IMPACT OF THE UKRAINIAN POULTRY MARKET AMIDST EU ACCESSION

by

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LIST OF ABBREVIATIONS

SSSU State Statistical Service of Ukraine

FAO Food Agricultural Organization

MHP Myronivsky Hliboproduct

EC European Commission

FCF Feed Conversion Rate

TRQ Tariff Rate Quota

PE Partial Equilibrium

PCD PC Dniprovsky

PC Poultry Complex

CWE Carcass Weight Equivalent

NBU National Bank of Ukraine

NCSREPU National Commission for State Regulation of Energy and Public Utilities

Mt Million tonnes

FRED Federal Reserve Economic Data

CHAPTER 1. INTRODUCTION

Ukraine's deep connection with nature has shaped not only its cultural identity but also its economic foundation. The reverence for nature, reflected in Ukrainian traditions, literature, and songs, has evolved into a critical aspect of modern agricultural entrepreneurship. Agriculture in Ukraine is highly developed, with two primary sectors: crop production and livestock farming. Over the last two decades, Ukraine has emerged as a significant global player in the agricultural market. This growth is exemplified by the successful public offerings of leading Ukrainian agribusinesses such as MHP SE[1], Astarta Holding[2], Kernel Holding[3], and others (Novoitenko & Nechyporenko, 2022). These companies have made Ukraine a global leader in poultry, sunflower oil, and meal production, contributing to global exports of barley, rapeseed, and wheat.

Despite these successes, Ukrainian agribusinesses have struggled to secure consistent investment growth through stock markets. Stock prices of leading companies have fluctuated over the years, partly due to macroeconomic instability and foreign investors' skepticism regarding Ukraine's market mechanisms. This perception has affected the agro-food sector, which is vital to Ukraine's economy. Agriculture accounts for over 14% of national employment and is a key driver of exports, which play a crucial role in global food security (USDA, 2022). However, the full-scale invasion of Ukraine in 2022 has posed severe challenges to the agricultural sector, disrupting approximately 25% of the arable land and causing logistical problems due to the closure of the Black Sea export routes (U.S. Department of Agriculture, 2023).

[1] May 2008 an initial public offering (IPO) at London Stock Exchange (LSE)**Invalid source specified.**.
[2] August 2006 an initial public offering (IPO) at Warsaw Stock Exchange (WSE) **Invalid source specified.**
[3] November 2007 an initial public offering (IPO) at Warsaw Stock Exchange (WSE) (2022)

Poultry farming, particularly chicken production, stands at the forefront of Ukraine's agricultural sector. It has become an essential strategy to address the global challenge of feeding a growing population sustainably (FAO, 2023). Poultry is a major source of affordable protein in Ukraine, with consumption rates increasing annually. In the EU, the CAGR for this market for the last 20 years reached 3.09% (Eurostat, 2024). As of 2023, poultry is the most consumed meat in Ukraine (SSSU, 2024), surpassing other livestock products. MHP SE, Ukraine's largest poultry producer, plays a significant role in meeting domestic and global demand, accounting for over 30% of Ukraine's poultry market (Union of Poultry Farmers of Ukraine, 2024) and approximately 9% of the EU's poultry production (Eurostat, 2024).

The ongoing Eurointegration process, accelerated by Ukraine's candidate status for EU membership granted in June 2023, has further influenced the poultry market (European integration of Ukraine, 2023). As part of its solidarity response to the war, the European Commission suspended all import duties on Ukrainian exports until June 2025, including the removal of tariff rate quotas (TRQs) on agro-food products (European Comission, 2024). While the suspension of TRQs has provided temporary relief, the long-term impact of these measures on Ukraine's poultry sector remains uncertain.

Thus, the central objective of this research is to assess the welfare gains for Ukraine's poultry market resulting from the removal of TRQs, particularly as the country moves closer to full EU membership. To do this, we analyzed the market power through analyses of the global and local Supply and Demand factors influence, determined price elasticities for Poultry products in the Ukrainian Market to both prove the existing market power in Ukraine as well as use it to estimate the total welfare impact of the TRQ lifting for Ukraine.

While the global meat market has been extensively studied, research focusing on the supply and demand elastisties for meat products in Ukraine was not discussed before. Moreover, the specific impacts of TRQs on poultry in Ukraine remain limited and not studied enough. This study aims to bridge that gap by providing localized data and insights into the supply-

demand interactions in the Ukrainian poultry market under the evolving EU integration framework. The findings will offer valuable perspectives for policymakers and industry stakeholders on how to navigate the challenges and opportunities in Ukraine's poultry sector amidst EU accession.

Our study employs a simultaneous equations approach, utilizing both Instrumental Variables (IV) regression and Three-Stage Least Squares (3SLS) to estimate supply and demand elasticities in the Ukrainian poultry market. This methodology allows us to address potential endogeneity issues and account for the interdependence of supply and demand factors. By incorporating data on production levels, inventory, input costs, trade dynamics, and various external factors, we aim to comprehensively analyze the market's behavior and responsiveness to policy changes.

In the following chapters, we will present a detailed industry overview, review relevant literature, outline our methodology, describe the data used in our analysis, present our results, and conclude with policy recommendations based on our findings. Through this comprehensive approach, we aim to provide a robust assessment of the Ukrainian poultry market's future in the context of deepening European integration.

CHAPTER 2. INDUSTRY OVERVIEW AND RELATED STUDIES

2.1. OVERVIEW OF THE UKRAINIAN POULTRY INDUSTRY

The poultry sector, with its considerable complexity, contributes a substantial share to global agricultural output and livestock exports. It is a highly complex industry with multiple levels of production, including feed mills, hatcheries, breeding farms, and processing facilities. The sector encompasses various species that are typically raised for either meat or egg production. Therefore, poultry's efficiency in resource use, along with its significant role in global exports, positions it as a key driver of growth within the livestock sector.

Among poultry species, chickens dominate the global breeding landscape, accounting for over 90 percent of the sector by volume (kg) produced (FAO, 2023). Other significant species include ducks, primarily in Asia; turkeys, mainly in North America; guineafowl in Africa; and geese, which are also notable in certain regions after chicken breeding.

The rise in poultry consumption is driven by its affordability, nutritional benefits, and adaptability to various culinary traditions (OECD/FAO, 2023). One of the other factors contributing to the growing preference for poultry is its superior efficiency in feed conversion, which significantly outperforms other livestock industries. Poultry, particularly standard broiler chickens, typically has an FCR (feed conversion ratio) between 1.3 and 1.6 in enclosed systems, meaning it takes only about 1.3-1.6 kg of feed to produce 1 kg of meat. In comparison, pigs have an FCR of 3 to 3.2, while cattle require 12.5 kg of feed to produce 1 kg of meat (Navfarm, 2020). This high feed efficiency reduces production costs and environmental impact, making poultry farming a more sustainable and economically viable option in many regions. Consequently, poultry has become the preferred method of meat production, especially in areas where resource efficiency is crucial.

In recent years, the poultry market has experienced significant growth. This trend is underpinned by increasing urbanization, rising incomes, and changing dietary preferences towards leaner meats (FAO, 2024). Additionally, the relative resilience of poultry farming to various animal diseases compared to other livestock has further solidified its position in global meat production. In 2021, global meat production reached 357 million tons, a 53 percent increase (124 million tons) compared to 2000 (FAO, 2023), *(Figure 1)*.

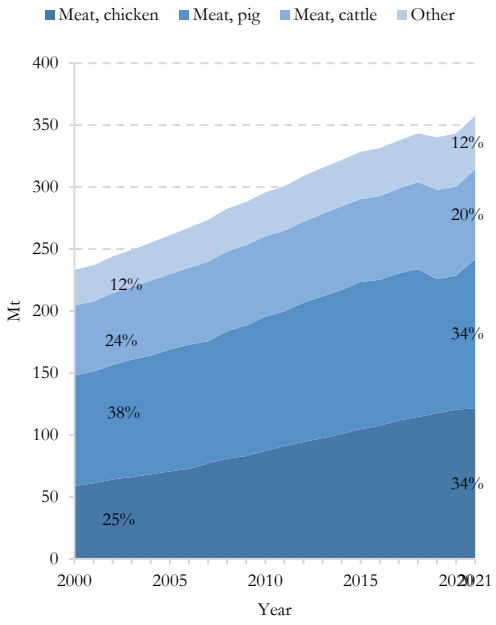

Figure 1. Global Meat Production Distribution by Category, 2023, Mt
Source: Statistical Yearbook FAO 2023

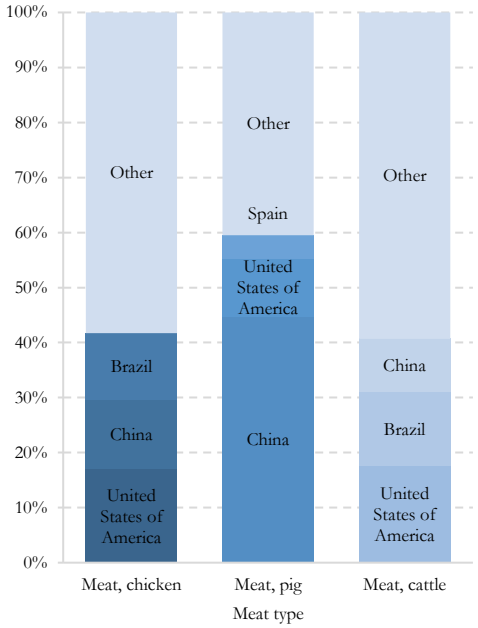

Figure 2. Geographic Distribution of Global Meat Production, 2023, %
Source: Statistical Yearbook FAO 2023

This growth represents a rapid expansion, particularly between 2020 and 2021, when production increased by 4 percent, the fastest rate in the 2000-2021 period. Chicken, pig, and cattle meat constituted nearly 90 percent of this global meat production.

Chicken meat showed the most substantial growth, making up 34 percent of global production in 2021. It increased by 107 percent (63 million tons) since 2000, positioning it as the most produced meat type that year. Pig meat also accounted for 34 percent of total

production in 2021, recovering from a decline caused by African swine fever outbreaks between 2018 and 2020. The distribution of meat production is relatively diverse, although the top three producers accounted for a significant portion of global output. China and the United States are leading producers in these categories, with China's production mainly serving its domestic market, while a notable share of American meat production is exported *(Figure 3)*.

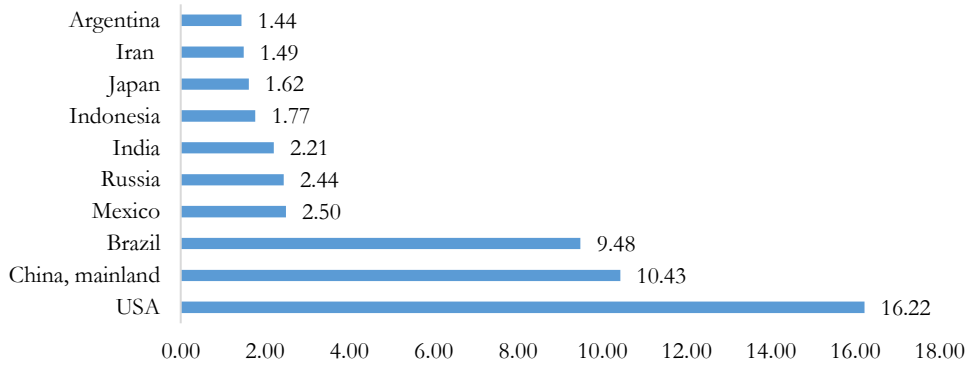

Figure 3. Average Production of Chilled Chicken Meat by Country, 2016-2022, Mt

Source: own presentation based on Statistical Yearbook FAO 2023

In 2022, global meat production grew by an estimated 1 percent to 347 million tonnes of carcass weight equivalent (cwe). This growth was primarily driven by increased pig meat production in China. The industry's profitability improved slightly towards the end of 2022 due to decreasing input costs. Global meat exports declined by 3 percent to 40 million tonnes in 2022 due to production shortfalls and higher domestic demand in major exporting countries. (OECD/FAO, 2023).

POULTRY MEAT		2020-22est	2023	2024	2025	2026	2027	2028
Production	kt rtc	136 552	139 681	141 387	142 914	144 976	146 917	148 797
% increase	%		2.3%	1.2%	1.1%	1.4%	1.3%	1.3%
Consumption	kt rtc	135 413	139 677	141 366	142 892	144 980	146 916	148 793
% increase	%		3.1%	1.2%	1.1%	1.5%	1.3%	1.3%

*Average numbers for those years

Table 1. OECD and FAO projections on poultry production in 2023-2028

Source: OECD-FAO Agricultural Outlook 2023-2032

Global poultry consumption is projected to increase to 91 million tonnes of retail weight equivalent, accounting for nearly half of the additional meat consumed (*Table 1*). Poultry's lower price drives this increase compared to other meats and its favourable nutritional profile, featuring high protein and low-fat content. This trend is expected to continue, reinforcing poultry's significant role in global meat consumption growth.

Ukraine has played a significant role in the growth of global meat production, particularly in the poultry sector. Since gaining independence, Ukraine's poultry production has developed steadily. Over the past 30 years, poultry production's compound annual growth rate (CAGR) has been 2.54%. More impressively, in the last decade, the CAGR for poultry meat production was 3.44%, with annual production increasing from 750 thousand tons to 1.25 million tons in 2022 *(Figure 4)*. This rapid growth has been made possible by the establishment of two major poultry production plants by MHP SE – the Myronivska poultry plant and the Vinnytsia poultry plant. The latter, which commenced full operations in 2012, is the region's largest poultry meat-producing factory with an output of around 280 thousand tons of poultry meat a year. Due to those advances and additional investment in the production by MHP this company is considered to be the 2nd largest poultry company in Europe by the volume of poultry produced (WATT Poultry International, 2023). These advancements have significantly boosted Ukraine's production capabilities.

