Vet Hekim Der Derg 96 (2): 112-122, 2025

VETERİNER HEKİMLER DERNEĞİ DERGİSİ

JOURNAL OF THE TURKISH VETERINARY MEDICAL SOCIETY

ISSN: 0377-6395

e-ISSN: 2651-4214

Dergi ana sayfası /*Journal homepage:* http://dergipark.org.tr/vetheder

OPEN ACCESS

10.33188/vetheder.1600369

Araştırma Makalesi / Research Article

Evaluation of the change in the economic and purchasing power of the welfare of cattle breeding in Türkiye

Seyfettin TUNCEL [1,a*], Taylan Taner DOĞAN [2,b], Pınar DEMİR AYVAZOĞLU [1,c]

[1] *Kırıkkale University, Department of Animal Health Economics and Management, Faculty of Veterinary Medicine, Kırıkkale, Türkiye.*
[2] *Kırıkkale University, Department of Economics, Kırıkkale, Türkiye.*

0000-0003-3575-1835[a]; 0000-0002-8901-0189[b], 0000-0002-7010-0475[c]

MAKALE BİLGİSİ / ARTICLE INFORMATION:

Geliş / Received:
12 Aralık 24
12 December 24

Revizyon/Revised:
8 Nisan 25
8 April 25

Kabul / Accepted:
29 Nisan 25
29 April 25

Anahtar Sözcükler:
Tarım hayvancılık destek endeksi
Ekonomik sürdürülebilirlik
İç ticaret hadleri
Satın alma gücü göstergesi
Regresyon analizi

Keywords:
Agriculture livestock support index
Economic sustainability
Internal terms of trade
Purchasing power indicator
Regression analysis

ABSTRACT

In this study, economic welfare changes in cattle fattening in Türkiye in 2010-2022 were analyzed with the Net internal terms of trade (NITOT) index and purchasing power changes were analyzed with the Income internal terms of trade (INTOT) index. Accordingly, the sustainability status of the enterprises was analyzed multidimensionally on the axis of parameters such as meat imports, agriculture and livestock subsidies and milk-feed parity. When meat import data are included, it can be seen that INTOT, the purchasing power parity indicator, changed little between 2010 and 2013, increased between 2014 and 2017, and decreased from 2018 for cattle farms. On the other hand, it is found that INTOT data decreased by 12.7%, 13.6%, and 19.1% in 2011, 2014, and 2018, respectively, when meat import data are excluded. According to the regression results of the study, with everything else held constant, a 1% increase in meat imports results in a 0.0861 unit decrease in the cattle farm economic welfare index (NITOT) in the short run, a 0.2129 unit decrease in the medium run, and a 0.2833 unit decrease in the long run. A 1-unit increase in consumer price index (CPI) results in a 0.7264-unit decrease, while a 1-unit increase in the Agriculture and Livestock support index (ASDI) causes a 0.6156-unit increase. As a result, inflation problem and meat imports in Türkiye affect the economic welfare of fattening enterprises negatively and subsidies positively. The regression model obtained as a result of the research will be guiding in animal husbandry policies.

Türkiye'de büyükbaş hayvancılığın, ekonomik refahının ve satın alma gücündeki değişimin değerlendirilmesi

ÖZET

Bu çalışmada, 2010-2022 yılları arasında Türkiye'de sığır besiciliğinde ekonomik refah değişimleri, Net iç ticaret hadleri (NİTOT) endeksi ile satın alma gücü değişimleri ise Gelir iç ticaret hadleri (INTOT) endeksi ile analiz edilmiştir. Bu doğrultuda işletmelerin sürdürülebilirlik durumu et ithalatı, tarım ve hayvancılık destekleri ve süt-yem paritesi gibi parametreler ekseninde çok boyutlu olarak analiz edilmiştir. Et ithalatı verileri dahil edildiğinde, satın alma gücü paritesi göstergesi olan INTOT'un büyükbaş hayvan çiftlikleri için 2010-2013 yılları arasında çok az değiştiği, 2014-2017 yılları arasında arttığı, 2018 yılından itibaren ise azaldığı görülmektedir. Öte yandan, et ithalatı verileri hariç tutulduğunda INTOT verilerinin 2011, 2014 ve 2018 yıllarında sırasıyla %12,7, %13,6 ve %19,1 oranında azaldığı tespit edilmiştir. Çalışmanın regresyon sonuçlarına göre, diğer her şey sabit tutulduğunda, et ithalatındaki %1'lik bir artış, sığır çiftliği ekonomik refah endeksinde (NITOT) kısa vadede 0,0861 birim, orta vadede 0,2129 birim ve uzun vadede 0,2833 birim azalmaya neden olmaktadır. Tüketici fiyat endeksindeki (TÜFE) 1 birimlik artış 0,7264 birimlik azalışa neden olurken, Tarım ve Hayvancılık destek endeksindeki (ASDI) 1 birimlik artış 0,6156 birimlik artışa neden olmaktadır. Sonuç olarak, Türkiye'de enflasyon sorunu ve et ithalatı besi işletmelerinin ekonomik refahını negatif, sübvansiyonlar ise pozitif yönde etkilemektedir. Araştırma sonucunda elde edilen regresyon modeli hayvancılık politikalarında yol gösterici olacaktır

How to cite this article: Tuncel S, Doğan TT, Demir Ayvazoğlu P. Evaluation of the change in the economic and purchasing power of the welfare of cattle breeding in Türkiye. Vet Hekim Der Derg. 2025;96(2):112-122.

