ECONOMICS AND ADMINISTRATIVE SCIENCES

Modern Analysis and Researches

Editors

Gülsen KIRAL

Davut KARAMAN

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Economics and Administrative Sciences Modern Analysis and Researches

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PREFACE

The book, titled "Economics and Administrative Sciences Modern Analysis and Researches," covers research undertaken by highly regarded academic members from various parts of Turkey. The subject involves interdisciplinary research in areas that include Business Administration, Economics, Econometrics, and Political Science.

The book examines into both theoretical and applied approaches that are often used in the discipline of Social Sciences. The book covers a range of current subjects, such as banking, politics, air pollution, agricultural production, consumer behavior, digital technology, innovation, sustainable logistics, and Fin Tech.

There are ten chapters in the book. The first four chapters are devoted to business and cover subjects including digital technologies, banking, and money. The next three chapters are devoted to the topic of econometrics and include studies conducted at the macro and micro levels using a variety of econometric techniques, including Markov Analysis, ARDL, NARDL, GMM, and Panel Data Analysis. These approaches are used to datasets sourced from the World Bank, TURKSTAT, and the WoS database. The following two chapters focus on Agricultural Economics, including Agricultural Policies and the discipline of agricultural economics itself. The final section of this research focuses on the Turkish World, with a specific emphasis on evaluating social, economic, and political interrelations. This section encompasses scholarly publications that explore various topics, such as economic policy and global trade.

We are certain that this book will offer assistance to a wide range of readers who have an intense curiosity in studying and carrying out research in the field of social sciences. We believe that our book will be of great assistance to both the instructors and graduate students who have an active role in social sciences research. Additionally, we expect that it will also be beneficial to a broader spectrum of readers.

I would like to express my appreciation to all the authors who willingly offered their valuable time to contributing to our book, as well as to all the publishing company staff who carefully and professionally participated in numerous responsibilities, including formatting and printing.

Prof. Dr. Gülsen KIRAL

CONTENTS

A NEW HOUSING FINANCING MODEL BASED ON PARTNERSHIP WITH FIXED REPAYMENTS CONSIDERING RHYTHMIC SKIPS: SAMPLE APPLICATIONS

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1. Introduction

Acquiring shelter for needs such as survival, income, eating, health and rest is considered as the basic need of human beings. Owning a house is one of the basic needs of a person. House ownership is an innate dream for every individual and a necessary dream for the family. However, the main problem here is that human needs are unlimited and the resources to meet these needs are limited. In other words, the supply and demand imbalance in the housing sector is a major problem worldwide, especially in underdeveloped countries. However, due to the ever-increasing demand-supply gap in affordable housing, purchasing a house has now become a problematic situation, especially for low- and middle-income households (Razak and Tazwar, 2018: 2). Additionally, inequality and the affordability of housing due to rising housing prices because of inflation rates are another cause for concern.

One of the most important factors affecting housing supply and demand is income level. Regardless of the source and type of financing needed to purchase the house, income level forms the basis. Limited financing, inflation pressure and the resulting decrease in demand negatively affect the housing sector.

Thus, the financing factor has an important role in determining housing supply and demand. Therefore, banks and other financing companies that provide financing resources to institutions and individuals play an important role in the development of the housing sector (Tekeli, 1982: 62).

The housing sector, which has a very important place among classical investment instruments in Turkey, has been observed to have a rapid growth trend in international markets (Ayan, 2011: 140). However, one of the main problems of developing countries such as Turkey is the search for funds for housing finance. However, even if sufficient funds are available, inefficient use of existing funds constitutes the basis of the financing problem of the sector (Berberoğlu and Teker, 2005: 59).

As it is known, banking services, which have become very widespread and effective today, offer many financing instruments of different types and features. One of these financing tools is the housing finance system. The housing finance system is a financial system aimed mostly at people with low and middle income levels or whose income has decreased due to inflation and who do not have the opportunity to purchase a house (Eroğlu and Erdaş, 2017: 16). In this system, individuals have the right to choose the maturity structure and payment methods for repayment of financing. Therefore, one of the most important advantages of the housing finance system is its flexibility. Another advantage of the housing finance system is that it enables individuals in need of housing to own a house in return for long-term loan borrowing at low amounts that will not impose a burden on them (Hanişoğlu and Güler, 2017: 344). Commercial banks, housing finance institutions, mortgage finance institutions, asset leasing companies, participation banks, mass housing administration, financial leasing companies and mortgage banks play an active role in this system.

