha. He was able to compare propaganda campaigns in the two cities, describing how propaganda in Yakutsk was culturally informed and far more present in everyday life.[42] These targeted and more visible recruitment campaigns may attract more volunteers who genuinely believe in the Russian mission.

ECONOMIC IMPLICATIONS

As the discussion above lays out, Russia's extractive regions bear a higher human cost of the war in Ukraine than do urban centers in its west, such as Moscow and St. Petersburg. This localized

Figure 8: Labor Force Projections



Source: Rosstat, reported and published in Aleksashenko. "The Russian Economy in 2050."

loss, which includes casualties, those away at the frontline, and those who have emigrated in fear of being conscripted, has already contributed to a labor crisis.[43] This threat existed long before the 2022 full-scale invasion, however. Already in 2014, experts were raising alarms about a demographic crisis due to increased alcohol-related mortality, a lack of young women, a delayed start in family formation, and poor conditions following the dissolution of the USSR.[44] Rosstat analysts created projections for three population scenarios, depending on the level of migration into Russia (see Figure 7). In a low migration scenario with 100,000 fewer migrants per year, Rosstat expected to see the overall population decline by 20% over 35 years. In order to maintain the population, annual immigration would need to gradually increase to 400,000 additional individuals per year, and in order to increase the population, there would need to be 550,000 additional migrants per year, every year.

Of course, this broad population crisis was expected to have important labor force implications. In 2014, Rosstat expected that the contemporary population conditions would create two waves of labor force loss: first a decline by 8-12% by 2020, followed by another 10-20% after 2030.[45] Notably, even optimistically high levels of migration would still yield a shrunken workforce (see Figure 8). Rosstat called the looming demographic and labor crises the "biggest political, social, and economic challenge for Russia" through 2050.[46]

When Moscow initiated its full-scale invasion of Ukraine in February 2022, the state was already on the brink of population disaster. The war has undoubtedly exacerbated the crisis through previously unprojected population loss, striking further blows to the country's labor force. In May of 2025, Russia reached a record-low unemployment rate of 2.2%.[47] While low unemployment is

often associated with positive economic conditions, most economists agree that unemployment below 4% is too low for a healthy economy.[48] Below this level, the economy fails to account for structural and transitional unemployment, which allows workers to sort into the most efficient industries. In a labor environment such as this, there will be a shortage of workers, forcing firms to increase wages above the productive value of labor in order to compete for employees. This drives inflation upward, often spiraling into a more significant, broader economic crisis.[49]

Russia's labor shortage is already apparent. In 2024, popular Russian job board SuperJob reported that 73% of Russian businesses were short-staffed.[50] Industrial facilities have slowed operations, producing at just 81% of capacity in 2024.[51] Overall, approximately 1.6 million jobs went unfilled in 2024.[52] This labor shortage has already resulted in artificially elevated wages. For example, in Kurgan, an industrial region producing armored vehicles for the war effort, salaries have increased by 33%.[53] Higher wages are driving inflation and forcing the central bank to adopt high interest rates, which have reached a record high 21%.[54] This inflation, which can "no longer be denied even by pro-Kremlin sources," has devalued the ruble and made it impossible for the Russian state to have both economic growth and stability.[55]