* *Sorumlu Yazar e-posta adresi / Corresponding Author e-mail address: seyfettintuncel@kku.edu.tr*

1. Introduction

After the 1980s, the word "sustainability" has become a frequently used title in developed and developing countries. Although the origin of the term sustainability belongs to the science of ecology, it is examined using many subheadings such as economic, environmental and social sustainability (1).

When the concept of sustainability in business economics is mentioned, businesses with regular, stable cash flow and profitability come to mind. In other words, it is the set of activities that provide the greatest amount of economic welfare with the least amount of resource use and environmental damage.

In studies where sustainability is evaluated from an economic point of view, profitability, efficiency, economic welfare change and purchasing power indicator are used (2). Among the mentioned parameters, economic welfare change and purchasing power indicator are two of the most striking parameters (3,4).

In studies examining economic sustainability, various methods are used to calculate changes in purchasing power and economic welfare. Accordingly, while variables such as personal income and disposable income have been the basic indicators of purchasing power at the household level since the 1920s, various studies on purchasing power have been conducted at both the household and enterprise levels using alternative parameters such as domestic trade conditions (5,6) since the 1950s. These studies have focused particularly on resource transfers between the agricultural and industrial sectors and the resulting changes in purchasing power. In this context, studies have been deepened by also taking into account imbalances in production factors. Eckaus (7) in Asia, the Middle East and Italy, Harris and Todaro (8) in Central Africa and Corden and Findlay (9) in the USA have examined changes in resource transfers between sectors caused by factor imbalances.

In the 1970s, the internal terms of trade focused on the relationship between the prices that agricultural enterprises received as a result of their sales and the prices they paid for production, which made the internal terms of trade a useful tool for researchers to analyse purchasing power and economic welfare indicators (10). In Türkiye, Keyder (11), Kip (12) and Çetinkaya (13) analysed the terms of trade and price differentials between the agricultural and industrial sectors and the effects of resource transfers between these two sectors on economic welfare and purchasing power. In the following years, sectoral studies on single products have increased in the literature and these studies have turned into specific analyses on one or a few specific products. In this context, studies on internal terms of trade focusing on single products are frequently encountered. Especially in studies on internal terms of trade in agriculture and animal husbandry, Uzunöz et al. (14) on milk, Uzunöz (15) on legumes, Mencet Yelboğa et al. (16) on tomatoes, Menşet Yelboğa et al. (17) on citrus fruits, Kızılaslan et al. (18) on sunflower and Tuncel and Cevger (19) on cattle fattening enterprises are examples of single product-based studies. In this framework, the Net Internal Terms of Trade (NITOT) is used as an indicator of economic welfare in analysing internal terms of trade for the livestock sector. NITOT is an index value obtained by dividing the prices obtained by the breeder from the sale of carcass meat by an index showing the production costs (agri-food index, PPI, etc.), while the Income Internal Terms of Trade (INTOT) is defined as an index value obtained by multiplying the NITOT index by the carcass production index (19). These indicators provide an important analysis tool for understanding the economic dynamics in the livestock sector. Within the scope of this research, the factors affecting the economic welfare level and purchasing power index of cattle fattening enterprises in Turkey between 2010 and 2022 are analysed using internal terms of trade (NITOT and INTOT). In this study, unlike other studies, the effects of meat imports, inflation and agricultural-livestock subsidies on cattle fattening enterprises are analysed with the model and estimation results of the internal terms of trade.

2. Material and Methods

Among the data and variables used in the study, the Net domestic terms of trade index (NITOT) was used as an indicator of economic welfare loss, the Income domestic terms of trade index (INTOT) was used as a purchasing power index, the Consumer Price Index (CPI) was used for the change in the general level of prices, and the agriculture and livestock support payment index was used for support in the agriculture and livestock sector. Accordingly, since livestock farms in Turkey benefit from both agricultural and livestock subsidies together, a composite index covering agricultural and

livestock subsidies is constructed in the study. In addition, data on meat imports are included in the study. Data on meat imports are obtained by summing the data on imports of slaughter animals and breeding meat imports in kg at annual frequency and converting them into an index.

The definitions of the variables used in the study are given in Table 1.

Table 1: Definitions of the variables used in the study

Tablo 1: *Araştırmada kullanılan değişkenlerin tanımları*

Variables	Definitions
NITOT	Net internal terms of trade
INTOT	Income internal terms of trade
CPI	Consumer price index
ASDI	Agricultural and livestock supports index
Limport	Natural logarithm of cattle import

Internal Terms of Trade

It is a concept that shows the relationship between the price received by the producer and the prices paid by the producer to the industrial sector. In this study, the "Breeder's Price Index Received" (BPIR), which shows the monetary amount received by the breeders after carcass sales in cattle farm, and the "Breeder's Price Index Paid" (BPIP), which shows the costs incurred to realize this production, are used. NITOT index and INTOT index are calculated with these two variables (19).

Net Internal Terms of Trade (NITOT)

It is the ratio of BPIR to BPIP. In the research, the NITOT index was calculated by using the Carcass Price Index (CAPI) for the "Price Received by the Grower" and the Agri-Food Index (AFI) index for the Price Index paid by the Grower (12, 20).