The housing finance system in a country offers investment options on the one hand, and meets the needs of those who want to own a house on the other. Therefore, the housing market and the housing finance systems that make this market functional are important for countries (Ayan, 2011: 140). Since owning a house is generally a costly venture, it is very difficult for middle and low-income families to buy a house with only their own savings. In addition, due to inflation, the savings of especially low- and middle-income people are often insufficient against production costs, and savings melt away day by day relative to the time value of money. Housing finance is one of the factors affecting the supply and demand of housing, which is an important problem in society due to its economic, social and psychological effects (Kömürlü and Önel, 2007: 91). Meeting the housing need and demand depends on the existence of an effectively

functioning financial system. While the real estate market is developing rapidly in developing countries, this trend has not been experienced sufficiently in the field of housing finance. In parallel with these developments, the application of real estate-based financial assets, which could contribute to the development of the financial market in Turkey, has not been sufficiently operationalised (Ayan, 2011: 140). In order to ensure an effective housing finance system, economic units with excess funds must have the function of transferring these funds to individuals and organisations that want to buy housing (Hanişoğlu and Güler, 2017: 339). However, it has been observed that some people avoid owning real estate by using interest-bearing financing methods because they are sensitive regarding the concept of interest. This situation creates an obstacle for these segments to own a house and negatively affects the stability of the financial markets. Therefore, to avoid any injustice to with such concerns, it seems that the housing financing needs of this segment should be met. The partnership-based housing finance model is one of these systems (Eroğlu and Erdaş, 2017: 15).

Most of the services offered by classical banks are based on interest. Very few of these services have been accepted by Islamic financial institutions and taken their place in the financial markets (Durmuş, 2011: 58). One and indeed the most preferred one of these financing tools is the housing finance system. The housing finance system offered by banks acting on an interest-free basis is based on the partnership-based housing finance system. Today, the functioning of the partnership-based housing finance system can be summarised as follows (Eroğlu and Erdaş 2017: 15; Akın, 1986: 151-152):

➢ The partnership-based housing finance system begins with a contract between the parties, that is, the credit institution and the customer agree to buy a house by providing financing at certain rates. This contract is in the form of a participation account and is a contract that imposes debt on both parties.

➢ The customer moves into the house and pays the rent and repayment of the house to the financial institution every month.

➢ With each monthly repayment, the customer's ownership share in the house increases, while the lending financial institution's share decreases.

➢ Rental income is shared between the parties every month in proportion to their shares.

➢ When the customer's share in the house reaches 100%, the customer becomes the owner of the house and the contract ends.

➢ Repayments are generally in the form of fixed, geometrically variable, arithmetically variable and derivatives.

It has been observed that Islamic finance institutions offer a housing finance system by taking into account interest rate comparison in determining the prices of assets. As a matter of fact, it has been shown that the mathematical formulas derived for Islamic housing financing are similar to the formulas used in classical loans, but differ because the interest rate is replaced by the rental rate (Meera and Dzuljastri, 2009). Siti and Azira (2013), who researched housing finance products offered in Malaysia, said that the bank continues to use the classical interest rate as a criterion. Hasan (2012) shared the same situation and concluded that Islamic banks always use the annuity formula to determine fixed installment payments in housing finance amortisation. As a result, it can be seen that the financial structure of the products in terms of cash flow is not much different from conventional banking in Islamic banking, but the Islamic housing finance system differs from the classical housing finance system because the interest rate is replaced with the rental rate. Although there are many studies in the literature on housing finance with interest-bearing methods, the study on housing finance with interest-free methods is quite limited. General formulas for the model where paybacks are fixed were derived by Meera and Razzak (2005). Different applications for the partnership-based housing finance model were presented by Rammal (2004), Siswantoro and Qoyyimah (2007), and Hijazi and Hanif (2010). General formulas for the geometric variation of repayments were derived by Eroğlu et al., (2010) and explained with examples. On the other hand, general formulas for piecewise geometric variations in repayments were derived by Eroğlu and Özdemir (2012), general formulas for the arithmetic variation were derived by Eroğlu et al., (2012), and general formulas for the pievewise geometric variations in repayments and rental payments were derived by Öztürk and Eroğlu (2012) via their partnership-based housing finance models and explained with practical examples. Salman (2014) proposed an alternative loan model for those who want to own an interest-free house and presented it along with its applications. Eroğlu and Erdaş (2017) proposed a housing finance model in which the amount of the first repayments is determined by the customer and explained the operation of the model with practical examples. Nasir and Abdullah (2019) proposed a new long-term Islamic housing finance model for low- and middle-income people, where the initial amount is kept low. Kurt and Okur (2020) developed an alternative financing model for participation banking in real estate financing and explained with examples that fact that the model can be applied by participation banks.