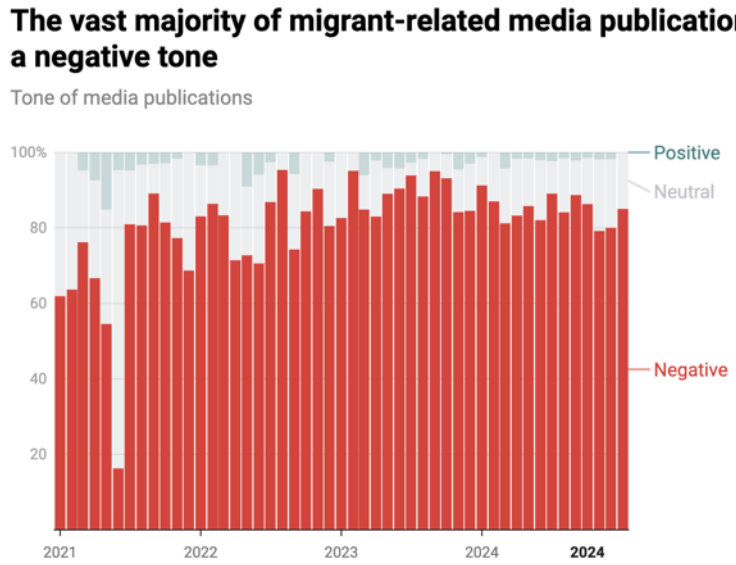
Extractive industries are not exempt from the effects of labor shortage. Despite typically being less prone to understaffing due to their ability to pay competitive wages and perceived employment stability, the oil and gas sectors have had spikes in job openings. In 2024, Kasatkin Consulting, a former subsidiary of Deloitte, reported that the first quarter of 2024 saw 24% more oil and gas job postings across all skill levels as compared to the first quarter of 2023.[56] In other words, even these vital and traditionally resilient industries are now struggling to staff operations.

CHALLENGES TO LABOR SUBSTITUTION

Historically, Russia has relied on Central Asian migrant labor to address labor shortfalls. In fact, in Rosstat's 2014 labor and population projections, increased migrant labor was the proposed strategy for crisis mitigation.[57] However, there have been three major changes for Central Asian migrant laborers in Russia since 2014: an increase in xenophobia, new legal barriers, and improved economic conditions at home.

Since 2021, rhetoric toward Central Asian migrants has become both more prevalent and more xenophobic and violent. Russia has a long history of ethnic tension and discrimination with the peoples on its periphery. However, in 2021, amid significant labor shortages due to COVID-19, President Vladimir Putin declared that "Russia does everything for migrants to feel comfortable."[58] This was part of a larger campaign to entice migrant laborers to come to the country, which included simplifying migrant recruitment for construction work and neutral media coverage of migrant-related topics.[59] Unfortunately, this more friendly posture proved to be short-lived. Since the second half of 2021, when Russian media latched on to a story of four migrant men

Figure 9: Tone of Russian Migrant-Related Media



Source: OpenMinds, "Rise of Xenophobia in Russia."

attacking a Russian youth in the street, migrant-related media coverage has exploded and become exceedingly negative.[60]

In 2024, international defense tech firm OpenMinds published a study on migrant-related media in Russia. They analyzed over five thousand migrant-related publications from ten popular political Telegram channels and collected 500,000 migrant-related VKontakte posts, scraping the comments to create a dataset of over 2.5 million comments. The publications, posts, and comments spanned a period from 2021 to 2024. They found that migrant-focused reporting had become incredibly prevalent, increasing almost four-fold in 2024 from a previous high in 2021. The coverage was overwhelmingly xenophobic in nature, with 84% of the content since 2021 characterized as "negative" (see Figure 9).[61] The comments saw a similar, if not more amplified, trend. In 2024, insulting or violent comments saw a 720% increase.[62] They also characterized more than half of all xenophobic comments as "radical," with frequent calls to "persecute," "kill," "beat," and even "castrate" Central Asian migrants, among other violent imperatives.[63]

Violent rhetoric is not limited to online forums. Especially after the 2024 Crocus City Hall terrorist attack, which was carried out by the Islamic State's regional franchise, migrants face daily discrimination and persecution.[64] One Tajik laborer told Human Rights Watch that migrants "feel in constant fear and danger. It's as if we are not humans, but criminals by default. And this attitude keeps us in permanent fear and humiliation, it's like we have no right to a dignified life." In daily life, ethnic discrimination has led Central Asians to be refused service and barred or

dismissed from jobs, as well as unfairly harassed by police.[65] All too often, verbal harassment and discrimination escalate into violence. Using the tagline "Revenge for Crocus City Hall," bands of ultra-nationalist teenagers have been posting videos of the street beatings of migrants.[66] The teens compete to create the most viral, violent video, disseminating the footage on far-right Telegram channels and TikTok.[67] Thus, hate has contributed to the creation of a humiliating and often dangerous daily reality for migrants living in Russia. The virtual nature of hate comments and violent video dissemination allows fear to permeate borders, as those not yet in Russia understand the reality that awaits them.