NITOT = CAPI / AFI *100

Income Internal Terms of Trade (INTOT)

The INTOT index, known as the "purchasing power index", also takes into account changes in demand for beef. Accordingly, the "Income Internal Terms of Trade Index" is calculated by multiplying the NITOT with the meat production volume (Q) of cattle farms (12)

INTOT = NITOT x Q/100

INTOT = CAPI / AFI x Q /100

Statistical analysis

In the analysis stage of the research, econometric analysis was conducted using the INTOT and NITOT indices from the internal terms of trade. In the study, the effects of meat imports, subsidies and inflation on the terms of trade index between 2010 and 2022 are analysed by regression analysis. Among the data used in the research, the data on agriculture and livestock subsidies were obtained from the Ministry of Treasury and Finance of the Republic of Turkey (THMB), while all other data were obtained from Turkstat (21).

Due to the change in Turkish Statistical Institute (TSI) data collection methodology in 2010, data from 2010 and subsequent years were used in the study. Accordingly, until 2010, the red meat production statistics published by

the Turkish Statistical Institute were based on data obtained from the slaughter of bovine and ovine animals recorded in slaughterhouses and the sacrificial skins received by the Turkish Aeronautical Association. However, the metadology was changed after 2010 (22).

Finally, although not directly included in the analysis in the regression model within the scope of the research, UKON (national milk council) milk/feed parity data are included and interpreted in Graphs 1 for a more consistent assessment of the current situation of the sector (23).

3.Results

Within the scope of the research, the values of beef production index (Q), Carcass Price Index (CAPI), Agri-Food Index (AFI), Net Internal Terms of Trade (NITOT), Purchasing Index (INTOT), Consumer Price Index (CPI), Inflation-Adjusted Agricultural and Livestock Support Index (ASDI) and Meat Import Index (MII) values are given in Table 2 (23-28).

Table 2: Q, CAPI, AFI, NITOT, INTOT, CPI, ASDI and MII indices
Table 2: *Q, CAPI, AFI, NITOT, INTOT, CPI, ASDI ve MII endeksleri*

Time	Q	CAPI	AFI	NITOT	INTOT	CPI	ASDI	MII
2010	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
2011	106.90	96.39	106.47	90.53	99.43	110.45	94.11	277.14
2012	113.12	98.59	115.94	85.04	103.83	117.25	107.07	284.13
2013	118.31	102.17	124.63	81.98	101.20	125.93	93.40	96.05
2014	125.88	117.77	135.66	86.81	109.44	136.22	94.45	333.03
2015	138.25	148.38	146.07	101.59	135.35	148.22	105.83	104.71
2016	153.69	159.14	157.01	101.35	149.78	160.86	114.34	236.11
2017	155.39	172.43	172.47	99.97	169.01	180.04	124.87	325.67
2018	158.68	178.56	208.54	85.63	169.55	216.59	132.68	691.98
2019	167.71	189.05	238.48	79.27	162.97	242.23	137.96	305.27
2020	186.01	212.82	263.92	80.64	167.18	277.59	121.97	185.72
2021	212.79	259.55	346.24	74.96	169.23	377.75	120.65	123.82
2022	249.25	519.22	760.69	68.26	165.91	620.53	109.83	60.34

1 Since the AFI index was calculated by the Turkish Statistical Institute (TURKSTAT) after 2015, the AFI calculation between 2010 and 2014 was calculated retrospectively using the Turkish Producer Price Index (PPI).
2 MII (Meat import index) data is the annual value in kg obtained from the sum of breeding and butchery meat imports. Based on 2010 and converted to index value.
*3 ASDI: Nominal agricultural livestock subsidy value/ Nominal livestock subsidy value*100*

When the NITOT index is analysed in Table 2, it shows a downward trend since 2010, except for 2015 and 2016. Especially since 2018, the CAPI index, which shows the prices received by cattle breeding enterprises after their sales, has remained far below the AFI index, which shows the prices they pay to realize their production. In other words, the income of breeding enterprises has remained below their costs.

When the INTOT index data in Table 2 are analysed, it is seen that the purchasing power, which is stagnant in 2010-2013, increased by 8.1%, 23.7%, 10.6% and 12.8% between 2014 and 2017, respectively, and remains stagnant again in 2018 and beyond. The CPI index, which is 100 in 2010, increased 3.7 times by 2021 and 6.2 times by 2022. Moreover, support items, which started to increase in real terms in 2015, reached the highest level in 2019, but have been decreasing since 2020.

The study also constructed a meat import data index (Table 2). Meat import data are converted into indices by summing the data on imports of slaughter animals and breeding meat imports in kg at annual frequency. Table 2 shows that meat imports, which reached a maximum level in 2018, entered a downtrend with the decision of the public authority to restrict meat imports.

In the study, Figure 1 presents the milk/feed parity, NITOT, INTOT, INTOT (excluding imports) and agricultural and livestock support indices (ASDI) together (12).