There are many alternative systems for financing houses built to meet the need for shelter, which is one of the basic mandatory needs of people (Can,

2011: 232). Yet, it is seen that many methods and models developed in providing housing finance are insufficient to solve many problems in today's life. However, those who are Muslims due to their religious beliefs stay away from the concept of interest. This situation prevents people who are religiously sensitive from owning and purchasing their own houses without paying interest. Therefore, this situation will bring social injustice to Muslim countries or individuals who stay away from interest due to their religious beliefs. For this reason, it is important to develop payment methods for housing finance in order not to be unfair to those who want to stay away from interest and in order to appeal to different types of customer profiles (Eroğlu and Erdaş, 2017: 15).

The development of the financial sector is directly proportional to the improvement of the housing finance system and therefore to the high housing supply and demand. For this reason, collecting the necessary funds from economic units with excess funds and transferring them to individuals and organisations that need borrowing to buy housing is an indispensable part of an effective housing finance system. Based on this, this study proposes an alternative housing finance model based on partnership that is compatible with the Islamic housing finance system. In this study, a partnership-based housing finance model having fixed repayments with rhythmic skipping is proposed for the first time. In this direction, the general formulas of the proposed model are derived and explained with examples. What is meant by extra repayment with rhythmic skipping is a cyclical situation where payment is made in a certain number of periods and no payment is made in a certain number of periods. The aim of this study is to offer partnership-based alternative housing financing payment methods to individuals who want to buy their own house and who want to own a house without paying interest. It is thought that this study will help customers who want to own a house without interest and financial institutions that want to appeal to the interest-free segment by offering a new housing financing method based on partnership.

2. Proposed Model

The partnership-based housing finance model begins with the credit institution and the customer agreeing together and purchasing a house by providing financing at certain rates. The customer moves into the house and gives the rent of the house and any extra repayment, if any, to the banks or credit institution every month. Since the rental income is shared between the parties in proportion to their shares, the customer's rental share is recorded as a repayment to the credit institution. Thus, while the customer's share in the house increases

with the above-mentioned payments every month, the credit institution's share decreases. When the customer's share in the house reaches 100%, the house becomes the customer's and the process ends. In this model, extra repayments are made in a rhythmic skipping way. In other words, it continues cyclically, with extra payment being made in n terms and not being paid in m terms. Another assumption of the proposed model is that the extra repayment amounts are equal to one another.

The model consists of z periods. Except for the last period, each period consists of n terms in which extra repayments are made and m terms in which extra repayments are not made. The last period consists of the terms in which n extra repayments are made. Therefore, each period, except for the last one, consists of n + m terms, and the last period consists of n terms. In the light of these explanations, the number of cycles at which the process will end, in other words the customer's share will be 100%, can be given by the equation N:

$$N = (z-1)(n+m)+n \tag{1}$$

Other notations of the proposed model are given below:

z: shows number of periods,

n: the number of terms in which extra repayments are made in a period,

m: the number of terms in which extra repayments are not made in a period,

A: the customer's share at the time the house is purchased,

$D_{k,j}$: the extra repayment amount in the jth term of the kth period; wherein E is the periodic rent of the house,

$E_{k,j}$: customer's rental income in the jth term of the kth period

C: the purchase price of the house,

$R_{k,j}$: Customer's share amount in the jth term of the kth period

In this case, the customer's share amount $R_{k,j}$ in the jth term of the kth period is shown by the following formula:

$$D_{k,j} = \begin{cases} 0, j = n+1, n+2, ..., n+m \ ; k = 1, 2..., z-1 \\ D, j = 1, 2..., n, \ ; k = 1, 2, ..., z \end{cases} \tag{2}$$

$E_{k,j}$, which is the rental income of the customer, can be shown with equation (3).