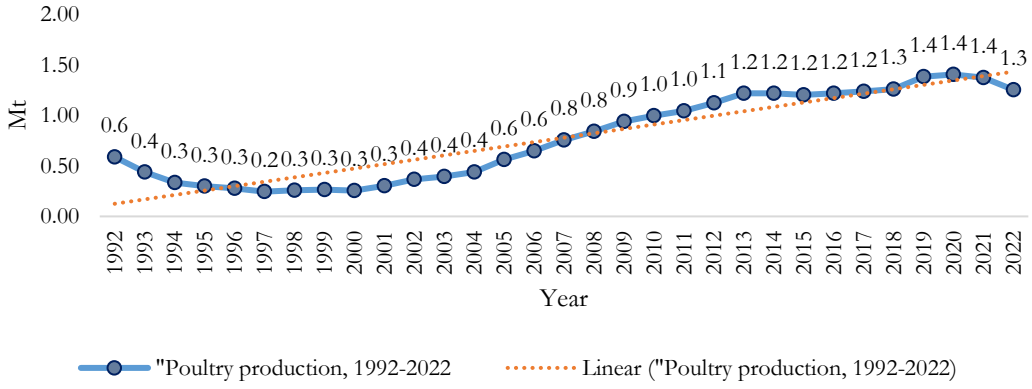

Figure 4. Poultry production in Ukraine, 1992-2022, Mt
Source: own presentation based on the FAO database

In Appendix 1, a map from the Gridded Livestock of the World database (FAO, 2020) illustrates the spatial distribution of chicken populations globally. For Ukraine, the map highlights significant densities of chicken populations in Ukraine (areas with deeper colors, particularly in the red spectrum, indicate higher concentrations of chickens per km^2), with dark red areas suggesting a substantial level of poultry production in the region.

The Ukrainian meat market 2024 reveals growth in poultry and pork production by 6% and 8%, respectively, driven by increased efficiency in industrial farming and strong export demand, especially for pork, which saw a 123% export surge. This may be due to improved production capacity and access to new markets. In contrast, beef production declined by 6%, reflecting the sector's higher costs and inefficiencies, as well as possibly lower demand, both domestically and abroad, where beef exports fell by 18%. Conversely, cattle farming fell by six percent indicating higher costs and inefficiencies within the sector along with a potential dip in demand both locally and internationally where beef exports reduced 18%. The collapse in overseas purchasing of chicken (-25) and pigmeat (-66) confirms the increasing self-sufficiency of Ukraine in these areas *(Figure 5-6)*.

The Ukrainian poultry industry, particularly the meat sector, demonstrated moderate recovery in 2024 from the impacts of the full-scale invasion that began in February 2022. Projections indicate continued growth through 2025, although production is expected to remain below pre-conflict levels. MHP SE - the major player of the market, strengthened its production capacity despite the prevailing challenges in the industry including the war and the disruption of electricity and of labor due to mobilization.

Overall, the Ukrainian poultry market is characterized by the existence of one leader in the market – MHP SE, whose main production capacities are in the Vinnytsia and Cherkasy regions, thus making those 2 regions the top performers in poultry production and slaughtering *(Appendix 2)* (SSSU, 2024).

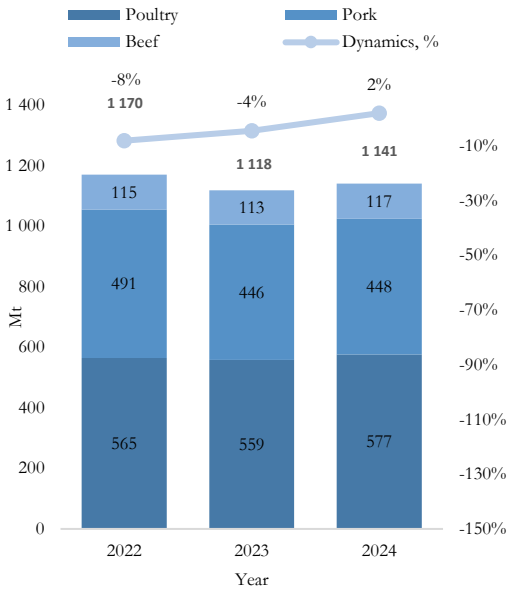

Figure 5. Distribution of Meat Production Volumes Across Market Segments in Ukraine, 2022-2024[4], k t

Source: own presentation based on SSSU data

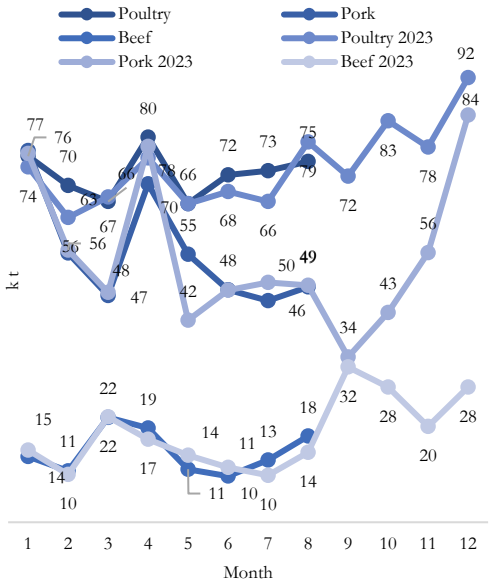

Figure 6. Temporal Analysis of Meat Production Volume Dynamics by Category in Ukraine (including households), k t

Source: own presentation based on SSSU data

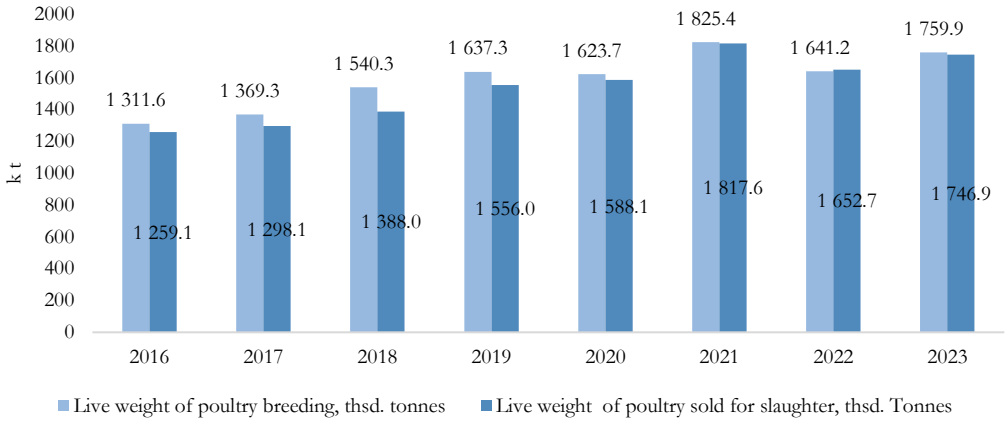

Figure 7. Live weight of poultry, 2015-2023, k t

Source: own presentation based on SSSU database

[4] Compered only 8 months of 2022, 2023, and 2024

As of the August 2024 market, even though the poultry and beef consumption increased by 3%, the total internal market of industrial meat settled down by 22%, possibly because of the economic difficulties, low purchasing power of the consumers, and interruptions owing to the continuing war.

Diving deeper into the poultry part of the livestock market, we see the growth in production capacities *(Figure 3),* and in 2024, it has demonstrated resilience despite some fluctuations in monthly performance. The poultry production dropped for the first time this year, with MHP and PCD being affected, with MHP -1% and PCD -4%, respectively, being the first August to note the dip. Nevertheless, smaller producers like Gubin and Agrol have been successful in combating this decline with a rise of 52% and 38%, respectively, which has offset the decline. Over the first eight months of 2024, however, the domestic market has shown a 4% growth in production, driven by a range of mid-sized and smaller producers *(Figure 8).* While household poultry production decreased slightly by 1%, the overall poultry market, combining both industrial and household production, posted a 3% growth year-to-date, reflecting the sector's strong overall performance (Union of Poultry Farmers of Ukraine, 2024).

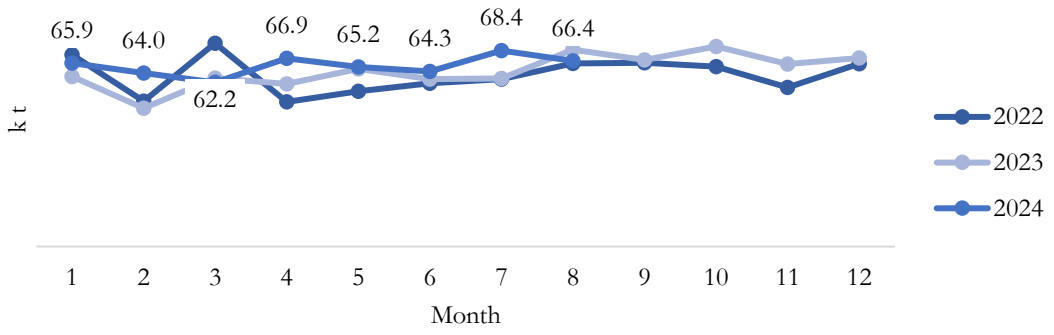

Figure 8. Dynamics of the domestic chicken market production, k t
Source: own presentation based on data from Union of Poultry Farmers of Ukraine, 2024

Ukrainian poultry exports experienced fluctuations in 2024, with August seeing a temporary 6% decline in overall exports. This dip was primarily attributed to reduced

shipments to key markets such as the Netherlands (-50%) and the United Arab Emirates (-35%). This decline was mostly explained by supply cutbacks to the Netherlands (-50%) and the United Arab Emirates (-35%). Even though this was a setback in the short run, the total shipped volume in the first eight months of 2024 was more than 5% higher, indicating the strong health of the markets. This expansion was further supported by the volumes of exports to a few other countries, with exports to some markets more than doubling compared to the last year.

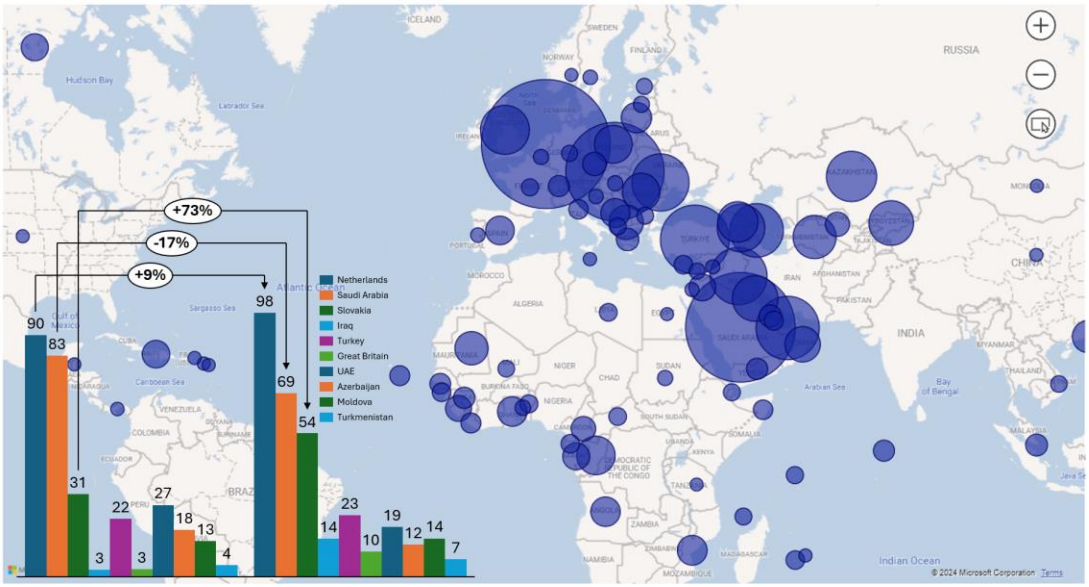

Figure 9. Map: Poultry exports from Ukraine in 2023, k t; bar chart: Comparison of the Top 10 countries of the export destination in 2022 and 2023.
Source: own presentation based on data from SSSU in PowerBI

The geographical map of Ukrainian poultry export markets in 2024 was associated with significant changes in the export orientation *(Figure 9)*. The Netherlands remained a significant market, accounting for 18% of exports, despite a 47% decrease compared to 2023. Saudi Arabia and Slovakia also experienced substantial declines of 44% and 53%, respectively, yet remained among the top destinations. In contrast, exports to Iraq grew by 43%, and the United Kingdom saw a remarkable 69% increase. Despite a 15% decrease, the United Arab Emirates maintained its position as a key market. Overall, exports to EU countries declined by 42%, reducing their share from 40% to 33% of total exports. This

shift led to increased diversification, with non-EU regions accounting for 67% of exports in 2024, up from 60% in 2023. The total export volume for 2024 reached 298.7 thousand tons, marking a 28% decrease from the previous year, indicating significant market adjustments and challenges in maintaining export levels across various international markets.

Trade in poultry products between Ukraine and the EU is of great significance for both entities' economic and social spheres. The production potential of Ukraine is important for the European poultry market, as it supplies roughly 10% of the total poultry produced in the EU (Eurostat, 2024). The increasing volume of poultry imports from Ukraine to the EU, reaching 231 thousand tons in 2023 (Eurostat, 2024), underscores the growing interdependence in this sector.

This poultry trade is part of a robust trading relationship between Ukraine and the EU. As of 2023, the EU was Ukraine's largest trading partner, accounting for 56% of its trade in goods. Conversely, Ukraine ranked as the EU's 16th biggest trading partner, representing 1.2% of the EU's total trade in goods (European Comission, 2024).

The total trade in goods between the EU and Ukraine reached €61.9 billion in 2023, more than doubling since implementing the Deep and Comprehensive Free Trade Agreement (DCFTA) in 2016. Ukraine's main exports to the EU include cereals, animal or vegetable fats and oils, ores, slag and ash, oil seeds, and iron and steel, with Ukraine remaining the EU's third-biggest source of agrifood imports by value in 2023. If we analyze the EU as a partner in poultry trade, the data (*Figure 10*) shows that since 2022, the EU's share in Ukrainian exports has remained significant but variable.