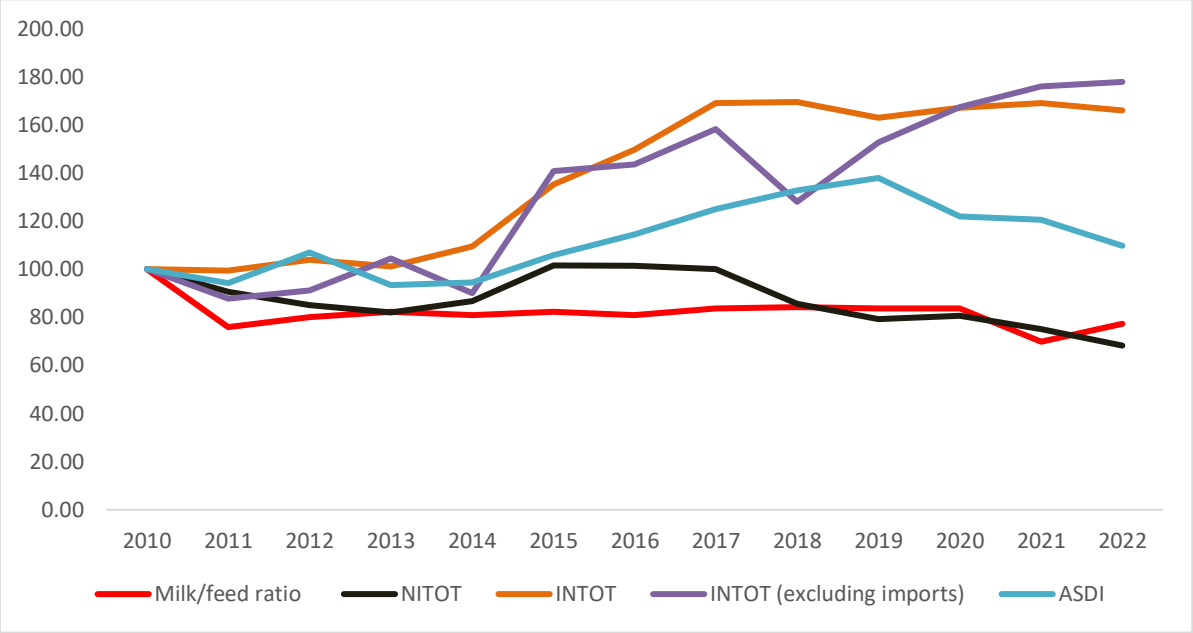

Figure 1: Milk/feed parity, NITOT, INTOT, INTOT (excluding imports), ASDI
Şekil 1: *Süt /yem paritesi, NITOT, INTOT, INTOT (ithalat hariç), ASDI*

Figure 1 reveals that sharp breaks in the purchasing power of INTOT (excluding imports) are not evident in the INTOT index. In line with this data, it is clear that the rise in the INTOT index is due to meat imports rather than a real increase in the level of meat production.

Figure 1 shows that the NITOT, which declines in 2013, increases in 2015 and remains constant until 2018, and starts to decline again after 2018. Accordingly, it is evident that since 2018, carcass meat prices have been well below the production costs of the breeders.

An analysis of the ASDI index data in Figure 1 reveals that the index, which is on an upward trend until 2019 except for 2011 and 2013, has been on a downward trend since 2020.

The natural logarithm value of meat imports (Limport) is given in Figure 2a, Consumer Price Index (CPI) is given Figure 2b, Net internal terms of trade (NITOT) index is given in Figure 2c in Figure 2 for the years understudy.

Figure 2 shows that meat imports decrease in 2019 and beyond, while the Consumer Price Index (CPI) increases and the NITOT index decreases as an indicator of the rapidly rising inflation problem.

Table 3 presents the model and estimation results of the regression analysis to determine the effect of red meat imports, inflation, agricultural and livestock subsidies on the terms of trade.