$$E_{k,j} = \left(E \middle/ C \right) R_{k,j-1} \tag{3}$$

In this case, the customer's share amount $R_{k,j}$ in the jth term of the kth period is shown by the following formula:

$$R_{k,j} = R_{k,j-1} + E\left(\frac{R_{k,j-1}}{C} \right) + D_{k,j}$$

$$R_{k,j} = R_{k,j-1}\left(1+\frac{E}{C}\right) + D_{k,j} \tag{4}$$

$$R_{k,j} = HR_{k,j-1} + D_{k,j}, \qquad k = 1, 2, ..., z; j = 1, 2, ..., n+m$$

where,

$$R_{k,j-1} \ll \left\{ \begin{array}{l} R_{\ddot{u}-\ddot{u} \ +} \quad j = 1; k = 2, ..., z \\ \quad A, j \quad 1; k \quad 1 \\ R_{k,j-1} \ , \ j = 2, ..., n, n+1, ..., n+m \ ; k = 1, ..., z \end{array} \right\} \tag{5}$$

$$H = 1 + \frac{E}{C}$$

Based on equation (4), for example for four periods; the situation in which extra repayment is made for three terms and no extra repayment is made for two terms in each period apart from the last one, and the last period in which extra payment is made in the first three terms is shown in Annex-1.

From here, we can write the customer's share amount for the last term (where the customer's share is 100%) as follows:

$$R_n = R_{z,n} = AH^{z(n+m)-m} + D\left(\sum_{k=1}^{z}\sum_{j=(k-1)(m+n)}^{(k-1)(m+n)+n-1} H^j\right) \tag{6}$$

Since the customer share for the last term will be one hundred percent, in other words, the customer share will be equal to the purchase price of the house (C), the following formula can be written.

$$C = AH^{z(n+m)-m} + D\left(\sum_{k=1}^{z}\sum_{j=(k-1)(m+n)}^{(k-1)(m+n)+n-1} H^j\right) \tag{7}$$

$$= AH^{z(n+m)-m} + D\left\{\left(\frac{C(H^{z(m+n)-1})}{E}\right)\left(\frac{H^{-m}-H^{-(m+n)}}{1-H^{-(m+n)}}\right)\right\}$$

Based on equation (7), (D) and the customer's initial share amount (A) are shown in equations (8) and (9).

$$D = \frac{E(C-AH^{z(n+m)-m})(1-H^{-(m+n)})}{C(H^{z(m+n)}-1)(H^{-m}-H^{-(m+n)})} \tag{8}$$

$$A = \frac{C - D\left\{\dfrac{C(H^{z(m+n)}-1)}{E}\left(\dfrac{H^{-m}-H^{-(m+n)}}{1-H^{-(m+n)}}\right)\right\}}{H^{z(n+m)-m}} \tag{9}$$

3. Sample Applications of The Proposed Model

In this section, sample applications of the model recommended for individuals who want to buy a house with interest-free financing method are included.

Example 1: A house worth 100,000 ₺ is purchased by paying 25,000 ₺ from the customer and the remaining 75,000 ₺ from the credit institution. Rental income is 3,000 ₺ per month and all is paid to the credit institution. Extra repayments continue on a cyclical basis, being made for 3 months and not made for 2 months. What should be the extra repayments so that the customer share can be 100% in 13 months?

In this case, the data of the problem is as follows;

C: 100.000, A: 25.000, z: 3, n: 3, m: 2, N: 13, E: 3.000

The customer's extra refund is calculated using Equation (8). Under this data, the customer's extra refund amount is 5,844.72 ₺. The payment (amortisation) plan of the house that the credit institution will offer to the customer is shown in Table 1.

Table 1: Installments, Return on Capital and Return of Capital

Month (k,j)	Customer's Share Amount $R_{k,j} = HR_{k,\,j-1} + D_{k,j}$	Customer's Rental Income $E_{k,j} = (E/C)\,R_{k,\,j-1}$	Customer's Extra Repayment $D_{k,j} = \begin{cases} 0, j = n+1, n+2, ..., n+m \\ D, j = 1, 2, ..., n \end{cases}$
--	25.000	--	--
1,1	31.594,72	750	5.844,72
1,2	38.387,28	947,84	5.844,72
1,3	45.383,62	1.151,62	5.844,72
1,4	46.745,13	1.361,51	0
1,5	48.147,48	1.402,35	0
2,1	55.436,62	1.444,42	5.844,72
2,2	62.944,44	1.663,10	5.844,72
2,3	70.677,49	1.888,33	5.844,72
2,4	72.797,81	2.120,32	0
2,5	74.981,74	2.183,93	0
3,1	83.075,91	2.249,45	5.844,72
3,2	91.412,91	2.492,28	5.884,72
3,3	100.000	2.742,39	5.844,72