This widespread xenophobia has already manifested itself in state policy. Instead of pursuing an open migration policy in the context of this labor shortage, as the Kremlin did in early 2021 to sustain production during the COVID-19 pandemic, Moscow has chosen to erect new legal barriers for migrant laborers. In 2024, the Code of Administrative Offenses was amended to increase the power of authorities to unilaterally deport migrants.[68] The changes also dictated that expulsion orders must be carried out immediately, preventing migrants from challenging the order, which was traditionally allowed for ten days after an order was issued.[69]

In 2025, amendments to the Law on the Legal Status of Foreign Citizens further restricted the rights of migrants in Russia. The changes created an "expulsion regime" by permitting authorities to add foreign nationals to a "controlled persons registry," preventing individuals from withdrawing large sums from banks, moving, travelling, driving, and marrying, among other things.[70] In the first month after the amendments came into force, 685,000 people were added to the registry.[71] Many of these people were not notified of their status as a controlled person, and did not know that they had been added to the registry until they discovered their bank accounts had been frozen.[72] Some regions have imposed additional restrictions on the lives and mobility of migrants living there. For example, the region of Samara prohibits migrants from working in the production of "perishable bakery goods or baby food."[73] Together, these legal barriers present significant constraints on the lives and livelihoods of foreign citizens working in Russia, making it both more difficult to stay in the country and more difficult to thrive.

As the appeal and ease of working in Russia has declined, so too has the economic imperative to do so. The traditional drivers of migrant labor to Russia were poor economic conditions in the migrant-sending countries of Central Asia, which prompted young men to periodically work in Russia to provide for their families.[74] Today, increasing regional connectivity and improving economic conditions have reduced the need for young people to leave Central Asia in order to succeed.

Expanded regional cooperation has been a Central Asian goal since the mid-2010s. In recent years, there has been major progress toward this objective, especially within the framework of the Organization of Turkic States (OTS). OTS initiatives to reduce cross-border employment barriers and work with outside partners to fund trade infrastructure have resulted in a more

integrated region.[75] These projects and other means of economic cooperation have been successful in improving economic conditions for Central Asian states. Since 2016, intra-regional trade has increased by 250%, "reaching $11 billion, while mutual investments have almost doubled, reaching $840 million."[76] Overall, the region now boasts an increasingly positive economic outlook. Given the simultaneous reduction in push and pull factors for Central Asian workers, migration to Russia can be expected to decline.

CONCLUSION

Russia's extractive regions, which are responsible for a significant portion of its GDP and federal budget, are also bearing disproportionate human costs of the war in Ukraine. This dynamic is exacerbating a pre-existing labor crisis as critical industries, like all other sectors, become increasingly unable to satisfy labor demand. The government can be expected to attempt to pivot to migrant laborers to mitigate this shortage, but rampant xenophobia and legal barriers, combined with improving economic conditions in Central Asia, will reduce the appeal of migrant labor opportunities in Russia.

The situation, moreover, is poised to continue—and deepen. As the current war of attrition progresses, there will assuredly be many more casualties. If present dynamics hold, these will have a disproportionate impact on Russia's most important extractive regions, and from there on the country's labor force as a whole.

The results are stark. Russia now faces a self-inflicted crisis. Moscow's aggression in Ukraine is destroying the labor force in industries that make its very ambitions possible. Eventually, because it will prove difficult to sufficiently supplement labor with migrant workers, oil and gas capacity will erode, forcing the Kremlin to choose between operations abroad and its economic base. What remains to be seen is not whether these pressures will constrain Russia, but when.

ENDNOTES

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APPENDIX

STATISTICAL CALCULATIONS AND VISUALS

Mediazona uses demographic information about the confirmed casualties to create map-like infographics displaying the regional distribution of casualties (see Figure A). The infographic assigns increasingly darker colors to regions facing higher losses; however, it is important to note that these are just total casualties, not reflecting per capita impact. In order to accurately compare the scale of loss by region, one must incorporate the region's standing population. Unfortunately, since the onset of the full-scale invasion, the Kremlin has refused to share population information and removed older census information from Rosstat, the Russian statistical service. However, population by federal district is still available on third-party sites that saved the information before it was erased.[i]

Combining the 2021 population by region data with *Mediazona*'s late October 2025 casualty list, a quantitative analysis was conducted. Using STATA, the per capita loss per 100,000 individuals in each of Russia's 85 subjects could be determined by calculating the ratio of casualties to the regional population. After establishing the per capita loss per 100,000 individuals, the resulting statistics were used to create a new map, colored to display per capita loss across the Russian Federation (see Figure B).