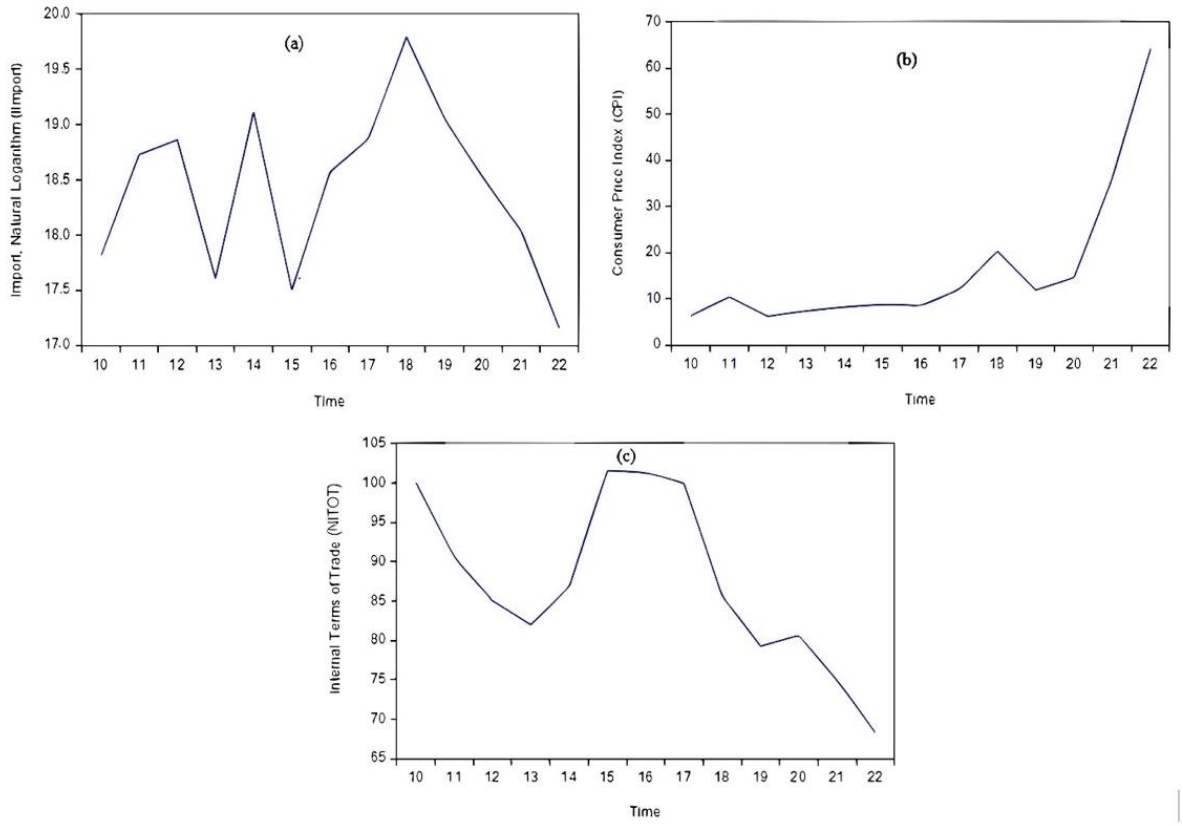

Figure 2: The figure in a is Natural logarithm figure of imports, the figure in b is Consumer Price Index (CPI) figure, the figure in c is Net domestic terms of trade (NITOT) figure.

Şekil 2: *İthalatının doğal logaritma grafiği(a), Tüketici fiyat endeksi (CPI) grafiği(b), Net iç ticaret haddi (NITOT) grafiği(c)*

Table 3: NITOT regression analysis results

Table 3: *NITOT regresyon analiz sonuçları*

Variables	**Results**
Limport	-8.6123*
Limport(-1)	-12.6790**
Limport(-2)	-7.0379*
CPI	-0.7264**
ASDI	0.6156**
Constant	554.0427***
Statistics and Diagnostics Test Results	
R^2	0.9032
$\bar{R}^2$, Adjusted R^2	0.8064
N, Number of Observations	11
F, Statistical Significance Test of Regression	9.3294**
F, Autocorrelation	0.8409
F, Heterocedasticity	0.8653
F, Model Specificarion	0.0562
Jacque-Berra Normality test	0.5230

****, ** and * denote statistical significance at 1%, 5% and 10% significance levels, respectively.*

When the results of the model are analysed in the regression analysis,

R-square Statistic: The explanatory variables in the model explain 90% of the variability in the dependent variable. This shows that the model is significant.

F Statistic: The F statistic is 9.3294, which indicates that the model is generally significant at 5% significance level.

Autocorrelation Test: The F test was used for the autocorrelation test and the result was 0.8409. In this case, the null hypothesis that there is no autocorrelation is not rejected, so there is no autocorrelation problem in the model.

Homoscedasticity Test: The Breusch-Pagan-Godfrey test is used to test whether the variance is constant and the F statistic is 0.8653. This indicates that the null hypothesis that the variance is constant (homoscedasticity) is not rejected. Accordingly, it is determined that the variance does not vary in the model and therefore there is no heteroscedasticity problem.

Model Setup Error Test: The Ramsey RESET Test was used to test the correctness of the model and the F statistic was found to be 0.0562. This result indicates that there is no setup error in the model.

Normal Distribution of Residuals Test: Jacque-Bera test is used to test whether the residuals are normally distributed, and the test statistic is 0.5230. This result indicates that the null hypothesis that the residuals are normally distributed is not rejected, in other words, the residuals are normally distributed.

According to the results of the regression analysis, the coefficient of the current import variable (Limport) among the independent variables is -8.6123 and statistically significant. This result indicates that, with all other variables held constant, a 1% increase in imports leads to a decrease of 0.0861 units in the short-run terms of trade (INTOT). Similarly, the coefficient obtained for the one-period lagged import variable Limport(-1) is -12.6790, indicating that a 1% increase in imports has a stronger downward effect on the short-run terms of trade (INTOT). Accordingly, past imports have a more pronounced negative effect than current imports. For the two-period lagged import variable Limport (-2), the coefficient is -7.0379, indicating that the lagged effect of imports is again negative. These findings suggest that the impact of imports continues to diminish over time, but in any case, it continues to have a negative impact on the terms of trade in the long run.

In the model, a 1% increase in the Consumer Price Index (CPI) inflation variable leads to a decrease of -0.7264 units in the short-term terms of trade, while the coefficient of the variable related to agricultural and livestock supports (ASDI) is positive and it is found that a 1% increase increases the terms of trade by 0.6156 units. This finding indicates that the increase in inflation has a negative impact on economic welfare, whereas agricultural and livestock subsidies have a positive impact on economic welfare.

In line with all these findings, the model has a high level of explanatory power and the estimated coefficients are statistically significant.

Sample: 2010 2022
Included observations: 11

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.232	-0.232	0.7700	0.380
		2	0.008	-0.048	0.7710	0.680
		3	-0.150	-0.169	1.1726	0.760
		4	-0.052	-0.139	1.2273	0.874
		5	0.082	0.025	1.3886	0.926

Figure 3: Correlogram of the estimated regression equation
Şekil 3: *Tahmin edilen regresyon denkleminin korelogram*

Figure 3 shows the autocorrelation (AC) and partial autocorrelation (PAC) coefficients for the analysed time series and their corresponding Ljung-Box Q-statistics (Q-Stat) and p-values. In this way, it is shown whether the time series has a statistically significant autocorrelation relationship with its past values at different lag levels. Lag (1-5) in

Figure 3 represents the first to fifth lag of the time series. In this context, the AC (Autocorrelation) coefficient of each lag reflects the direct correlation of the series with a particular past value. The values of these AC coefficients are close to zero, indicating that there is no significant autocorrelation. Indeed, Figure 3 shows that the AC coefficients are low and the series does not exhibit a strong autocorrelation structure.