Example 2: A house worth 100,000 ₺ is purchased with a monthly rental income of 2,000 ₺. The customer makes rhythmic skipping payments, paying 6,000 ₺ for three months and not paying for one month. What should the customer pay when purchasing the house so that the customer's share becomes 100% in 15 months?

In this case, the data of the problem is as follows;

C: 100.000, z: 4, n: 3, m: 1, N: 15, E: 2.000, D: 6.000

The customer's extra refund is calculated using Equation (9). Under this data, the customer's extra refund amount is 12,600.87 ₺. In this case, the payment (amortisation) plan of the house that the credit institution will offer to the customer is shown in Table 2.

Table 2: Installments, Return on Capital and Return of Capital

Month (k,j)	Customer's Share Amount $R_{k,j} = HR_{k, j-1} + D_{k,j}$	Customer's Rental Income $E_{k,j} = (E/C) R_{k, j-1}$	Customer's Extra Repayment $D_{k,j} = \begin{cases} 0, j = n+1, n+2, ..., n+m \\ D, j = 1, 2, ..., n \end{cases}$
--	12.600,87	--	--
1,1	18.852,89	252,02	6.000
1,2	25.229,95	377,06	6.000
1,3	31.734,55	504,60	6.000
1,4	32.369,24	634,69	0
2,1	39.016,62	647,38	6.000
2,2	45.796,95	780,33	6.000
2,3	52.712,89	915,94	6.000
2,4	53.767,15	1.054,26	0
3,1	60.842,49	1.075,34	6.000
3,2	68.059,34	1.216,85	6.000
3,3	75.420,53	1.361,19	6.000
3,4	76.928,94	1.508,41	0
4,1	84.467,52	1.538,58	6.000
4,2	92.156,87	1.689,35	6.000
4,3	100.000	1.843,14	6.000

4. Results and Recommendations

The housing sector in the world is an important sector due to its rapid development and creation of added value to the country's economies. In

developing countries such as Turkey, it is very difficult for individuals to own a house because their capital savings are very low, interest rates are high and there is pressure from inflation. When individuals who do not have sufficient savings reach a certain income level, they primarily want to own a house where they can live well with their family. However, if individuals have a certain income level but cannot afford to purchase a house, they obtain the portion they need from credit institutions for a certain amount and over a period of time. This situation occurs especially in underdeveloped and developing countries with low savings levels. However, investors who want to invest their savings tend to buy real estate first.

Today, almost all of the repayment plans offered by financial institutions are spread over time with a certain interest rate, in which the ownership of the real estate is mortgaged to the customer. This study is important in terms of providing credit institutions with alternative payment methods for housing finance and offering payment plans in line with investors' wishes, and establishing theoretical foundations for new research. In partnership-based housing finance models, repayments are generally fixed. Thanks to payment plans created with different methods and to the flexibility of payment plans, different customer profiles can be addressed. Therefore, today new models are being developed in the housing finance system. In this study, general formulas of the partnership-based housing finance model have been developed for the situation where repayments are fixed within the period and fixed repayments with rhythmically skipped terms from one period to the next, and the model is explained with practical examples.

The development of models for housing finance is very important both in terms of increasing the housing supply and making it easier for low- and middle-income families to own a house, and in terms of developing the housing sector and related financial market systems at macro and micro levels. For the healthy development and sustainability of the housing finance system, long-term, low-cost financing is required together with the development of capital markets and legal regulations. In this regard, legal regulations that enable financing institutions to use long-term housing loans against mortgages for those who want to own a house, a variety of instruments that capital markets can use and flexible payment models should be developed.