The exports to the EU were 136 units which amounted to 33% of total exports in 2022. This number increased further in 2023 to 40%, with 168 units exported to the EU. However, the first 8 months' statistics for 2024 only show 98 units or 31% of exports to the EU, which does not seem to be sustainable if this trend continues throughout the year. The total trading volumes for the first eight months of 2024 have already reached 299 units,

with the EU maintaining its consistent share of around one-third of exports. Other regions have maintained their majority share of the trade, accounting for 67% of exports in both 2022 and the partial 2024 period.

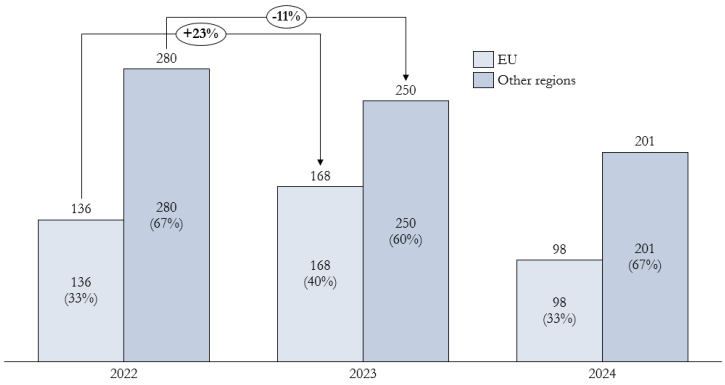

Figure 10. Export of poultry to EU and Other countries in 2022, 2023 and 8 month of 2024, k t

Source: own presentation based on data from SSSU

In Figure 11, we can observe the evolution of poultry imports to the EU since 2014, showing Ukraine's growing presence in this market.

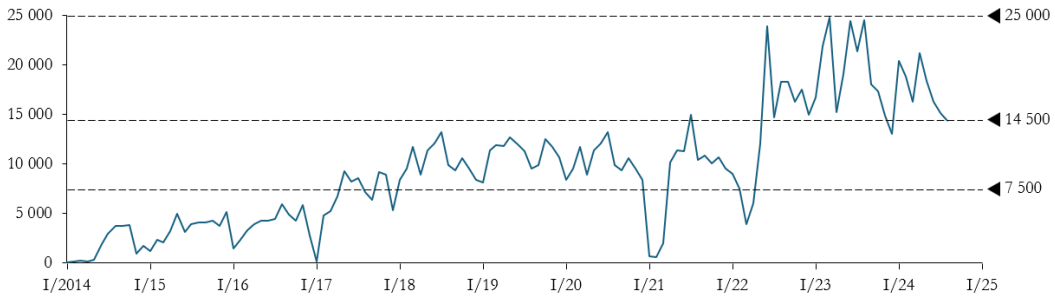

Figure 11. Export of poultry from Ukraine to EU, monthly since 2014, k t

Source: own presentation based on data from Eurostat[5]

While total EU poultry imports have fluctuated between 800,000 and 1,000,000 units, Ukraine's share has grown significantly from just 2% in 2014 to 24% in 2024. There was a

[5] Eurostat (Comext). Statistical regime 4 (total trade, including goods imported or exported temporarily for further processing).

slight decline in Ukrainian exports during 2020 and 2021, followed by a substantial surge in 2022-2023. This recent growth was primarily driven by the lifting of Tariff Rate Quotas (TRQs) for Ukrainian poultry as part of the EU's support measures following Russia's full-scale invasion of Ukraine. The increase in Ukrainian poultry exports to the EU has been further supported by the expansion of production capacities in Ukraine's poultry sector

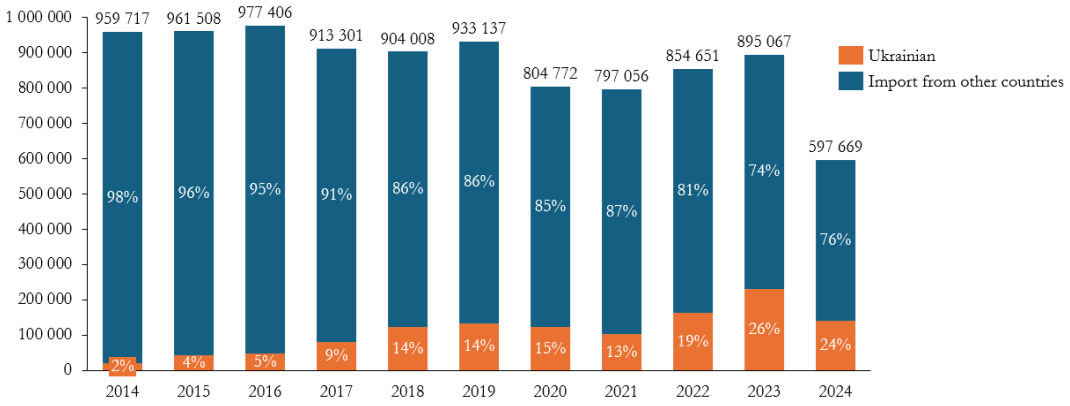

Figure 12. Ukraine's Share in European Poultry Imports, 2014-2024, by volume, carcase weight in tons)
Source: own presentation based on data from Eurostat[6]

According to Avinews (2021), the falloff in Ukrainian poultry exports to the EU recorded in 2020 and 2021 is mostly attributed to the widespread avian influenza as well as the changes in the European Union custodians' import policy. In December 2020, Ukraine reported its first avian flu outbreak in the Mykolaiv region, leading to widespread culling of birds and a ban on poultry exports from affected areas (European Food Safety Authority, 2020). Concurrently, the EU implemented a new import Tariff Rate Quota (TRQ) structure in 2020, which eliminated over-quota imports of chicken meat cuts under HS code 020713. Unquestionably, the regulation alteration and the incessant outbreaks of Highly Pathogenic Avian Influenza (HPAI) led to a remarkable reduction of 32% in the

[6] The data presents trade figures of the EU excluding the UK from its composition, even for months prior to 1/02/2020 when the UK was still a Member State. The UK is presented within the list of partner countries.

sales registered by Ukraine to the EU market in 2020. Up to the early months of the year, an agricultural commodity deficit was registered, overcoming it only on March 20, thanks to a new international arrangement that permitted Ukraine to sell poultry products in the EU again. Because of this agreement, a zoning system was put in place that allowed for the relative exclusion of regions where avian flu was present from zones where it was absent. With the implementation of this treaty, the first phase of recovery of poultry exports from Ukraine to the EU began, and in 2022, this process accelerated as the EU applied considerable trade measures to assist Ukraine's trade exchange. The Autonomous Trade Measures (ATM) Regulation, first introduced on June 4, 2022, and subsequently renewed, grants Ukraine full trade liberalization by suspending import duties, quotas, and trade defence measures for imports from Ukraine on a temporary basis (European Comission, 2024). These measures, now planned to be valid until June 5, 2025, target the difficulties faced by Ukrainian producers and exporters (European Comission, 2024). Nonetheless, the regulation contains a certain poultry meat product emergency brake to avoid any disturbance in relation to the market.

The activation of the emergency brake mechanism by the European Commission in May 2024 has been a major factor in greatly diminishing Ukraine's poultry exports to the EU. The mechanism constrains Ukraine's exports to the EU to the levels of chicken meat of 133 thousand metric tons in the year 2024, which virtually amounts to a zero-import duty tariff rate quota(TRQ). As a result, it is expected that Ukraine's poultry exports in 2024 will show a wider range of products than in 2022 and 2023 which saw the EU as a not restricted sales market. The Ukrainian government as well intervened with a corresponding export licensing regime, setting an export quota of 133,283 MT for unprocessed chicken meat in the year 2024 in response to the EC restriction.

Despite these new restrictions, Ukraine's overall chicken meat exports are projected to grow in 2024, driven by increased production from mid-sized domestic producers. MHP, responsible for 93 percent of Ukraine's poultry exports in 2023, is expected to remain the dominant exporter (USDA, 2024). Nevertheless, factors related to the war, including a lack

of electricity and workforce mobilization, are threats to the stability of export flows in 2024 and in 2025. Due to the import bans imposed by the EU, Ukraine is expanding its export geography, with markets in the Middle East expected to appear in 2024 as the main vectors of exports, much like in the case of the 2020 and 2021 exports.

It is worth noting that Ukraine's poultry exports have faced additional challenges, including the Ukraine-Polish border blockade by Polish truck drivers and farmers from November 2023 to April 2024 (Nivievskyi & Neyter, 2024). This disruption led to delays in chilled poultry product deliveries and necessitated the conversion of some chilled exports to frozen products, resulting in financial losses (USDA, 2024). While the blockade has ended, its potential renewal remains a trade risk factor for 2024 and 2025.

To gain a deeper understanding of the profitability dynamics in the poultry segment, we analyze quarterly performance data from MHP SE for 2023-2024 (*Table 2*).

Value	2023 Q1	2023 Q2	2023 Q3	2023 Q4	2024 Q1
Gross Margin, %	21	24	23	24	29
Operating Margin, %	11	8	13	11	12

Table 2. Quarterly Profitability Metrics in the Poultry Segment, 2023-2024

Source: compiled based on MHP SE financial reports (2023-2024)[7]

The data reveals notable fluctuations in profitability metrics throughout the observed period. Gross margins showed an upward trend, increasing from 21% in Q1 2023 to 29% in Q1 2024, indicating improved cost management and pricing strategies. Operating margins remained relatively stable, fluctuating between 8% and 13%, with the lowest point observed in Q2 2023 (8%) and the highest in Q3 2023 (13%). This stability in operating margins, despite varying gross margins, suggests effective operational cost control measures and adaptable business strategies in response to market conditions.

[7] Compiled from: MHP SE Unaudited Financial Results for Q1, Q2, Q3 2023; Integrated Annual Report and Accounts 2023; Unaudited Financial Results for Q1 2024.

Further analysis of product-specific profitability reveals a clear hierarchy in margin potential across different meat categories. Premium cuts, particularly breast fillets, consistently demonstrate the highest profitability metrics among all product types. Standard products such as whole carcasses maintain moderate yet stable margins, while specialized cuts like wings show intermediate profitability levels. This margin differentiation reflects the market's premium pricing for higher-value cuts and demonstrates the importance of optimal product mix management in maintaining overall profitability.

The period from 2020 to 2023 saw some interesting shifts in the costs associated with poultry production in Ukraine (*Table 3*).

Category	2020 (%)	2023 (%)	Change	Key Factors
Feed Costs	70.6	54.7	↓	• Lower grain and oilseed prices due to export logistics challenges (Black Sea route instability)
Other material	15.0	26.7	↑	• Inflationary pressures • Increased fuel and electricity costs • Higher veterinary medicine prices
Labor Costs	4.0	5.3	↑	• Need to retain qualified personnel due to increased market competition for the workforce
Social Security Contributions	1.0	2.7	↑	• Increased labor-related expenses
Depreciation	3.0	3.0	→	• Relatively stable capital costs
Other Services	3.0	3.0	→	• External service providers costs
Other Costs	3.4	4.6	↑	• General operational expenses (administrative and overhead costs)

Table 3. Evolution of Cost Components shares in Ukrainian Poultry Production, 2020-2023
Source: own presentation and analysis based on SSSU[8] and Ministry of Agrarian Policy and USAB

Despite remaining the predominant cost factor, the proportion of the expenditure on feed has notably declined from 70.6% to 54.7% because of logistics-driven changes in the prices of grain crops. On the other hand, the material expenses turned out to be growing as well

[8] 2020 data: SSSU; 2023 data: 2023 data: Ministry of Agrarian Policy and USAB

and reached 26.7% from 15.0%, which is indicative of the inflationary pressure as far as the prices of fuel, electricity, and veterinary materials are concerned. More expenses have also been incurred on labor; this is evidenced by the increase in expenditures associated with direct labor and social charges from 5% to 8%. This statistic further proves the significance of competition in the Industry as companies must actively seek to retain employees. These shifts in the cost of production between various goods have a direct and inverse relationship to the profit margins realized from the sale of the specific goods. Thus, the importance of cost-effectiveness in such instances cannot be overlooked.

By understanding the relationship between price and marginal costs of production, we can get some additional insights into the market power that exists in the poultry market. The Lerner Index (1934) could be used to determine the extent of price control by large producers or processors by comparing prices to marginal costs.

The Lerner index is defined by:

$$L = \frac{P-MC}{P} \quad (1)$$

where P is the market price set by the firm, and MC is the firm's marginal cost.

In the case of the biggest poultry producer in Ukraine - MHP, the Lerner Index values for all products are relatively low (0.21 - 0.32), indicating that the firms producing these products have limited market power *(Table 4)*. The prices are not significantly higher than the marginal costs, suggesting that competition constrains the firms from charging excessive markups.

Product	Lerners Index
Chicken breast fillet, untrimmed, chilled (unpackaged 20 kg)	0.32
Whole chicken carcass, untrimmed, chilled (unpackaged 20 kg)	0.30
Front part chicken carcass, untrimmed, chilled (unpackaged 15 kg)	0.30
Chicken wing, untrimmed, chilled (unpackaged 20 kg)	0.21

Table 4. Lerner's Index for MHP SE in 2024

Source: own calculations based on MHP SE Interim report

To investigate further the market power of the poultry market, foreign poultry prices can be compared with domestic poultry prices. Figure 13 shows that the world average prices dominate the European ones, which in turn dominate the average Ukrainian price. A closer investigation makes it clearer that the series of price movements in Europe and Ukraine are quite closely related, even though they occur at different levels.