Similarly, the PAC (Partial Autocorrelation) coefficients indicate the extent to which the relationship at a given lag explains the series after subtracting the effect of other lags. The fact that the PAC values are close to zero indicates that there is no strong partial autocorrelation in the series.

The Ljung-Box Q-statistics (Q-Stat) in the fifth column test the cumulative statistical significance of autocorrelations up to the lag. The p-values (Prob) in the last column indicate the significance levels of the respective Q-statistics. Values above 0.05 or 0.10 indicate that the autocorrelation is not statistically significant.

According to the findings, the time series does not have a significant autocorrelation for the first five lags. This indicates that the series does not have a strong relationship with its past values and there is no significant autoregressive (AR) structure. In the literature, such structures are interpreted as “exhibiting white noise characteristics”.

As a result, the AC and PAC coefficients in Figure 3 and the p-values of the Ljung-Box test reveal that there is no autocorrelation relationship in lags 1 to 5 of the analysed series.

4. Discussion and Conclusion

The terms of trade are used to monitor changes in the purchasing power and income of the rural sector and to determine the transfer of resources between sectors and the impact of inflation (29). The terms of trade can be calculated on a sectoral basis such as agricultural and industrial sectors or on a single product. As a matter of fact, Uzunöz and Esengün's (14) study on dairy cattle farms, Tuncel and Cevger’s (19) study on cattle breeding establishments, and Yelboğa et al.'s (30) study on tomato producers are examples of studies conducted on a single product. However, in this study, internal terms of trade, meat imports, subsidies, inflation, and milk/feed parity data were analysed in a multifaceted manner.

The economic survival of enterprises is closely related to their production costs and the sales price and sales volume of this product. However, Türkiye has intensively implemented policies to increase the import of carcasses and live animals in order to reduce the price increases in red meat prices and to ensure the supply-demand balance between 2010 and 2018 (31, 32). In 2019 and afterwards, the pandemic process and the disruptions in production caused by this process, the rapid upward change in foreign exchange prices and the accompanying increase in inflation caused the costs of breeding establishments to increase rapidly, while their incomes did not increase at the same rate. As a matter of fact, in the study, NITOT index is an indicator of economic welfare, has been at a low level since 2018 (As seen at Figure 2). Since the Carcass Price Index (CAPI) remained below the Agricultural Food Index (AFI) in this period, it can be said that the situation was unfavorable to the breeders operating in the sector and the income obtained by the producers did not cover the production costs. The analysis shows that the terms of trade have changed to the detriment of livestock enterprises. In his study, Demir Ayvazoğlu (33) reports that producers suffered losses due to the decrease in profit margin in the face of increasing costs in the same periods and withdrawals from production started. Similarly, in another study conducted in the agricultural sector, it is reported that the terms of trade developed against producers (29). In his study, Hossain (34) reports that especially in developing countries, long-run terms of trade will develop against enterprises producing agricultural and livestock products.

Within the scope of the research, it was found that although the price changes between input and output prices are realized to the detriment of breeding establishments, the purchasing power of breeding establishments did not change due to the increase in production. In other words, while the NITOT index, which is an indicator of economic welfare, decreased, the INTOT index, which is the purchasing power of breeding enterprises between 2017 and 2022, remained constant. Accordingly, it was determined that there was a horizontal course in the economic welfare of cattle fattening enterprises, in other words, there was no sharp change in a positive or negative direction, and economic welfare did not change in terms of cattle fattening enterprises. However, it is clear that this situation is misleading. It can be stated that the recent increase in meat production in Türkiye is due to meat imports and slaughter of cows rather

than a real increase in production (35). As a matter of fact, in this study, it is revealed that the purchasing power of breeding establishments decreased by 12.7%, 13.6% and 19.1% in 2011, 2014 and 2018 when the data on meat imports excluded, which caused an artificial increase.

Apart from meat imports, another factor that causes an artificial increase in meat production is the slaughter of breeding dairy animals. Changes in milk and feed price parity affect livestock prices and meat production. In years when milk-feed parity decreases, the number of female and milking cows sent to slaughter increases as the cost of keeping live animals increases for producers (33, 36). This situation causes an increase in artificial production outside the activities of breeding establishments. Especially in 2008 and 2021, when the milk-feed parity was below 1 in Türkiye, dairy animals were slaughtered, leading to an increase in meat production (35). Therefore, the INTOT index increased in these periods.

The study finds that the purchasing power (INTOT) of breeding farms increases in 2020-2021, when the Covid 19 pandemic occurred, but the economic welfare power (NITOT) of farms decreased. In parallel with the results of this study, Tuncel (37) reports that a 1% increase in restrictions during the pandemic period in Türkiye causes an 11% decrease in meat demand.