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Appendix 1

$$R_{1,1} = R_{1,0}\left(1 + \frac{E}{C}\right) + D_{1,1} = AH + D$$

$$R_{1,2} = R_{1,1}\left(1 + \frac{E}{C}\right) + D_{1,2} = AH^2 + DH + D$$

$$R_{1,3} = R_{1,2}\left(1 + \frac{E}{C}\right) + D_{1,3} = AH^3 + DH^2 + DH + D$$

$$R_{1,4} = R_{1,3}\left(1 + \frac{E}{C}\right) + D_{1,4} = AH^4 + DH^3 + DH^2 + DH + 0$$

$$R_{1,5} = R_{1,4}\left(1 + \frac{E}{C}\right) + D_{1,5} = AH^5 + DH^4 + DH^3 + DH^2 + 0$$

$$R_{2,1} = R_{1,5}\left(1 + \frac{E}{C}\right) + D_{2,1} = AH^6 + DH^5 + DH^4 + DH^3 + D$$

$$R_{2,2} = R_{2,1}\left(1 + \frac{E}{C}\right) + D_{2,2} = AH^7 + DH^6 + DH^5 + DH^4 + DH + D$$

$$R_{2,3} = R_{2,2}\left(1 + \frac{E}{C}\right) + D_{2,3} = AH^8 + DH^7 + DH^6 + DH^5 + DH^2 + $$
$$\cdot DH + D$$

$$R_{2,4} = R_{2,3}\left(1 + \frac{E}{C}\right) + D_{2,4} = AH^9 + DH^8 + DH^7 + DH^6 + DH^3 + $$
$$DH^2 + DH + 0$$

$$R_{2,5} = R_{2,4}\left(1 + \frac{E}{C}\right) + D_{2,5} = AH^{10} + DH^9 + DH^8 + DH^7 + DH^4 + $$
$$DH^3 + DH^2$$

$$R_{3,1} = R_{2,5}\left(1 + \frac{E}{C}\right) + D_{3,1} = AH^{11} + DH^{10} + DH^9 + DH^8 + DH^5 + $$
$$DH^4 + DH^3 + D$$

$$R_{3,2} = R_{3,1}\left(1 + \frac{E}{C}\right) + D_{3,2} = AH^{12} + DH^{11} + DH^{10} + DH^9 + DH^6 + $$
$$DH^5 + DH^4 + DH + D$$

$$R_{3,3} = R_{3,2}\left(1 + \frac{E}{C}\right) + D_{3,3} = AH^{13} + DH^{12} + DH^{11} + DH^{10} + DH^7 + $$
$$DH^6 + DH^5 + DH^2 + DH + $$

$$R_{3,4} = R_{3,3}\left(1 + \frac{E}{C}\right) + D_{3,4} = AH^{14} + DH^{13} + DH^{12} + DH^{11} + DH^8 + $$
$$DH^7 + DH^6 + DH^3 + DH^2 + DH + 0$$

$$R_{3,5} = R_{3,4}\left(1 + \frac{E}{C}\right) + D_{3,5} = AH^{15} + DH^{14} + DH^{13} + DH^{12} + DH^9 + $$
$$DH^8 + DH^7 + DH^4 + DH^3 + DH^2 + DH + 0$$

$$R_{4,1} = R_{3,5}\left(1 + \frac{E}{C}\right) + D_{4,1} = AH^{16} + DH^{15} + DH^{14} + DH^{13} + DH^{10} + $$
$$\cdot DH^9 + DH^8 + DH^5 + DH^4 + DH^3 + D$$

CHPATER II

DIGITAL TECHNOLOGIES AND THE EFFECTS OF DIGITALIZATION ON THE ECONOMY

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1. Introduction

When evaluated within the historical process, humankind has made intense efforts to cope with difficult climatic conditions and improve the quality of life since its existence. As a result of these intensive efforts, human beings, who took fire under control, switched to agricultural order with the invention of the heavy plow in the 10th century, established the agricultural society and started the agricultural economy. In the 18th century, with the invention of the steam engine, industrial production started and the industrial society and industrial economy were established. At this point, the 18th century, which included the first industrial revolution, was a period when freedoms and structural transformations began and left its mark on world history. At the beginning of the 20th century, the second industrial revolution started with the transition to the electrical system in production. Following this period, the third industrial revolution based on electronic systems and automation technologies emerged at the end of the 20th century. These successive innovations have led to radical changes in the structure of societies and dragged societies into a constant transformation. In the 21st century, information has become the basic element in shaping societies and production. So much so that the 21st century we are in appears as an age where science or knowledge production turns into technology and technology turns into new products. Today, developments in Information and Communication Technologies (ICT) increase the interest of individuals and