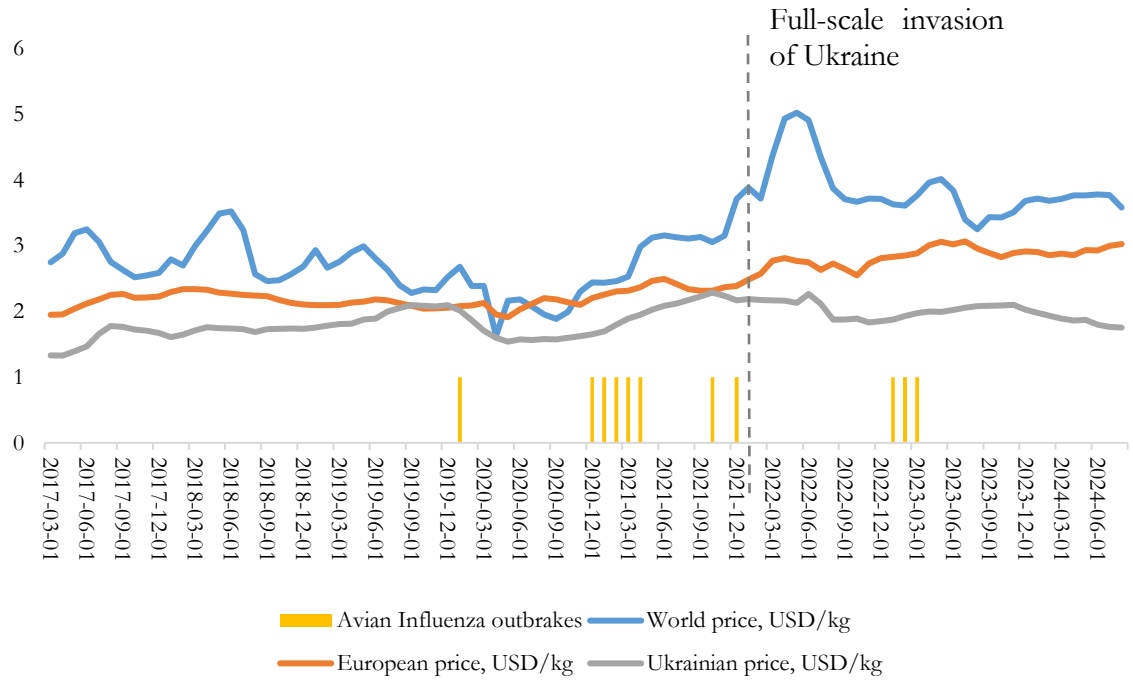

Figure 13. Global, European and Ukrainian poultry prices, 2017-2024, USD/kg

Source: own presentation based on International Monetary Fund [9], SSSU, Eurostat[10]

However, the variability in this price difference over time points to a complex relationship between the two markets (*Figure 14*). Notably, there are periods where the price difference narrows significantly (e.g., early 2020) and even briefly becomes negative, suggesting

[9] International Monetary Fund, Global price of Poultry [PPOULTUSDM], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/PPOULTUSDM

[10] MS notifications (Commission Implementing Regulation (EU) 2017/1185). Prices for the European Union are calculated as a weighted average of price data from all Member States.

moments of increased market integration or competitive pressure on Ukrainian producers likely due to the overall impact of the avian influence on the market in Europe.

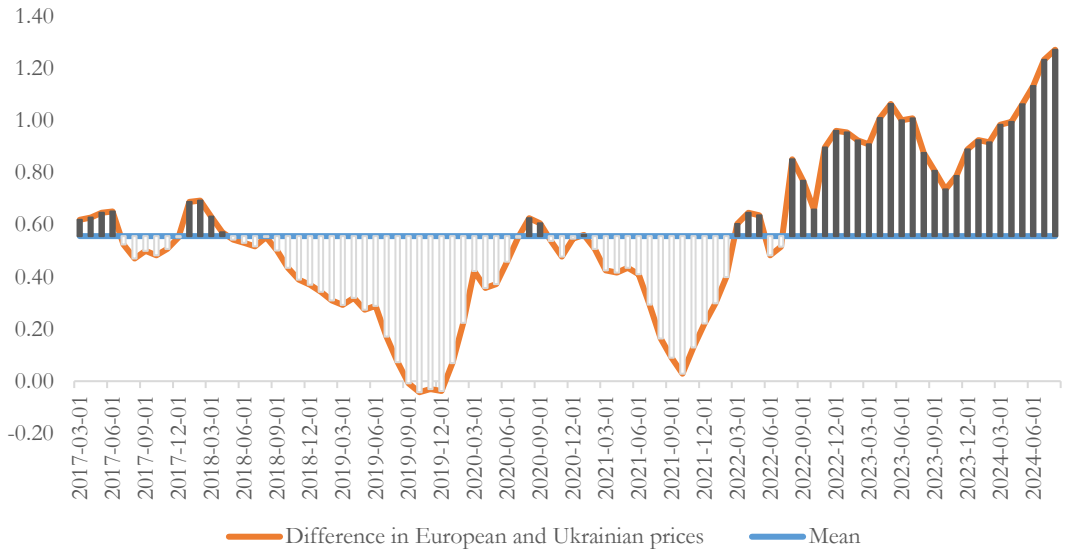

Figure 14. Difference in European and Ukrainian prices, USD/kg

Source: own presentation and calculations based on *SSSU, Eurostat*

The trend of increasing price differences from 2022 onwards could indicate growing market power among Ukrainian producers in the European market (related to the increase of its market share there), allowing them to maintain lower prices relative to the European market. The volatility of the price difference, especially its highs and lows, shows that the Ukrainian market still reacts to changes in the external environment, which is more typical of a competitive market than one with great monopolistic control.

Given this evidence, it is reasonable to conclude that the Ukrainian poultry market operates under conditions of competition. In such markets, firms cannot influence prices, which are determined by the intersection of overall supply and demand forces. Consequently, assuming a framework of competition is appropriate when modeling the impact of Tariff-Rate Quotas (TRQs) on the Ukrainian poultry market. This assumption aligns with the

synchronization between Ukrainian and global prices, where market forces rather than individual firm behavior dictate pricing trends.

In conclusion, this chapter presented the analysis of Ukrainian poultry market in a broader scope and context, including many aspects of its complexity and importance both locally and internationally. The industry is heavily concentrated, with MHP SE enjoying a dominant status. However, the Lerner Index analysis points to substantially low market power, meaning that the level of competition is high. The analysis produced in the paper demonstrated the complex relationships between European/global and Ukrainian prices for poultry, although some divergence showed the effect of certain localities and trade policies.

Recent changes in Ukraine's export landscape, particularly new EU trade restrictions and increased focus on Middle Eastern markets, demonstrate the industry's adaptability. The analysis of production costs, profitability benchmarks, and external factors such as geopolitical uncertainties provides insights into the industry's resilience and future prospects.

The Ukrainian poultry market appears to be a "price taker" based on our analysis of price movements and the nature of poultry as a commodity product. Our aim is to examine the elasticity of the market in order to check the existence of a price in the market. Once we see the effect of such changes, we shall have more evidence concerning the extent of competition in the market since in most of the highly competitive markets, demand elasticity is quite high. The results pertaining to the elasticity of demand will help us understand the workings of the poultry market in Ukraine. This perspective shall be important as we turn our attention to the supply factors and analyze the possible impacts of some other political transformations on the market like the removal of the EU tariff quotas.

2.2. LITERATURE REVIEW OF SUPPLY AND DEMAND IN THE POULTRY MARKET

The ability to understand the behavior of the poultry industry relies heavily on how market participants adjust to changes in economic factors that include prices, income, and consumer preferences. Since market power is established, an assessment of the elasticities of demand and supply offers an understanding of how the market operates as well as the effects that policy change or external shift would have on the economy.

Numerous studies explain demand elasticities for meat and poultry using various techniques and data sets to show the elasticity of demand of consumers with respect to changes in prices and income. This literature reviews findings from a number of key works published between 1983 and 2023 on the elasticities of meat demand with a focus on poultry, where applicable, decorated with a variety of econometric modeling methods such as Structural Equation Modeling to examine the outlying economic and demand factors in different countries poultry markets.

The development of methodological approaches for estimating the elasticities of demand and supply in the meat and poultry sector shows how far the complexity of the competitive environment and the level of economic modeling techniques have grown. Investigators in the initial studies relied on classical econometric approaches, anticipatory joint approaches, and structural econometric approaches, among others, have been adopted.

The Almost Ideal Demand System (AIDS), introduced by Deaton and Muellbauer in (1980), marked a significant advancement in demand analysis. Its flexibility in capturing substitution patterns and incorporating budget constraints made it particularly suitable for meat demand studies.

Researchers such as Eales and Unnevehr (1988) (1993) and Moschini and Meilke (1989) utilized AIDS to explain the moves consumers made due to judgments and revaluation as well the shifts that occurred in the meat market. As an example, the model's scope went

further than its original specification with Chalfant and Alston's (1988) expanding it to include temporal shifts in consumer preferences and the introduction of Quadratic AIDS (QUAIDS) developed by Laili and Anindita (2018) to account for more complex covariant relationships between expenditure and consumption.

At the same time, the field observed the use of more elaborate modeling approaches that go beyond the demand side as they provide an elaborate picture to how demand and supply dynamics are intertwined. Structural Equation Modeling (SEM), employed by Malone and Reece (1976) and Thurman (1987), offered a holistic approach to capturing the interdependencies within the poultry market system. Constructing models that comprised both observed and latent variables enabled a more comprehensive appraisal of markets, particularly in areas of market equilibrium. Building on this, researchers like Kapombe and Colyer (1999) (1998) integrated structural time series analysis with SEM, enabling the capture of temporal dynamics and long-term trends in supply and demand.

The need for more efficient estimation of simultaneous equation models led to the adoption of Three-Stage Least Squares (3SLS). Hahn's (2006) use of 3SLS to address autocorrelation in meat demand systems exemplifies how this method improved the accuracy of elasticity estimates by accounting for correlations between equation disturbances. This approach has been particularly valuable in understanding the interplay between supply and demand in the poultry market.

In recent years, a new trend of using models that incorporate the components of consumer heterogeneity and market segmentation emerged. The latent class approach employed by Muhammad et al. (2022) represents this shift, revealing how demand elasticities vary across different consumer segments and retail channels. As consumer preferences and marketing strategies become more and more diverse, such information is very useful. Some methodological advances have also dealt with some issues concerning demand estimation.

Methodological innovations have also addressed specific challenges in demand estimation. Golan, Perloff, and Shen's (2001) introduction of nonnegativity constraints and Perali and

Chavas's (2020) development of censored demand systems have enhanced the reliability of models, particularly in dealing with seasonal products or periods of non-consumption common in the poultry market.

Other studies have also put into practice the advanced methods in particular Structural Equation Modeling (Dharmasena, Bessler, & Capps, 2016) and Latent Class Models (Muhammad, D'Souza, & Amponsah, 2022)

This evolution of methods used is indicative of the changing pattern of the general economic research on the level of detail applied and the focus on data and its analysis. As the field continues to evolve, integrating diverse methodological approaches will likely yield even more sophisticated models capable of capturing the multifaceted nature of modern agricultural markets.

The synthesis of existing literature reveals a consistent pattern of inelastic demand for poultry across different markets. As summarized in *Table 4,* own-price elasticities typically range between -0.65 and -0.81, with some variations across different studies and geographical contexts. The higher elasticities found by Ortega et al. (2020) in China (-1.07 to -1.39) suggest that cultural and market-specific factors can significantly influence demand responsiveness. This evaluation emphasizes the need for further country-oriented investigations, also indicating a potential merit in studies that look at Ukraine's particularities of the market.

Income elasticities for poultry, which generally ranged from 0.236 to 0.872, demonstrate that poultry is indeed a normal good in nearly every market under study. But the variance in these figures indicates that the income-poultry demand relationship might be varied across countries due to local factors and intradian habits. Given the conditions of Ukraine with its unique socio- economic and culinary background, these studies could be of interest and importance to both national and business managers.

As few economists have executed studies on supply elasticities, such as Okrent and Alston (2012), who found my estimate at 0.506 for the US market, it suggests that the U.S. domestic supply is relatively less elastic in the short run. However, as Ukraine is important in the world in poultry production, its characteristics might be quite the opposite. From a Ukrainian perspective, different production technologies, feed prices, and access to export markets may result in different production elasticities, and thus require further investigation.

Year	Country	Authors	Own Price Elasticity of Demand	Income Elasticity	Elasticity of Supply	Method
2019	Indonesia	Ani & Antriyandarti	-1.673	0.474	N/A	Almost Ideal Demand System (AIDS)
2001	USA	Cheney et al.	-0.33 (broilers), -0.58 (turkeys)	N/A	N/A	Simultaneous equation model (SEM)
2004	Turkey	Dağdemir et al.	-0.190	0.336	0.235	Simultaneous equation model (SEM)
1976	USA	Malone & Reece	-0.5218	N/A	0.2276	Simultaneous equation model (SEM)
1986	USA	Martinez et al.	-0.454	0.429	N/A	Simultaneous equation model (SEM)
2016	South Africa	Masha et al.	-0.1135	0.2477	N/A	Error Correction Model (ECM)
1987	USA	Thurman	-0.33 to -0.87	N/A	N/A	Simultaneous equation model (SEM)
1998	USA	Kapombe & Colyer	N/A	N/A	0.25 (short-run), 0.87 (long-run)	Simultaneous equation model (SEM)
2018	Indonesia	Laili & Anindita	-1.025	0.989	N/A	Quadratic Almost Ideal Demand System (QUAIDS)

Table 5. Demand and Supply elasticities in literature

Source: own presentation of the literature reviewed in this chapter

Moreover, looking at the changes in the structure of demand for meat over time in various markets, which Moshini and Meilke (1989) and Eales and Unnevehr (1988), have traced, it would be reasonable to conclude that consumption patterns are deterministic. In the case of Ukraine, it is worth noting the possible changes in these parameters, especially in light of the changing economic environment and the preferences of consumers in the country. The recent study by Asche et al. (2023) on price transmission in the Russian chicken market, with elasticities ranging from -0.83 to -1.02, is an appropriate benchmark for comparison with eastern European countries but also calls for the urgent need for Ukraine analysis.