In the study, it is found that a 1-unit increase in agricultural and livestock subsidies (ASDI) causes an increase of 0.6156 units on NITOT. Accordingly, subsidies affect the economic welfare of the farms not only directly but also indirectly through terms of trade. There is no study in the literature that focuses on the relationship between terms of trade and subsidies. However, Demir and Yavuz (38) report that there is a statistically significant relationship between livestock subsidies and the number of animals and animal production. In the study, it is also found that a 1 unit increase in the consumer price index causes a 0.7264 unit decrease unit in the terms of trade. Accordingly, an increase in the inflation level causes a decrease in the terms of trade and consequently a decrease in the economic welfare of breeding establishments. In parallel with the finding of this study, Aral et al. (39) reports in their study that an increase in an income of breeding establishments remains below the cost increases due to the inflation in Türkiye after 2018. It can be said that the fact that the changes in the price of carcasses have remained far below the increase in costs over the last 10 years is an important obstacle to the economic sustainability of establishments. In the research, it can be said that inflation, meat imports, changes in milk/feed parity and livestock supports have affected the economic welfare levels of cattle breeding establishments, and in this context, it can be said that the establishments that had to produce by being squeezed between price and cost pressure in the market have turned into structures that can survive with livestock supports (credit, feed, etc.) over time.

In conclusion, although practices such as improvement in livestock support and import restriction program provide significant economic contributions to breeders, it is important to reduce production costs for the sustainability of a farm. In this context, in the livestock policies to be taken in this context, on the one hand, public authorities should support the economic welfare and purchasing power of cattle breeding enterprises, on the other hand, it is necessary to realize the necessary structural transformation that will increase the demand of the consumer and enable the market to return to its normal functioning.

The findings of this study are based on secondary data; when compared to future studies with primary data, they will provide an important reference point for policymakers to develop more accurate and data-driven strategies.

Conflict of Interest

We certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

Funding

This study is not funded.

Authors' Contributions

Motivation / Concept: Seyfettin TUNCEL
Design: Seyfettin TUNCEL, Taylan Taner DOĞAN, Pınar DEMİR AYVAZOĞLU
Control/Supervision: Pınar DEMİR AYVAZOĞLU
Data Collection and / or Processing: Seyfettin TUNCEL
Analysis and / or Interpretation: Taylan Taner DOĞAN
Literature Review: Seyfettin TUNCEL
Writing the Article: Seyfettin TUNCEL, Taylan Taner DOĞAN, Pınar DEMİR AYVAZOĞLU
Critical Review: Taylan Taner DOĞAN, Pınar DEMİR AYVAZOĞLU

Ethical Approval

There is no need for ethics committee and other ethics committee decisions regarding the use of experimental animals.

References

1. Holden E, Linnerud K, Banister D. The imperatives of sustainable development. Sustain Dev. 2017;25(1):213-26.
2. Gedik Y. Sosyal, ekonomik ve çevresel boyutlarla sürdürülebilirlik ve sürdürülebilir kalkinma. International Journal of Economics, Politics, Humanities & Social Sciences. 2020;3(3):196-215.
3. Sidhoum AA, Dakpo KH, Latruffe L. Trade-offs between economic, environmental and social sustainability on farms using a latent class frontier efficiency model: Evidence for Spanish crop farms. PLoS One. 2022;17(1):e161190.
4. Njoroge M, Anderson W, Mbura O. Innovation strategy and economic sustainability in the hospitality industry. Bottom Line. 2019;32(4):253-68.
5. Schwab PM. Two measures of purchasing power contrasted. Mon Lab Rev. 1971;94:3.
6. Dutia BP. Long term factors influencing terms of trade of agriculture with special reference to India. Indian J Agric Econ. 1950;13:184-205.
7. Eckaus RS. The factor proportions problem in underdeveloped areas. Am Econ Rev. 1955;45(4):539-65.
8. Harris JR, Todaro MP. Migration, unemployment and development: a two-sector analysis. Am Econ Rev. 1970;60(1):126-42.
9. Corden EM, Findlay R. Urban unemployment, intersectoral capital mobility and development policy. Economica. 1975;42:59-78.
10. Carter MR. The economics of price scissors: Comment. Am Econ Rev. 1986;76(1):1192-4.
11. Keyder N. Türkiye'de tarımsal reel gelir ve kırsal refah endeksi. ODTÜ Gelişme Dergisi. 1976;12(1):57-73.
12. Kip E. Türkiye'de tarımsal ürünlerde iç ticaret hadleri. 1st ed. Erzurum, Türkiye: Atatürk Üniversitesi Press; 1981.
13. Çetinkaya C. İç ticaret hadleri. Maliye Dergisi. 1979;14(1):157-71.
14. Uzunöz M, Esengün YAK. Internal terms of trade and risk analyses in milk production in Türkiye. Gaziosmanpaşa Üniv Ziraat Fak Derg. 2004;21(2):39-48.
15. Uzunöz M. Türkiye'de baklagil ürünlerinde iç ticaret hadleri. GOÜ Ziraat Fak Derg. 2009;2(1):29-37.
16. Mencet Yelboğa MN, Sayın C, Eryiğit FD. Türkiye'de domates üretiminde iç ticaret hadleri. Ziraat Mühendisliği Dergisi. 2019;367(1):6-12.
17. Mencet Yelboğa MN, Sayın C, Eryiğit FD. Türkiye'de turunçgil üretiminde iç ticaret hadleri. Third Sector Social Economic Rev. 2018;53(3):881-90.
18. Kızılaslan N, Kızılaslan H, Çift A. Türkiye'de ayçiçeği tarımında iç ticaret hadleri (Tokat ili örneği). Gaziosmanpaşa Bilimsel Araştırma Dergisi. 2022;11(1):98-107.