Figure A: Russian Total Military Deaths by Region

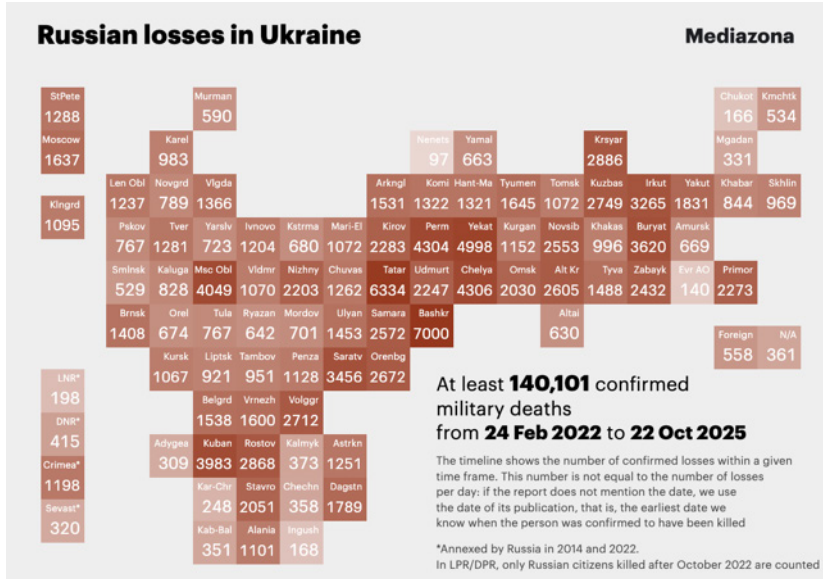

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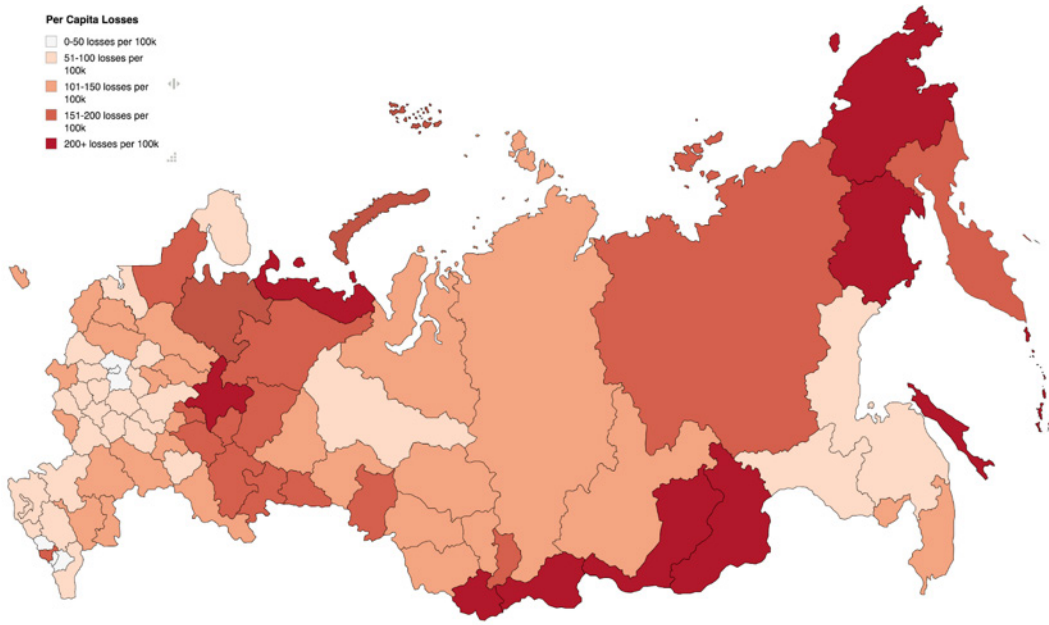