In this context, the inelasticity of demand for poultry implies that there is limited consumption dependence on price changes. This has implications for both policymakers contemplating the efficacy of price interventions and for the industry practitioners making pricing decisions. As incomes increase, demand for poultry products will tend to increase as well.

Those findings for the demand and supply need further analysis on the Ukrainian market. Therefore, we are going to perform it in the next Chapter.

This overview has outlined the economic behaviors that exist in the meat market with particular emphasis on the price components as well as the different techniques employed by research scholars in such a buying and selling event. Although these articles are helpful to both academics and practitioners, the differing results across the numerous studies encourage caution as they imply context-specific behavior of the market, and hence, more research would be useful. The graphical representation of the literature review grouped by country and year is available in *Appendix 3*.

CHAPTER 3. METHODOLOGY

3.1. ELASTICITY ESTIMATION VIA THREE-STAGE LEAST SQUARES (3SLS)

This study employs a simultaneous equations approach to estimate supply and demand elasticities in the Ukrainian poultry market. The methodological framework builds upon several works: the three-stage least squares (3SLS) estimation technique developed by Zellner and Theil (1962) , the commodity market analysis framework established by Roberts and Schlenker (2013) that shows the usage of the model, and the Ukrainian agricultural market analysis methodology proposed by Kuznetsova (2007) that helped us identify that we need to add third equation to our system to evaluate the export impact.

The model employs Three-Stage Least Squares (3SLS) estimation rather than simpler techniques such as Ordinary Least Squares (OLS) or Two-Stage Least Squares (2SLS) to address several econometric challenges. First, 3SLS accounts for the contemporaneous correlation between error terms across equations, improving estimation efficiency. Second, it handles the inherent endogeneity in simultaneous supply and demand systems. Third, the technique effectively manages the multicollinearity present in agricultural commodity markets where prices and quantities are jointly determined using instrumental variables (IV) (Zellner & Theil, 1962).

To capture potential non-linear relationships and facilitate interpretation, we apply logarithmic transformations to key variables. These include prices (chicken, beef, pork, and fish), production volumes, domestic consumption, Ukrainian GDP, export volumes (total and EU-specific), European Union GDP, feed corn prices, and energy prices. This log-linear specification allows direct interpretation of coefficients as elasticities. To ensure temporal comparability, all Ukrainian prices are deflated using the Ukrainian CPI Index (base period: January 2010), while international prices are adjusted for U.S. dollar inflation relative to the same base period.

Our national demand equation in this equation system is specified as:

$$ln(D_t) = \beta_0 + \beta_1 \ln(P_{pt}) + \beta_2 \ln(P_{ft}) + \beta_3 \ln(P_{bt}) + \beta_4 \ln(GDP_t) + \quad (2)$$
$$+ \beta_5 \ln(P_{pt}) + \beta_6 Break_t + \epsilon_{1t}$$

where:

D_t – $Domestic\ demand\ in\ period\ t$

P_{pt} – $Price\ of\ poultry\ in\ period\ t$

P_{ft} – $Price\ of\ fish\ in\ period\ t$

P_{bt} – $Price\ of\ beef\ in\ period\ t$

GDP_t- $Gross\ domestic\ product\ in\ period\ in\ period\ t$

P_{pt} – $Price\ of\ pork\ in\ period\ t$

$Break_t$ – $Structural\ break\ dummy\ (1\ after\ breakpoint, 0\ otherwise)$

t – $Time\ trend$

ϵ_{it} – $error\ term\ at\ time\ t$

As per the economic theory, the own price coefficient (β_1) is expected to be negative and inversely related to the demand augmenting alternative, and the reason being that, with the increase in demand, poultry prices go up, which reduces its overall consumption. It is only logical to argue that the coefficients for substitute protein prices (β_2, β_3, and β_5) will be positive since customers view these as alternative protein sources. If the prices of these substitutes rise, it is anticipated that consumers will resort to poultry. Conversely, for fish (β_2), it may be more problematic due to underlying preferences and culture, especially for a Ukrainian consumer that may result in the opposite case of being a complement rather than a substitute.

The income effect, which is captured through the GDP coefficient (β_4), is expected to be positive but relatively small. This is because poultry meat in Ukraine is considered a

necessary good. The use of GDP, rather than per-capita income, in this specification, is to capture both the overall market size effect and general economic conditions that affect purchasing power as well because we used the total poultry demand rather than demand per capita.

The introduction of the break dummy variable in the Ukrainian context is very important since it reflects the structural shifts in the market that occurred as a result of such major developments in the industry as greater export orientation, changes in production processes and modification of the consumers' tastes.

The structural break in the Ukrainian poultry market was identified through visual inspection and formal statistical testing. Visual inspection of time series plots for domestic demand, production, and exports suggested a potential break point around observation 100 (*Appendix 4*). This was formally tested using multiple approaches. A Chow test (*Table 6*) with the suspected break point confirmed a significant structural change ($p < 0.05$). Collectively, these tests provided statistical support for a structural break in the studied market around significant changes in the structure of poultry trade in Ukraine.

Test Statistic	Value	p-value
Chow Test (M-fluctuation)	2.7632	2.802×10^{-6}

Table 6. Chow Test results [11]

Source: own estimation

The supply equation is specified in such way:

$$ln(Q_t) = \alpha_0 + \alpha_1 \ln(P_{pt}) + \alpha_2 \ln(Q_{t-1}) + \alpha_3 \ln(t) + \alpha_4 \ln(t)^2 + \quad (3)$$
$$+ \alpha_5 Break_t + \epsilon_{2t}$$

where:

Q_t – *Production volume in period t*

[11] The test was performed at observation 100. The highly significant p-value ($p < 0.01$) provides strong evidence for the presence of a structural break.

$P_{pt} - \ Price\ of\ poultry\ in\ period\ t$

$t - \ Time\ trend$

$Break_t - Structural\ break\ dummy\ (1\ after\ breakpoint, 0\ otherwise)$

$\epsilon_{2t} - \ error\ term\ at\ time\ t$

The poultry price coefficient (α_1) is anticipated to be a positive number, consistent with the law of supply whereby an increase in the price allows for greater output. In the specific instance of Ukraine, however, this may be subject to complications resulting from the high degree of vertical integration dominant in the poultry industry and the effects of potential market power (that we are testing). The coefficient of the lagged production term (α_2) is included in the model to reflect the existence of capacity constraints and adjustment costs in the poultry sector and a positive value is expected as this signals the partial adjustment of production variables. This version subscribes to the principle that poultry producers will not be able to alter their output levels instantaneously for biological reasons or because of the irreversibility of investments in physical assets.

The time trend terms (α_3, α_5) are included to capture technological progress and structural changes in the Ukrainian poultry industry. The linear term is expected to be positive, reflecting technological improvements and efficiency gains over time. The inclusion of a quadratic term allows for non-linear evolution of these effects, which is particularly relevant given the rapid modernization of Ukraine's poultry sector during the sample period. The break dummy variable (α_4) accounts for significant structural changes in the production sector, possibly related to major investments, changes in industry organization, or shifts in export orientation. For instance, a positive value of α_4 could indicate a shift towards more efficient production methods, while a negative value could suggest a decline in production due to market saturation or other factors.

Unlike the pork supply example, we do not include an explicit output-input price ratio but rather control for input costs through our instrument set, which includes feed corn prices and other relevant cost shifters such as energy prices. This approach was chosen due to the

complex nature of vertical integration in Ukraine's poultry sector, where major producers control multiple stages of the production process. The instrumental variables technique offers a remedy for prospective endogeneity concerns regarding the cost of inputs influencing supply decisions.

The third and last equation that we incorporated into our model is the export equation:

$$ln(X_t) = \gamma_0 + \gamma_1 ln(X_{t-1}) + \gamma_2 ln(t) + \gamma_3 War_t + \gamma_4 DCFTA_t + \quad (4)$$
$$+ \gamma_5 Break_t + \epsilon_{3t}$$

where:

X_t – *Export volume in period t*

t – *Time trend*

War_t – *dummy variable* (1 since February 2022, 0 before)

$DCFTA_t$ – *dummy variable* (1 since that start of DCFTA for Ukraine, 0 before)

$Break_t$ – *Structural break dummy* (1 *after breakpoint*, 0 *otherwise*)

ϵ_{3t} – *error term at time t*

The expected coefficient for the lagged export term (γ_1) is considered positive, which considers the residuals in international trading relations and pre-existing market channels. This form of addressing the problem recognizes that initiating export markets is costly because it involves diplomacy, meeting the prerequisite requirements of foreign markets, and setting up distribution networks. Once these ties are formed, they are likely to be strong; hence, the previous level of exports serves as a reliable indicator of the current one. However, The coefficient is expected to be less than one, meaning there is a steady dynamic process.

The time trend coefficient (γ_2) is expected to be positive, capturing the secular growth in Ukraine's export capacity and international market penetration. This variable indicates the creation of export infrastructure as well and the growing demand for Ukrainian poultry products on international markets. The inclusion of policy and shock variables (war,

DCFTA_dummy) is essential in terms of Ukraine. The 'war dummy' (γ_3) is expected to have a negative coefficient since exports and international trade relations were disrupted during this period of the conflict. This disruption could have led to a decrease in export capacity and market penetration. On the other hand, the 'DCFTA_dummy' (γ_4) is expected to be positive as it captures the EU trade-creating effects given Ukraine's role as a key poultry export market. The signing of the DCFTA agreement is expected to have boosted Ukraine's export capacity and market penetration.

The structural break dummy (γ_5) is included to account for significant changes in export patterns, which might relate to major developments in international market access, changes in global trade policies, or significant shifts in domestic production capacity oriented toward export markets. This pause coincides with significant changes in Ukraine's decision to become one of the leading importers of poultry products in the global market.

Export equations are not quite classical in their construction, in the sense that they pay attention to the effects of institutions and policies as opposed to prices. This choice reflects the purchase behavior of the Ukrainian poultry export sector where long-term contracts, trade and other access to markets are more important than price changes that take place over short periods. The use of 'instrumental variables' shows that this approach is capable of resolving some of the concerns related to endogeneity and other factors that may impact the export decision through the wider economy. Instrumental variables are used to address potential endogeneity issues, which occur when an independent variable is correlated with the error term in a regression model. By using instrumental variables, the analysis can account for factors that might influence export decisions through the broader economic environment, such as changes in trade policies or shifts in global demand.

Our instrument variables set includes substitute protein prices $(ln\,P_{bt}\,, ln\,P_{pt}\,, ln\,P_{ft})$, input costs $(ln\,FC_t)$, exchange rate $(ln\,E_t)$, lagged dependent variables $(ln\,X_{t-1}\,, ln\,Q_{t-1})$, time effects $(ln\,t)$ and policy/structural change indicators $(Break_t, ES_t, DCFTA_t, War_{,t}, ln\,P_{wt})$. These instruments were chosen based on two

key criteria: they are expected to be correlated with the endogenous variables (relevance condition) while being uncorrelated with the error terms in the structural equations (exogeneity condition). For example, substitute meat prices affect poultry demand but are determined in separate markets, while feed corn prices directly influence production costs (as 60% of the cost price is the feed), but are largely determined by global markets. The inclusion of policy dummies and world prices helps capture exogenous shocks to the Ukrainian poultry market.

The validity of our instrumental variables can be assessed through several statistical tests. The Hausman test results (test statistic = 24.747$, p-value = 0.7372) fail to reject the null hypothesis that 3SLS estimates are consistent and more efficient than 2SLS, supporting our instrument specification. Additionally, we examine instrument relevance through first-stage F-statistics and test for over-identifying restrictions using the Sargan-Hansen test. The formal representation of our instrument set is:

$$Z_t = \ln P_{bt}, \ln P_{pt}, \ln P_{ft}, \ln FC_t, \ln E_t, \ln X_{t-1}, \ln Q_{t-1}, \ln t, \text{Break}_t, ES_t, DCFTA_t, War_t, \ln P_{wt} \quad (5)$$

where:

P_{bt}, P_{pt}, P_{ft} are beef, pork, and fish prices respectively

FC_t is feed corn price

E_t is exchange rate

X_{t-1} is lagged exports

Q_{t-1} is lagged production

ES_t is European solidarity dummy

P_{wt} is world poultry price

3.2. ASSESSING THE WELFARE IMPACT OF TRQ REMOVAL ON EXPORTERS

After estimating the demand and supply elasticities for the Ukrainian poultry market using the simultaneous equations approach, we can now evaluate the impact of removing the tariff rate quota (TRQ) on Ukraine as the Exporter. The elasticity estimates provide crucial information about the responsiveness of producers and consumers to price changes, which is essential for understanding the potential effects of trade policy alterations that should be as well incorporated later in the total welfare estimates.

To analyze the impact of the TRQ system and its potential removal, we employ a partial equilibrium framework drawing on both the theoretical foundations established by Laroche Dupraz and Matthews (2005) and the methodological approach used by Nivievskyi, Kandul, Kuznetsova, & Strubenhoff (2011) in their analysis of the Ukrainian sugar market. This combined approach allows us to represent the domestic Ukrainian poultry market and its interaction with international trade under the current TRQ regime while accounting for the complexities of multiple competing exporters and varying levels of competitiveness.