19. Tuncel S, Cevger Y. Et ithalatının Ankara ili sığır besi işletmelerinde iç ticaret hadleri, fiyat, üretim ve gelir dalgalanmaları üzerine etkisi. Vet Hekim Der Derg. 2017;17(1-2):126-35.

20. Çolakoğlu LT. Türkiye'de iç ticaret hadleri [tez]. Ankara: Gazi Üniversitesi; 1986.

21. TCHMB. Türkiye Cumhuriyeti Hazine ve Maliye Bakanlığı Muhasebat Genel Müdürlüğü verileri 2022 [Internet]. [cited 2023 Dec 21]. Available from: https://muhasebat.hmb.gov.tr/duyuru/2022-yili-merkezi-yonetim-aylik-mali-istatistikleri-yayimlandi-6

22. TSI. Turkish Statistical Institute 2023 Metodoloji değişikliği [Internet]. [cited 2023 Dec 21]. Available from: https://data.tuik.gov.tr/Bulten/Index?p=Kirmizi-Et-Uretim-Istatistikleri-Subat-2011-8479

23. UKON. Ulusal Et Konseyi carcass prices. Ankara, Türkiye [Internet]. [cited 2023 Dec 21]. Available from: http://www.ukon.org.tr/fiyatlar.aspx

24. TSI. Turkish Statistical Institute 2010-2022 Meat import [Internet]. [cited 2023 Dec 21]. Available from: https://iz.tuik.gov.tr/#/showcase/SC-2851FY777F34D2R/db-9e59be0de2nsx9a?token=8d79727fff862a891ce574d27220bfebbf66fecd

25. TSI. Turkish Statistical Institute 2010-2022 Annual meat and milk production statistics [Internet]. [cited 2023 Dec 21]. Available from: https://data.tuik.gov.tr/Bulten/Index?p=Kirmizi-Et-Uretim-Istatistikleri-202249696#:~:text=Bu%20kapsamda%20bir%20%C3%B6nceki%20y%C4%B1la,13%20bin%20586%20ton%20oldu

26. TSI. Turkish Statistical Institute 2010-2022 Agricultural input index [Internet]. [cited 2023 Dec 21]. Available from: https://data.tuik.gov.tr/Bulten/Index?p=Tar%25C4%25B1msal-Girdi-Fiyat-Endeksi-Ekim-2022-45782&dil=1

27. MMB. Meat and Milk Board monthly meat sale data. Ankara, Türkiye [Internet]. [cited 2023 Dec 21]. Available from: https://www.esk.gov.tr/tr/10284/Bilgi-Edinme

28. Şanver C, Söğüt Y. Türkiye'de 2000-2021 yılları arası tarımsal desteklerin tarım sektörünün gelişimine etkisi. Ekonomi ve Finans Konularına Teorik Yaklaşımlar. 2023;20231:1-16.

29. Arısoy H. Impact of agricultural supports on competitiveness of agricultural products. Agric Econ. 2020;66(6):286-95.

30. Yelboğa MNM, Sayın C, Eryiğit FD. Domestic terms of trade for tomato prices in Türkiye. Ziraat Mühendisliği. 2019;367:6-12.

31. Aktaş G. Canlı hayvan ve karkas ithalatının kırmızı et fiyatlarına etkisi: Türkiye'de ithalatın regülasyonu. Gümrük ve Ticaret Dergisi. 2020;7(21):12-29.

32. Demir-Ayvazoğlu P, Aydın E. Canlı sığır ve sığır eti ithalatının hayvancılığa etkisi. 4th International Congress on Agriculture, Animal Science and Rural Development; 2020 Jun 12-14; Ankara, Türkiye.

33. Demir-Ayvazoğlu P. Türkiye'de süt sığırcılığında destekleme politikalarının etkileri üzerine bir değerlendirme. 2nd International Çukurova Agriculture and Veterinary Congress; 2021 Jan 4-5; Adana, Türkiye.

34. Hossain AA. Macroeconomic policies and agricultural terms of trade, Bangladesh, 1952–2005. J Contemp Asia. 2009;39(2):204-30.

35. TUSEDAD. Cattle breeders association milking animals slaughter data. Ankara, Türkiye [Internet]. [cited 2023 Aug 15]. Available from: https://www.tusedad.org/faaliyetler/haberler

36. Kalkan S, Cünedioğlu HE. Et fiyatlarındaki artışa nasıl bakılmalı. Türkiye Politikaları Araştırma Vakfı Politika Notu. 1st ed. Ankara, Türkiye; 2010.

37. Tuncel S. Comparison of different levels of restrictions imposed in Türkiye during the COVID-19 pandemic with the data on the demand for meat at the outlets of the Meat and Milk Board. 4th International Çukurova Agriculture and Veterinary Congress; 2023 Feb 27-28; Adana, Türkiye.

38. Demir N, Yavuz F. Hayvancılık destekleme politikalarına çiftçilerin yaklaşımlarının bölgelerarası karşılaştırmalı analizi. Atatürk Üniversitesi Ziraat Fakültesi Dergisi. 2010;41(1):113-21.

39. Aral Yılmaz, Altın O, Şahin TS, Gökdai A. Türkiye sığır besiciliğinde yapısal durum ve sektörel analiz. Vet Hekim Der Derg. 2020;91(2):182-92.