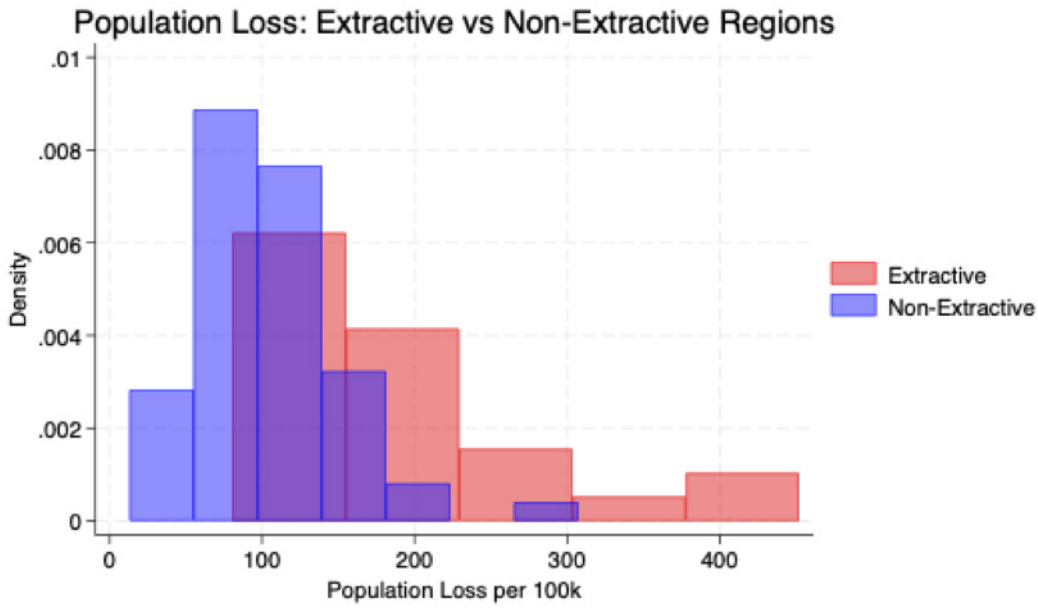
Figure B: Russian Per Capita Losses by Region



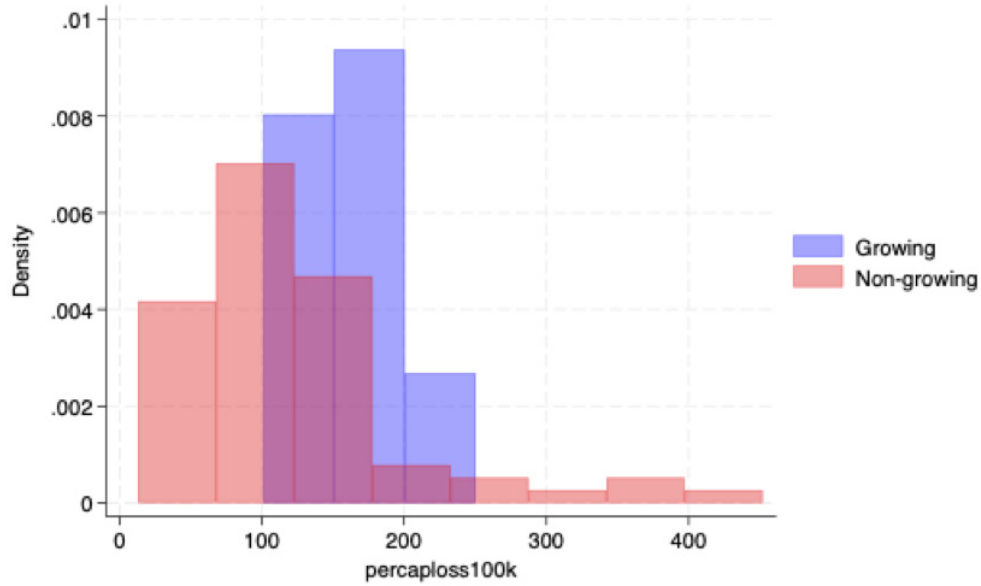
Source: Quantitative Analysis using STATA, visual created using MyChart mapping tool.