The methodological framework (2005) distinguishes between eleven scenarios based on three key parameters: whether the quota is binding, over-quota imports exist, and whether the TRQ is specifically allocated to preferred suppliers. Of particular relevance to Ukraine's situation is Case D (*Figure 15*) from Laroche Dupraz and Matthews' analysis, which depicts a scenario where the TRQ is filled, over-quota imports exist, and there are both preferred and non-preferred supplier imports. In this case, the graphical representation shows several key components: the import demand curve (D), the residual demand curve (DRES), the preferred supplier's in-quota supply curve (StPRE), and the over-quota supply curve (ST(res)PRE). The preference margin (T-t) is defined as the vertical distance between these supply curves.

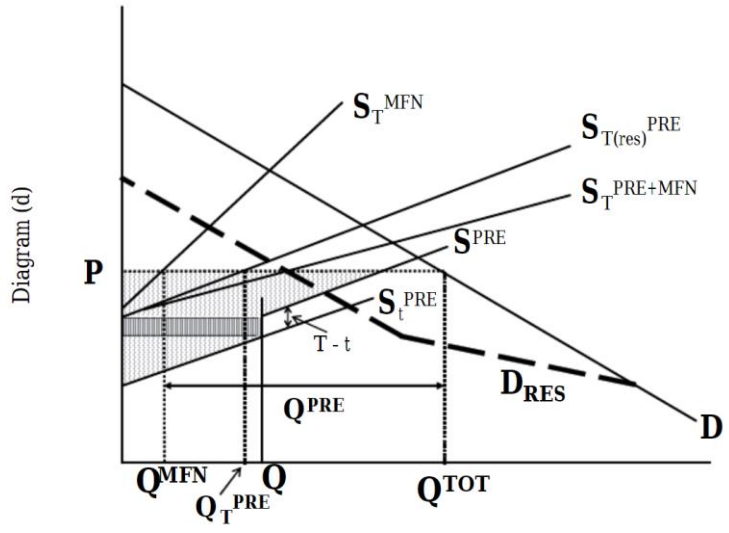

Figure 15. Graphical representation of the welfare effect for Exporter where the TRQ is filled, over-quota imports, MFN imports

Source: Dupraz and Matthews (2005)

The market equilibrium, in this case, demonstrates three critical characteristics:

1. The preferred supplier completely fills the quota amount (Q), as shown by the vertical quota line being fully utilized.

2. The same supplier continues to export beyond the quota (QTPRE), indicating their strong competitive position.

3. Non-preferred suppliers also participate in the market (QNPF), resulting in total imports of QTOT = QPRE + QNPF.

The domestic price (P) is determined at the intersection of DRES and the combined supply curve (STPRE+MFN). The hatched rectangular area in the diagram represents the quota rent captured by the preferred Exporter, calculated as (T-t)*Q, while the dotted area beneath the supply curve represents the producer surplus. Such a doted area, interesting

enough, shows no change as compared to the situation where no TRQ is present, that is, the Exporter would still supply the same quantity even accessing MFN tariff.

In analyzing the effects of TRQ, like Nivievskyi et al., we create a scenario for free trade. For this, the quota line and the corresponding tariffs are eliminated, and the supply curve is shifted by the new equilibrium achieved with the exclusion of trade restrictions. The welfare effect of TRQ abolishment on exporting nations, on the other hand, is dependent on how competitive those nations are against one another. For highly competitive exporters like Ukraine that can profitably export at over-quota tariff rates, the primary welfare impact comes through the loss of quota rents rather than reduced market access. This is because such exporters would continue to supply the market even at the higher MFN tariff rate, though they would lose the preferential margin on their previous in-quota exports. The analysis suggests that for competitive exporters, TRQ removal primarily represents a transfer of economic rent from the exporting country to the importing country's treasury through increased tariff revenue rather than a reduction in trade volumes.

In this research, we exercise this theoretical framework in relation to empirical data gathered from the agricultural export industry of Ukraine, which benefits from a peculiar natural experiment brought about by the time-related changes present in the adopted TRQ measures. Specifically, we analyze the market dynamics during three distinct periods: the baseline period with full TRQ implementation (2021), the partial TRQ removal period (2022), and the complete TRQ suspension (2023), before the introduction of a modified system in 2024. Systematically, the policy modification makes it possible to assess the welfare effects of abolishing TRQs. It also makes it possible to confirm based on real estimation the theoretical expectations from Laroche Dupraz and Matthews' model. This study aims mainly to measure the potential loss of quota rents likely to result due to trade versus the probable expansion of the market through trade. Quantitative assessments combine the Ukrainian State Statistics Service's monthly trade data and the European Commission's prices.

CHAPTER 4. DATA

This study utilizes monthly data spanning from January 2010 to June 2024, sourced from a variety of authoritative institutions including the State Statistics Service of Ukraine (SSSU), National Bank of Ukraine (NBU), Market Operator (post-2019), National Commission for State Regulation of Energy and Public Utilities (NCSREPU) for the period 2010-2019, as well as the Food and Agriculture Organization (FAO) and Eurostat. Monthly averages were calculated for data collected daily in order to make them part of a consistent time series. All the dated monetary amounts have all been meticulously adjusted for inflation, with 2010 January serving as the base period. Also, in such a case where elasticities can be analyzed, all the variables have been converted to the form of natural logarithms.

The demand equation incorporates data primarily from the SSSU, detailing the prices of meats (chicken, pork, beef) and fish in UAH, along with the volumes of poultry production, exports, and imports, all measured in kilograms. GDP and the Consumer Price Index (CPI), sourced from the NBU, were used to adjust prices to real terms. The domestic demand for poultry was computed by subtracting exports from total production and adding imports, providing a monthly estimate of the total domestic demand for poultry by Ukrainians.

The supply equation is based on SSSU data, which includes poultry prices and the quantities produced, presented in kilograms.

The export equation also uses the SSSU data to estimate the volumes of poultry exported. Two key dummy variables were introduced: the DCFTA dummy, which indicates the beginning in 2016 of further advancement of economic relations between Ukraine and the EU, and the war dummy, which points to the beginning of the full Russian invasion in February 2022 that severely hampered logistical processes.

I also have coped with the problem of omitting a variable by choosing instrumental variables that were relevant and exogenous. The price of corn which accounts for 70-80%

of the total poultry feed cost was obtained from the database on the global price of corn maintained by IMF. These prices were in usd and were converted to UAH using the official exchange rate of the NBU and were deflated. The transaction costs and other operating costs were significant and were obtained from NCSREPU and from the Market Operator. EU poultry prices, which are important because the EU was a key destination for exports in 2021-2024, were converted into euros through the inflation rate adjusted for the EU countries with the start of the period as January 2010. DF was constructed to consider important events such as placement of the avian influenza outbreak sourced from FAO documented for the last 10 years in *Appendix 5* which could have led to supply disruptions.

We constructed descriptive statistics to describe the structure of the volume and prices variables used in research (*Table 7*):

Variable	N	Mean	SD	Median	Min	Max	Skew	Kurtosis
log_production	173	11.48	0.1	11.48	11.26	11.69	-0.04	-0.74
log_feed_corn	173	7.52	0.2	7.53	7.06	8.03	0.12	-0.28
log_energy_price	173	6.36	0.19	6.37	5.66	6.99	-0.14	0.78
log_exchange	173	2.93	0.59	3.25	2.07	3.7	-0.57	-1.38
log_domestic_demand	173	11.3	0.2	11.37	10.8	11.68	-0.31	-1.02
log_gdp	173	8.63	0.58	8.39	6.07	9.61	-0.06	0.66
log_price_beef	173	3.64	0.12	3.67	3.41	3.99	0.09	-0.13
log_price_pork	173	3.52	0.09	3.53	3.34	3.73	-0.2	-0.83
log_price_fish	173	3.2	0.12	3.14	3.05	3.65	0.99	0.37
log_price_poultry	173	3.75	0.51	3.79	2.91	4.53	-0.12	-1.39
log_export	173	9.73	0.88	10	7.02	10.75	-1.02	0.1

Table 7. Descriptive Statistics to volume and prices variables

Source: own calculations

An interesting pattern emerges when examining the logged price variables. Among all meat prices, poultry shows the highest mean (3.75) and notably the highest variability with a standard deviation of 0.51, significantly larger than other meat products (beef SD=0.12, pork SD=0.09, fish SD=0.12). This higher volatility in poultry prices suggests that the poultry market is more responsive to market shocks and policy changes compared to other meat markets. The negative skewness (-0.12) and high negative kurtosis (-1.39) in poultry

prices indicate a relatively flat distribution with a slight lean toward higher prices. In contrast, fish prices show positive skewness (0.99), suggesting occasional price spikes, while beef and pork prices demonstrate more symmetric distributions with skewness close to zero (0.09 and -0.20 respectively). These trends can reflect the export-driven nature of Ukraine's poultry (that we confirmed in the *Chapter 2*) in contrast to the other meats, which are more focused on domestic market.

In addition, we find linkages between the prices of different types of meat products in the Ukrainian market via correlation analysis (*Figure 16*). The findings on the correlation mean chicken and beef prices in the Ukrainian protein market have the highest correlation value of 0.54, meaning that people consider the two types of meat complements. What is notable, however, is that poultry prices exhibit a moderate negative correlation with pork prices (-0.36), which means that these meats have some relation with the degree to which consumers would be purchasing depending on their respective prices. There are, however, consistently moderate positive correlations between the price of poultry and fish (0.36) and the price of beef and fish (0.37) while the price of pork and fish are hardly correlated (0.07).

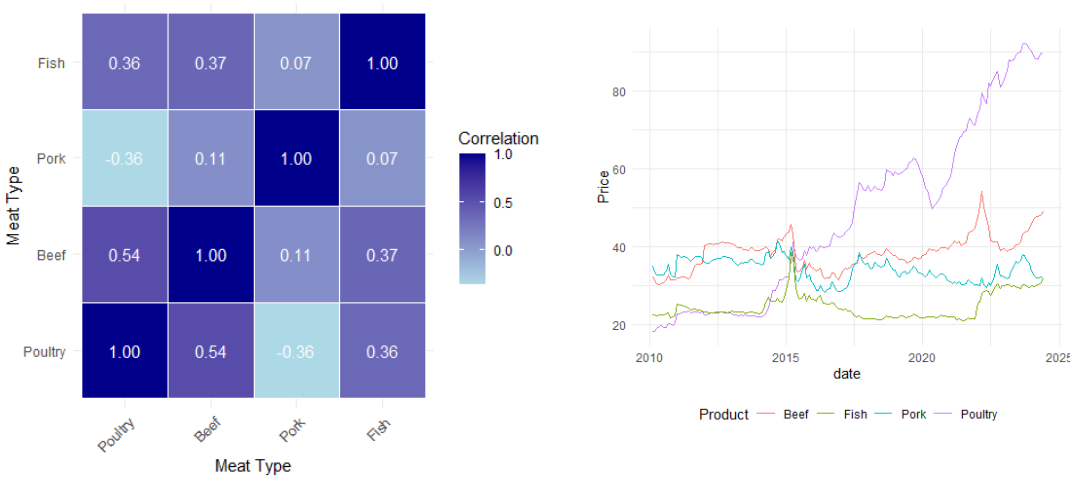

Figure 16. Different meat and fish correlation and real price movements for them

Source: own presentation

These correlation patterns have important implications for our model specification, particularly for the demand equation, where all meat prices are included as explanatory

variables. The moderate correlations suggest enough independence between prices to avoid severe multicollinearity issues in our estimation. For instance, the negative correlation between poultry and pork prices supports their inclusion as potential substitutes in the demand equation, while the positive correlation between poultry and beef prices might explain why our model shows beef as a complementary good rather than a substitute. This means that when the price of poultry increases, the demand for beef also increases, indicating that they are complementary goods. Since the price of fish has a moderate correlation (0.36), it is advocated for inclusion in the demand function estimating equations, while it is plausible that it affects consumers' behavior in a different way than other types of meat, it is expected.

CHAPTER5.RESULTS

5.1. RESULTS FROM THE THREE-STAGE LEAST SQUARES DEMAND-SUPPLY MODEL

The estimated simultaneous equations model reveals complex dynamics in Ukraine's poultry market. As shown in equation (6), the demand equation demonstrates significant price responsiveness, with own-price elasticity of -0.202 ($p<0.01$), indicating relatively inelastic demand. This aligns with findings from other markets, such as Turkey (-0.190) and South Africa (-0.114), suggesting similar consumer behavior patterns across developing markets. Interestingly, beef appears as a complement rather than a substitute (0.202, $p<0.05$), while fish shows an unexpected negative relationship (-0.190, $p<0.01$).

$$\ln(\mathrm{Dt}) = 12.471 *** -0.202 ** \ln(\mathrm{Ppt}) - 0.190 ** \ln(\mathrm{Pft}) + 0.202 * \ln(\mathrm{Pbt}) -0.092.\ln(\mathrm{GDPt}) + 0.101\ln(\mathrm{Ppt}) - 0.244 *** \mathrm{Breakt} + \varepsilon 1\mathrm{t} \quad (6)$$

$$R^2 = 0.695718$$

$$(0.562)\ (0.077)\ (0.065)\ 0.088)\ (0.104)\ (0.053)\ (0.040)$$

$$ln(Qt) = 10.484 *** -0.255 *** ln(Ppt) + 0.151 ** ln(Qt-1) - 0.142.ln(t) + 0.047 ** [\ln(t)]2 - 0.110 *** \mathrm{Breakt} + \varepsilon 2\mathrm{t} \quad (7)$$

$$R^2 = 0.511291$$

$$(0.792)\ (0.060)\ (0.055)\ (0.076)\ (0.015)\ (0.023)$$

$$\ln(\mathrm{Zt}) = 2.722 *** + 0.556 *** \ln(\mathrm{Xt}-1) + 0.367 *** \ln(\mathrm{t}) - 0.108.\mathrm{War_t} + 0.080\mathrm{DCFTAt} + 0.080\mathrm{Breakt} + \varepsilon 3\mathrm{t} \quad (8)$$

$$R^2 = 0.913282$$

$$(0.387)(0.058)(0.061)(0.064)(0.070)(0.065)$$

The income elasticity is marginally significant and negative (-0.092, $p<0.10$), suggesting poultry might be regarded as an inferior good in Ukraine, contrasting with findings from other countries where poultry typically shows positive income elasticity.