companies in this field day by day. The adoption of technology-based innovative products by individuals and companies that make up the structure of societies, the medical technology transformation in the field of health, three-dimensional printer, big data, internet of things, cloud computing, artificial intelligence, innovations in technologies, the emergence of digital transformation in the 21st century. plays a very important role in its emergence. In addition, digital transformation aims to digitalize all sub-sectors of the economy by spreading over a wide range from advertising to finance, from education to health, from transportation to logistics. Accordingly, the aim of digital transformation is to create a new digital society and digital economy order and integrate societies into the "Industry 4.0" era, which is described as a new step in industrialization.

In today's age of digitalization, where very rapid technological transformation and developments are experienced, it is of great importance to expand the use of ICT by increasing knowledge and investments in ICT for countries and companies that want to exist in the global world order and have a say in international trade. In the digital economy order that will emerge as a result of digital transformation, countries that can transform information production and ICT efficiency into economic added value will be defined as the successful economies of this period. At this point, countries that invest in telecommunication infrastructure, encourage increased ICT dissemination, and support technological product development and R&D activities will gain significant opportunities for development, growth and development in the digital economy order. Although there are widespread findings that the impact of digital transformation on economic growth will mostly positively affect the social, cultural and economic structures of societies, there are also approaches that digital transformation threatens to destroy some professions and that this threat will lead to unemployment. The impact of digital transformation on unemployment is of a different dimension. It is expected that occupational groups dominated by new technologies will be formed instead of occupational branches that are likely to disappear. In this section, rather than the idea that digital transformation will lead to unemployment, it is tried to emphasize that employment should shift to high-tech sectors by training a qualified workforce with a high level of education who is eager to increase efficiency and quality in the digital economy order.

2. Conceptual Framework

Technology has played a significant role in the formation of civilizations throughout history, and every technological development in the social order has

been effective in ensuring social welfare. In this context, the industrialization step that emerged with the discovery of the steam engine in the 18th century continues today with the digital transformation process in the economy depending on the developments in ICT. In this context, explanations of basic concepts such as digital economy, digital transformation, digital technologies and digitalization, which form the framework of this study, are included.

Recently, especially in ICT, advanced robotics, big data, cloud computing, internet of things, artificial intelligence, etc. Developments in technologies have revealed the notion of digital transformation. Developments in the field of digitalization in the 21st century have the potential to radically affect country economies when evaluated from a macroeconomic perspective.

2.1. Digitalization

Digitalization refers to the transformations that will occur when information and communication technologies that produce, process, share and transfer information are adopted by the decision-making mechanisms that make up the society (Katz, 2017, p. 6). Digitalization depends on the widespread use of transmission through electromagnetic systems, called information and communication technologies, computer technologies (tablets, wireless devices and computers) (fixed broadband and mobile) and software programs (artificial intelligence and machine learning) (Katz, 2017, p. 6). The age of digitalization started in the 20th century with the invention of the first modern programmable computer and took its current form depending on the developments in the field of ICT. In this context, ICT, one of the most developing areas of the 21st century, plays a significant role in the production of digital information, leading to an increase in the knowledge of societies. This increasing knowledge has reached larger audiences through internet technologies and has been effective in the emergence of the phenomenon of digitalization around the world (Aslıyüksek, 2016, s. 88).

2.2. Digital Transformation

Concept of digital transformation, big data, learning machine, artificial intelligence, internet of things, etc. It is defined as the process of integrating digital technologies such as robotic systems into the manufacturing industry and digitalizing all production stages. However, it should be noted right away that digital transformation not only affects the manufacturing industry but also affects all sectors of the economy and social life, from health to education, from

agriculture to finance, creating a new concept of "digital economy" (T.R. Ministry of Science, Industry and Technology, 2017a, 20). Digital transformation, unlike the physical and industrial-oriented production seen in previous periods, has a structure that is based more on information sharing and collaboration and aims to produce technology-centered high added value. Digital transformation, which occurs due to ICT-based developments, is the preparation phase for the 4th industrial revolution, which is described as the "Industry 4.0" era. This process briefly defines the concept of Industry 4.0 as a smart production period based on the communication between all objects of economic value through ICT, depending on the advances in the fields of artificial intelligence, three-dimensional printers, cloud computing and robotic technology (Aksoy, 2017, s. 37).