Figure C: Distribution of Per Capita Loss, Extractive v. Non-Extractive



Source: Quantitative Analysis using STATA, visual created using STATA.

Figure D: Distribution of Per Capita Loss, Growing v. Non-Growing

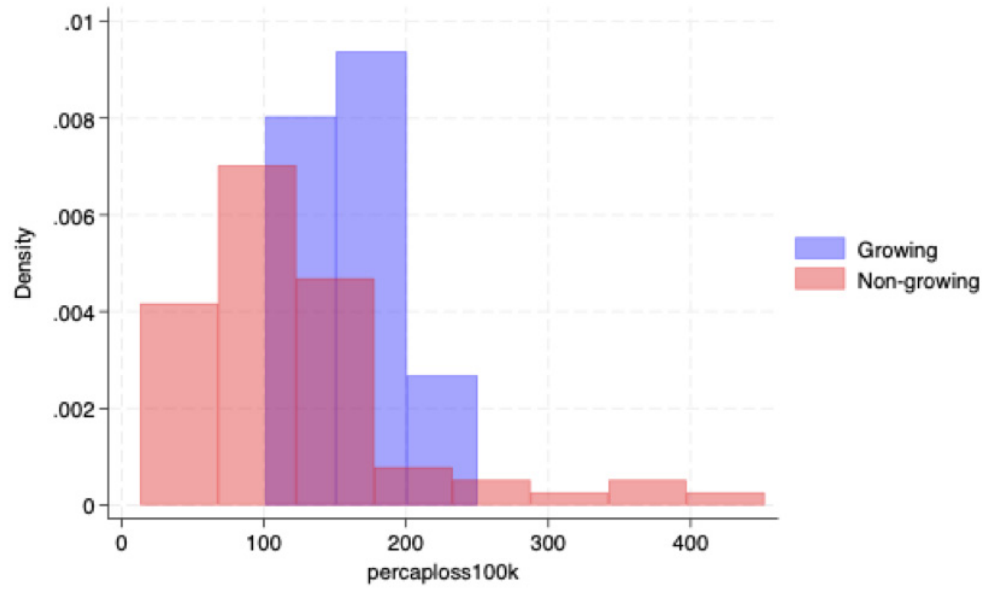


Source: Quantitative Analysis using STATA, visual created using STATA.

To test for a difference in means between extractive regions and non-extractive regions, a two-sample t-test was conducted using STATA. After identifying extractive regions as those with a significant portion[ii] of GRP from natural rents through literature,[iii] the two-sample t-test revealed that the 26 extractive regions experience significantly higher losses (Mean = 101.3629 vs. 183.0165; t(83) = -5.2369, p < 0.001). Thus, the null hypothesis is rejected and the alternative hypothesis that extractive regions have, on average, higher casualties than non-extractive regions is accepted at the 99% confidence interval. Specifically, these regions saw an average of 82 additional casualties per 100,000 than their non-extractive counterparts (see Figure C for a visual representation of the difference in means).

One study used to identify extractive regions also highlighted nine regions that had seen growth in the extractive industry as a share of GRP between 2005 and 2019.[iv] A similar two-sample t-test for the difference in means between these "growing" regions and "non-growing" regions, found that "growing" regions also have higher casualties per capita on average than non-growing regions, thought this is a weaker correlation (Mean = 120.424 vs. 176.2907; t(83) = -2.1303, Ha: diff < 0 (Pr(T < t) = 0.0181), Ha: diff != 0 Pr(|T| > |t|) = 0.0361, Ha: diff >0 Pr(T > t) = 0.9819)). Non-growing regions see an average of about 56 fewer casualties per capita than do regions becoming more extractive. The relatively low t-statistic reflects higher variability in the "non-growing" group, as some regions with large but stagnant extractive sectors increase the group's mean and inflate the standard error. Despite this increased variability, the one-tailed test rejects the null hypothesis at the 95% confidence level and confirms that "growing" regions experience higher average casualties (see Figure D).