The supply response, captured in equation (7), presents some unexpected patterns. The negative own-price coefficient (-0.255, $p<0.001$) contradicts traditional supply theory but might reflect the complex nature of Ukraine's highly concentrated poultry industry where production decisions may be influenced by factors beyond immediate price signals. The significant lagged production term (0.151, $p<0.01$) indicates substantial adjustment costs in production, while the quadratic time trend (linear: -0.142, $p<0.10$; squared: 0.047, $p<0.01$) suggests evolving industry dynamics, possibly reflecting technological improvements and structural changes in the production sector.

Export behavior, described in equation (8), demonstrates strong persistence as indicated by the significant lagged export coefficient (0.556, $p<0.001$). The time trend shows a strong positive effect (0.367, $p<0.001$), reflecting Ukraine's growing presence in international markets. The war dummy shows a marginally significant negative impact (-0.108, $p<0.10$), quantifying the disruption to export activities, while the DCFTA effect, though positive (0.080), is not statistically significant.

The system's high McElroy R^2 (0.813) indicates strong overall explanatory power. The residual correlation matrix reveals substantial interconnectedness between demand and supply (0.803), while export residuals show weaker correlation with both demand (-0.199) and supply (0.079), suggesting some degree of independence in export market dynamics.

All results of the model is represented in Appendix 6.

5.2. IMPACT ANALYSIS OF TRQ REMOVAL IN UKRAINE (2022-2023)

The removal of Tariff Rate Quotas (TRQ) on Ukrainian poultry export to the EU during the years 2022 to 2023 had many significant impacts, with different consequences. Our analysis of the Total welfare effect that this cause is presented in *Table 8-9*.

Variable	2021	2022	2023	Comment
Domestic Price (P1)	2.47	2.45	2.42	USD/kg
European Price (P2)	3.29	3.76	3.91	USD/kg
Production Quantity (Q1)	1 153 738.00	1 081 513.00	1 138 138.00	tons
Consumption Quantity (Q2)	814 492.00	743 062.00	773 274.00	tons
Export Quantity (Q3)	459 058.68	413 197.25	424 575.46	tons
Export Quantity to EU (Q4)	102 891.51	162 837.33	231 777.07	tons
Market Size (Value), USD	2 849 732.86	2 649 706.85	2 754 293.96	USD
TRQ Volume	74 205.25	38 205.87	0.00	tons
Supply Elasticity (εs)		7.73	-4.29	PES = (ΔQ/Q)/(ΔP/P)
Demand Elasticity (εd)		10.83	-3.33	PED = (ΔQ/Q)/(ΔP/P)

Table 8. TRQ welfare analysis inputs

Source: own calculations based on the dataset

There was a notable change in the price relationship between the domestic market and the European markets in the wake of the TRQ removal. While Ukrainian domestic prices showed a modest decline, European prices demonstrated an upward trend from $3.29/kg in 2021 to $3.91/kg in 2023 (*Table 8*). This price flactuations suggests that Ukrainian producers maintained their competitive position in the EU market primarily through price adjustments, enabling them to significantly increase their export volume.

To accurately assess the welfare effects of TRQ removal, we employed point price elasticities calculated from year-to-year changes, as they better reflect immediate market adjustments compared to long-term structural relationships estimated by our 3SLS model. The point elasticity calculations revealed dramatic shifts in market responsiveness, with supply elasticity moving from 7.73 in 2022 to -4.29 in 2023, while demand elasticity

changed from 10.83 to -3.33 (*Table 8*). These substantial variations in elasticities reflect the market's dynamic adjustment to the new trade environment.

The welfare analysis using point price elasticities, as shown in *Table 9*, indicates a positive total net welfare effect of 329 million USD for the 2022-2023 period. This consists of a substantial producer surplus loss of 2,090 million USD, which was more than offset by a consumer surplus gain of 2,419 million USD. This finding suggests that while producers faced significant challenges from the TRQ removal, consumers benefited considerably from the resulting price adjustments. Interestingly, when we applied our 3SLS model elasticities for comparison, we obtained notably different results, showing a negative net welfare effect of -147 million USD, with both producer and consumer surpluses experiencing losses (-71M and -76M USD respectively).

Variable	Fomula	2022	2023	2022-2023 Total	2022-2023 with 3sls
Producer Surplus Change	ΔPS = (Post-TRQ Surplus - Pre-TRQ Surplus) × (1 + εs)	-1 746	-344	-2 090	-71
Consumer Surplus Change	ΔCS = (Post-TRQ CS - Pre-TRQ CS) × (1 - εd)	1 966	453	2 419	-76
Net Welfare Effect	$\Delta W = \Delta PS + \Delta CS$	220	109	329	-147

Table 9. Net welfare effect of the TRQ removal in 2022 and 2023 years using different elastisites

Source: own calculations based on the dataset

Such dramatic changes as evidenced in Table 11 raise caution to those who analyze trade policy impacts without thinking about the time dimension. In this regard, it is essential to remember that point price elasticity estimates should be able to explain the short term responses of the market to TRQ slashes as to market behaviors of Ukrainian producers who in this case specifically increased export amounts of their goods because they did not have to sell them at such low prices.

To evaluate the robustness of our welfare effect calculations from TRQ removal, we conducted a sensitivity analysis using both point price elasticities and 3SLS model estimates. Our analysis reveals significant differences in welfare effects when using

different elasticity measures. The point elasticity calculations, which capture short-term market responses, showed a positive total welfare effect of 329M USD, comprised of a negative producer surplus (-2,090M USD) offset by a positive consumer surplus (2,419M USD). However, when using the more structurally robust 3SLS model elasticities (εs = -0.2551, εd = -0.2018), we found a notably different result with a negative total welfare effect of -147M USD.

The stark contrast between these results highlights the importance of proper elasticity specification in welfare analysis. Using point elasticities, which showed average values of εs = 1.72 and εd = 3.75, we observed larger welfare effects due to their capture of immediate market reactions, including potential overshooting and short-term adjustments. The 3SLS model estimates, reflecting longer-term structural relationships, produced more modest but likely more realistic welfare effects, with both producer surplus (-71M USD) and consumer surplus (-76M USD) showing losses.

A key finding from our sensitivity analysis is that welfare calculations are highly sensitive to elasticity specifications. This is evidenced by the significant variation in results when moving from point elasticities to structural estimates. The price change of -2.02% and substantial export volume increase from 102,892 to 231,777 tons had different welfare implications under different elasticity assumptions, suggesting that the way market participants' responsiveness is measured significantly impacts welfare effect estimates.

CHAPTER 6. CONCLUSIONS AND RECOMMENDATIONS

This research makes notable contributions to the comprehension of the dynamics within Ukraine's poultry market and the effects of changes in trade policy. Utilizing a three-stage least squares (3SLS) model, we identify specific characteristics and estimated elasticities that provide valuable insights previously absent in academic discourse. The estimated demand price elasticity of -0.202 is consistent with findings from other emerging markets like Turkey (-0.190) and South Africa (-0.114), indicating comparable consumer behavior across these economies. Conversely, the negative income elasticity of -0.092 introduces a unique aspect, suggesting that in Ukraine's specific context, poultry may be considered an inferior good. But, we believe that this is not the case, but a problem of the model results. Thus the part of the demand analysis need further investigation and analysis.

On the supply side, the analysis uncovers interesting behavioral patterns and market structures. The counterintuitive negative price coefficient (-0.255) within the supply equation challenges traditional economic theories but may indicate decision-making within the highly concentrated Ukrainian poultry sector. This, combined with a significant lag in production adjustment (0.151), points to considerable costs and strategic planning by producers, reflecting traits of oligopolistic competition, yet still influenced by competitive market that affects pricing and outcomes.

The study also evaluates the welfare impact of Tariff Rate Quotas (TRQ) removal, revealing significant insights. The differences that we have found between the basic point elasticity calculations, which predicted a positive net welfare gain of $329 million, and the more comprehensive 3SLS results, indicating a $147 million loss, underscore the critical need for temporal analysis in policy evaluation. The considerable variability in elasticity estimates from one year to the next (e.g., supply elasticity shifting from 7.73 to -4.29, and demand elasticity from 10.83 to -3.33) clearly shows the market's dynamic nature and its complex response to policy shifts like the TRQ removal case.

The model's high R-squared value of 0.913 in the export equation shows that it does an excellent job of explaining Ukraine's trade patterns. The significant coefficient for lagged exports (0.556) suggests that the market structure is relatively rigid. However, the positive value in the main equation (0.367) implies that Ukraine's share in the global poultry market is growing, despite past disruptions from conflicts. The estimate for the DCFTA (0.080), though small and not statistically significant, hints that there are still possibilities for deeper integration into the EU market.

The removal of TRQs had different impacts on producers and consumers: while producers faced significant losses, consumers benefited greatly. This large difference highlights the challenges involved in analyzing public policies and serves as a cautionary note when interpreting these findings. This study assumes that future research will delve deeper into aspects like production costs and market structures. It also points to the need for advanced, dynamic techniques to better capture both short- and long-term market changes. Additionally, future studies should explore why poultry is often viewed as a low-quality product in Ukraine and examine how market concentration affects competitive behavior.

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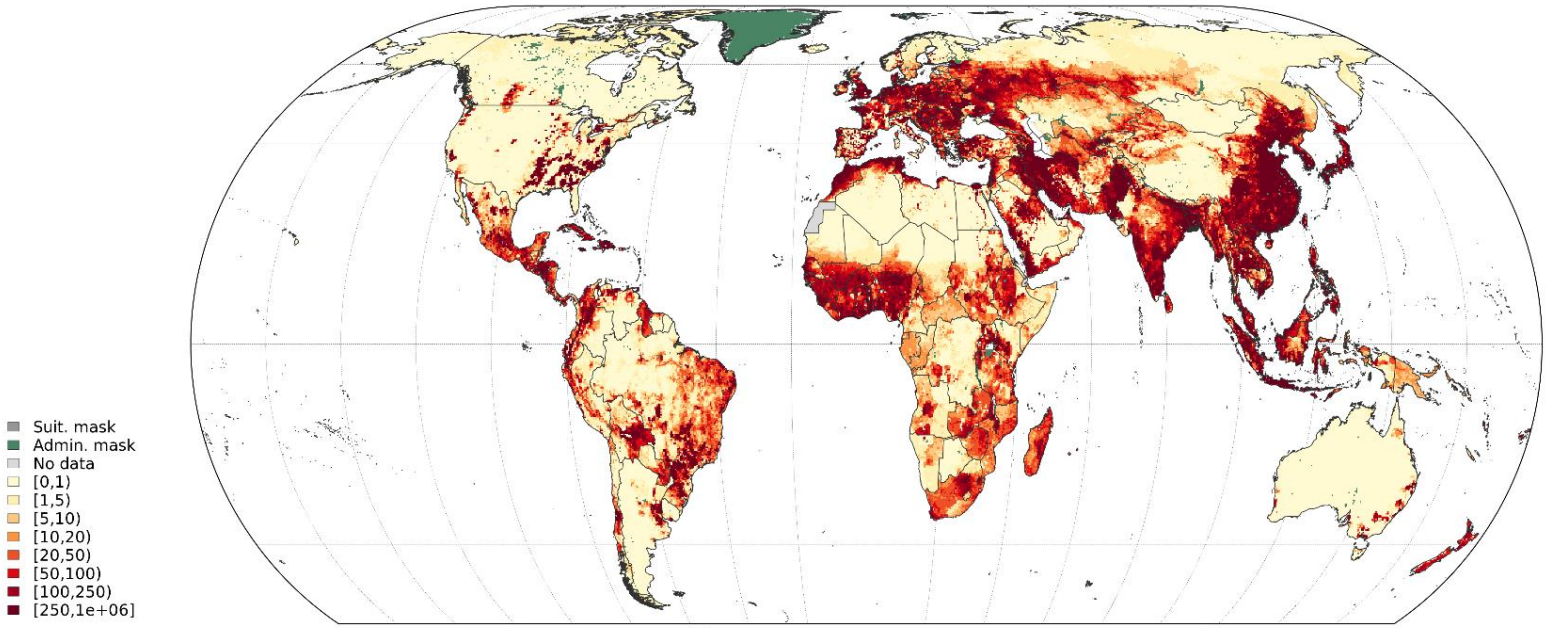
APPENDIX