Figure E: Distribution of Labor Loss, Extractive v. Non-Extractive

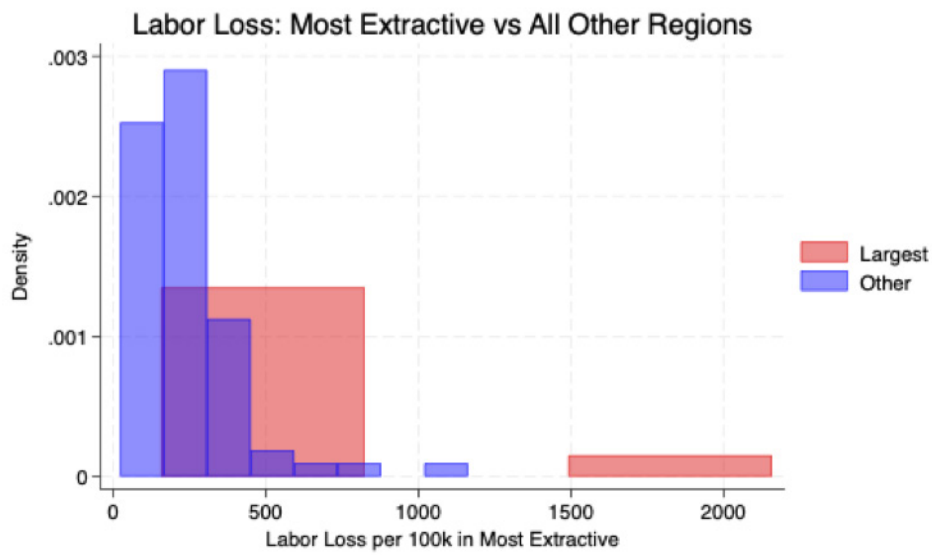


Source: Quantitative Analysis using STATA, visual created using STATA.

The same platform that continues to host population census data also hosts information on the labor force by region.[v] Using this data, a labor loss per 100,00 laborers was likewise calculated. The analysis using labor loss per 100,000 laborers revealed even more pronounced realities. These projections may be more representative of the true labor impact of the war, as many soldiers are working-age men who would otherwise be participating in the workforce. Additionally, firms are only affected by losses to the labor force, not the overall regional population. This figure ignores children, the elderly, those in prison, homemakers, and those who have left the labor market, counting only those 16 or older, either working or actively searching for work. Of course, prisoners are represented in the Russian military and in casualty lists, meaning these calculations may not be fully accurate, as some casualties are not counted in the labor force. However, this calculation, together with the broader per capita loss, yields a meaningful approximation of conditions.

The same two-sample t-test for a difference of means was conducted between labor losses in the previously identified 26 extractive regions and all others. Similarly, extractive regions had significantly more labor losses (Mean = 200.8356 v 438.6256, t(83) = -4.1447, p = 0.0001). Extractive regions saw about 238 additional losses from the labor force, more than double the impact in non-extractive regions, which is significant at the 99% confidence interval (see Figure E).

Figure F: Distribution of Labor Loss, Largest Extractive Regions v. All Others



Source: Quantitative Analysis using STATA, visual created using STATA.

While the comparison between the labor loss in the 9 regions becoming more extractive and "non-growing" regions did not yield any statistically significant results, the same study that identified growing regions also identified the ten largest contributors of Russian natural rents.[vi] The comparison of mean labor loss in the largest natural rent producers and that in all other regions illustrated that these major extractive industries experience an additional 246 casualties per 100,000 laborers (Mean = 244.6185 vs. 490.7175; t(83) = -2.8616, Ha: diff < 0 (Pr(T < t) = 0.0027), Ha: diff != 0 Pr(|T| > |t|) = 0.0053, Ha: diff >0 Pr(T > t) = 0.9973)). This difference is significant at the 99% confidence level (see Figure F). Kemerovo, one of these large extractive regions[vii] and a single-industry[viii] region, has faced by far the steepest human cost from the war in terms of labor. Kemerovo has lost approximately 2,158 individuals per 100,000 laborers; it is the only region that has surpassed 2,000 casualties per 100,000 laborers.

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