Appendix 1

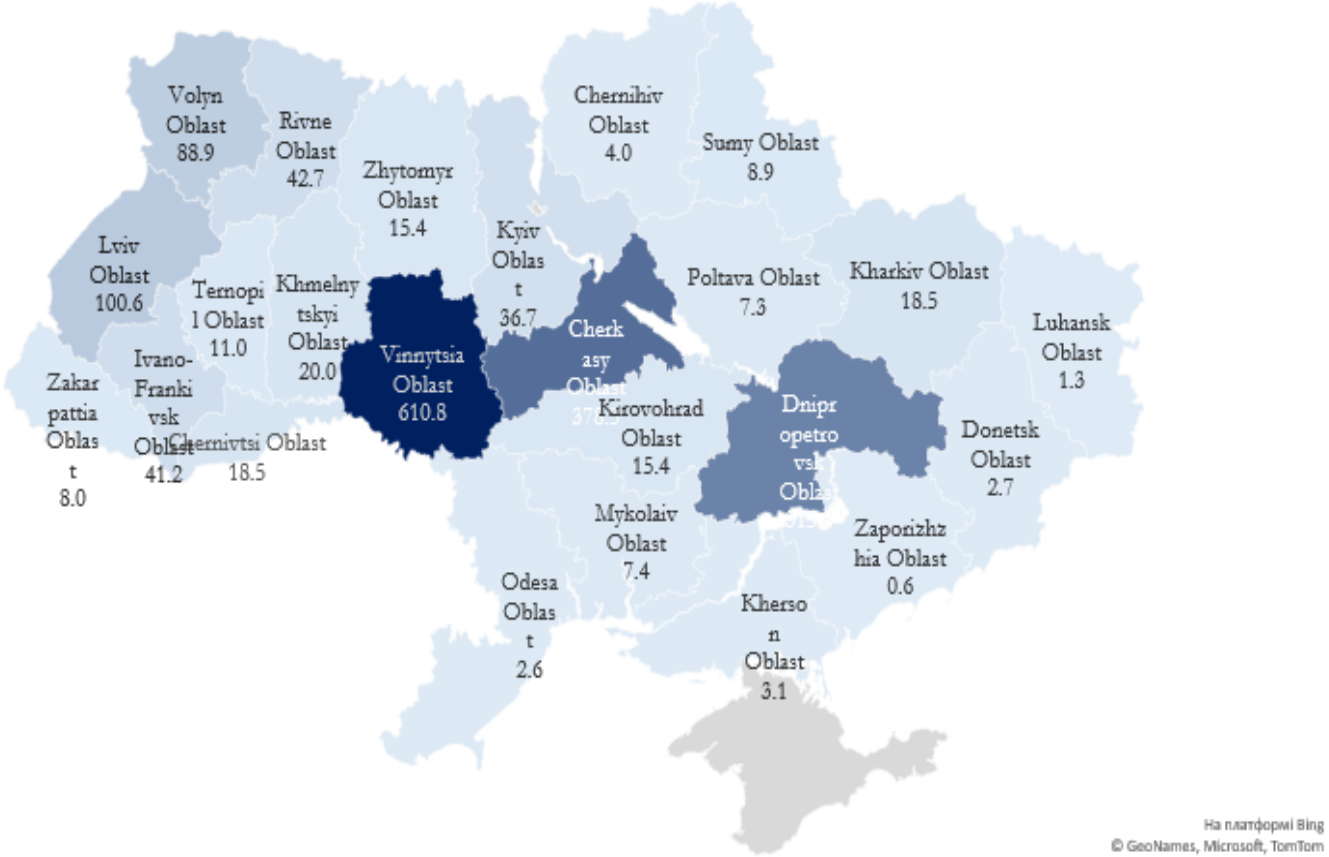
Spatial distribution of chicken populations across the globe as part of the Gridded Livestock of the World database for the year 2020



Source: Gridded Livestock of the World database by FAO, 2020

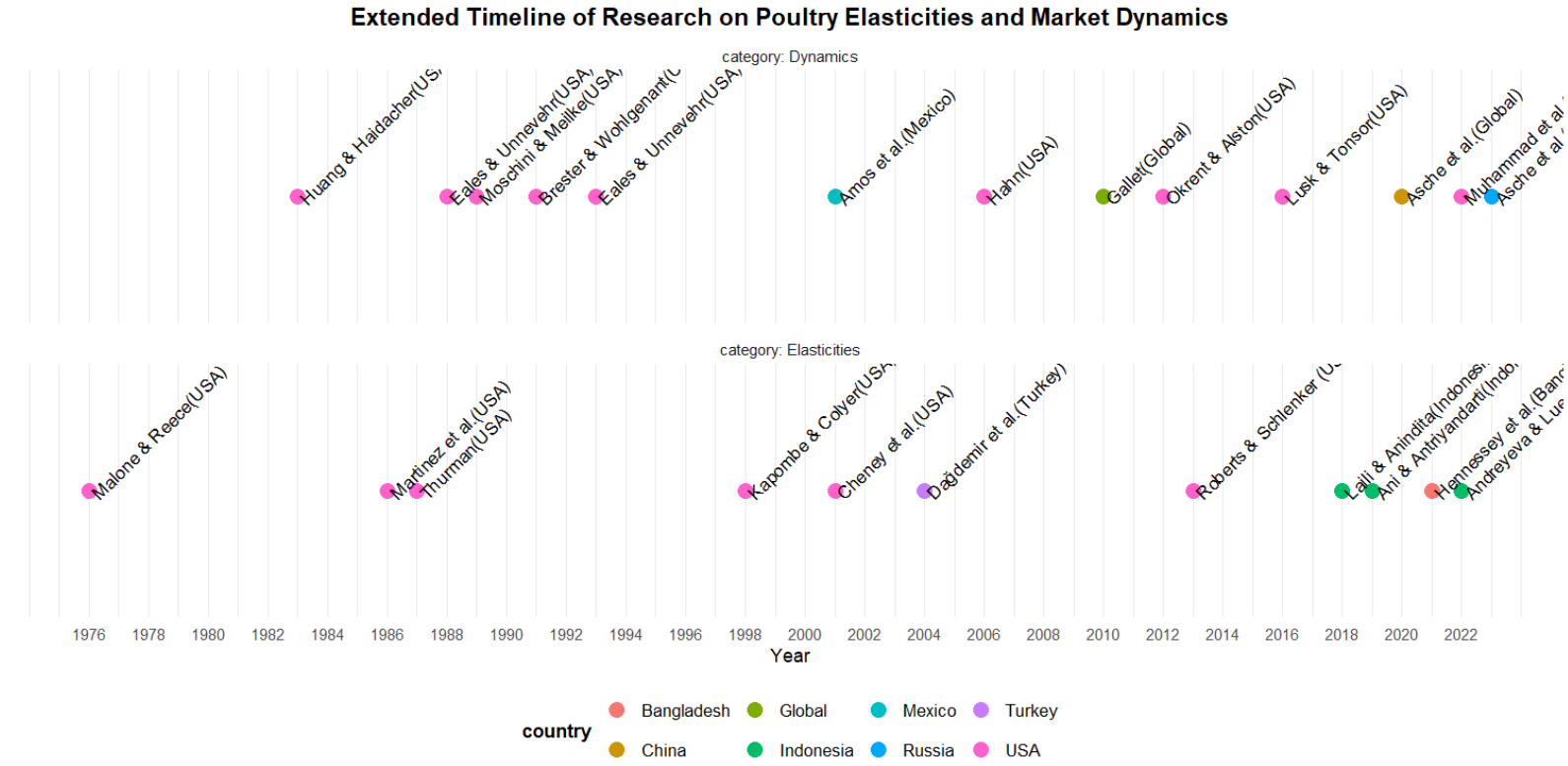
Appendix 2

Live weight of poultry breeding by region, thsd. tonnes in 2023

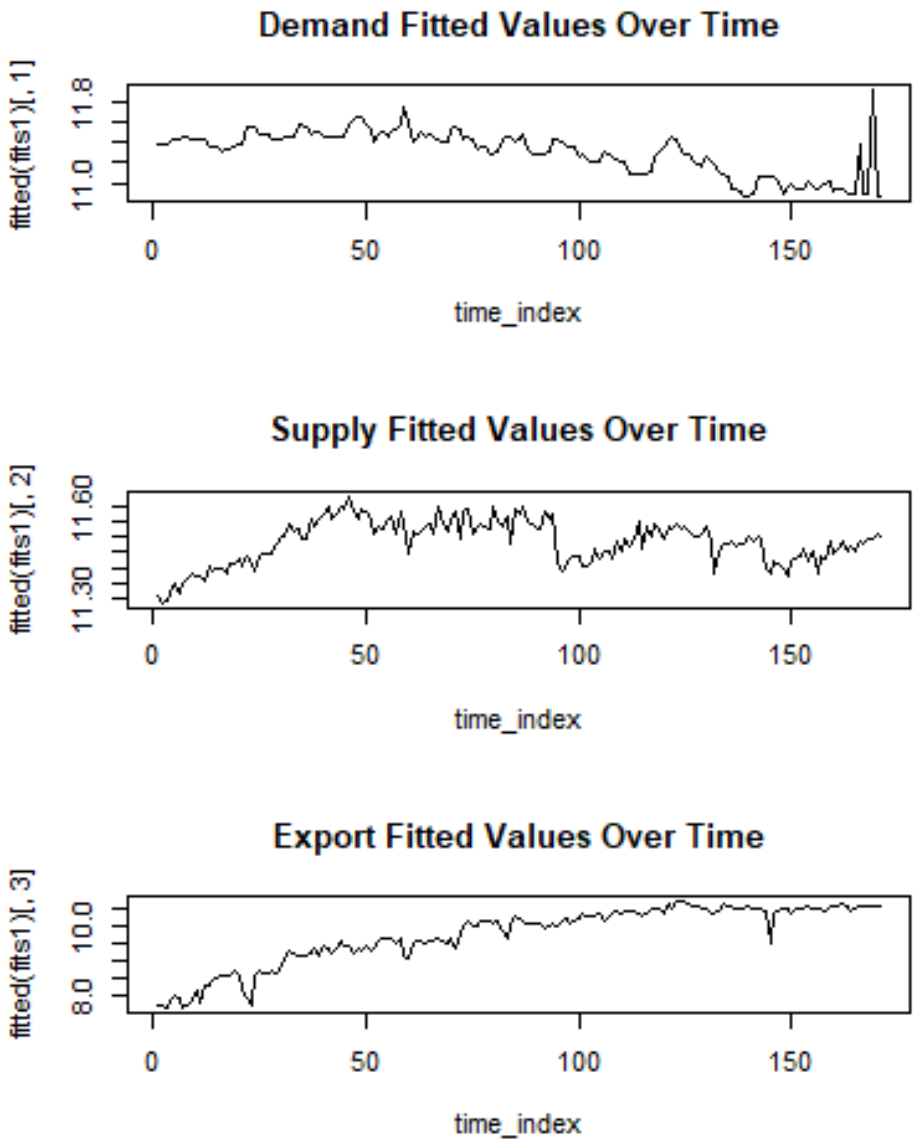


Source: own presentation based on data from SSSU

Appendix 3



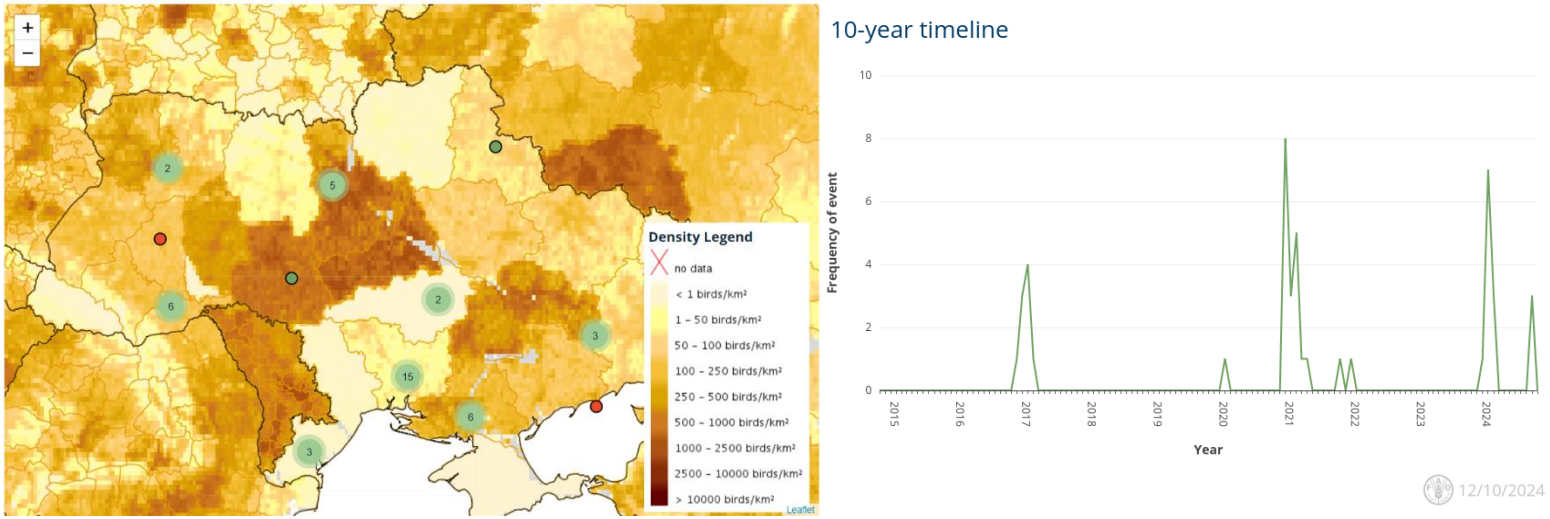
Source: own presentation based on literature review



Source: own presentation based on SSSU data

Appendix 5

Avian Influence outbreaks in Ukraine



Source: FAO

Appendix 6

Three-Stage Least Squares (3SLS) Estimation Results

Dependent Variables	ln(Demand)	ln(Production)	ln(Export)
Variables	-1	-2	-3
ln(Poultry Price)	-0.202**	-0.255***	
	-0.077	-0.06	
ln(Fish Price)	-0.190**		
	-0.065		
ln(Beef Price)	0.202*		
	-0.088		
ln(Pork Price)	0.101		
	-0.104		
ln(GDP)	-0.092.		
	-0.053		
Lagged Production		0.151**	
		-0.055	
Lagged Export			0.556***
			-0.058
ln(Time Trend)		-0.142.	0.367***
		-0.076	-0.061
ln(Time Trend)^2		0.047**	
		-0.015	
War			-0.108.
			-0.064
DCFTA Dummy			0.08
			-0.07
Break Dummy	-0.244***	-0.110***	0.08
	-0.04	-0.023	-0.065
Constant	12.471***	10.484***	2.722***
	-0.562	-0.792	-0.387
Observations	171	171	171
R-squared	0.696	0.511	0.913
RMSE	0.113	0.072	0.259

Notes: Standard errors in parentheses. Significance levels: *** p<0.001, ** p<0.01, * p<0.05, . p<0.1

System Statistics:

- N = 513
- McElroy R^2 = 0.813
- Degrees of Freedom = 494

Source: own estimations