With digital transformation, it is look forward to create new jobs, increase efficiency and reduce environmental problems, particularly in the field of economy. However, for predict the effects of digital transformation on the economy, it is convenient to examine what benefits previous industrial revolutions brought to the world economy. (T.R. Ministry of Science, Industry and Technology, 2017a, s. 22-23).
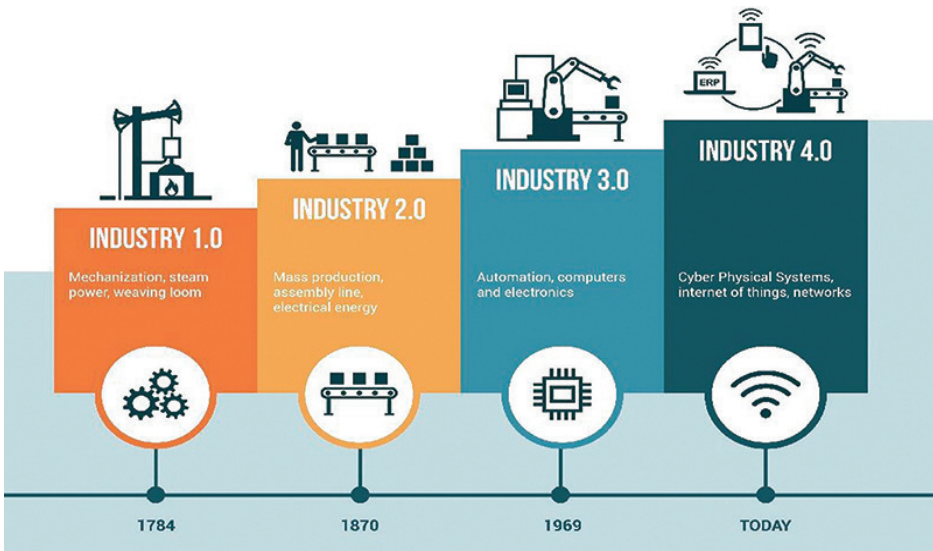
Figure 1: Technologies Shaping the Fourth Industrial Revolution

Technologies shaping the Fourth Industrial Revolution (Figure 1); When these technologies are divided into four groups, the number-one group includes

technologies that extend digital technologies. Blockchain and distributed ledgers, internet of things and quantum computing in this group develop innovative resolutions in the field of information storage, processing and transmission. The second group consists of technologies such as advanced materials, and robotics, artificial intelligence, additive manufacturing and 3D (three-dimensional) printers that reorganize the physical world. These technologies have the potential to reorganize industrial production, transportation infrastructure and trade relations. The target of the technologies in the third group is humans. Biotechnologies, neurotechnologies, virtual and augmented reality can change the way people associate with each other and the world. Ethical issues mostly focus on the technologies in this group. In the fourth group, there are studies in the fields of energy, geoengineering and space technologies.

In the interaction between technologies, these technologies have common features even though they are developed by different disciplines. *First*, the technologies of the Fourth Industrial Revolution, as in other industrial revolutions, develop under the conditions prepared by the previous revolutionJust as the 2nd and 3rd Industrial Revolutions required electrical grids, the Fourth Industrial Revolution relies on the information storage, processing and transmission capabilities of its predecessor. However, there is also a rupture as well as continuity. Inevitably, the question comes to mind whether we can move on to the 4th Industrial Revolution without completing the third revolution and strengthening and expanding the digital infrastructure. Moreover, when the funds allocated to education and R&D are taken into consideration, there is a large gap between developed countries and developing countries. If action is not taken against it, the Fourth Industrial Revolution could further deepen this divide. Talking about the Fourth Industrial Revolution in a developing country where there is still no cheap, fast, quota-free, uncensored internet can become tragicomic. *Second*, the technologies being developed are not just digital and have the power to transform the physical world. In the 3rd Industrial Revolution, especially after the spread of the internet, one of the most discussed issues was the digitalization of physical products. The data obtained from digital activities is used to create different physical objects, actions or services. Engine parts can be made from 3D (Three Dimensional) printers. The internet of things differentiates people's relationship with home appliances.

The Fourth Industrial Revolution will greatly affect not only the economy but also daily life, with the opportunities it offers and the problems it creates. In this context, it can be said that it has a greater potential to contribute to

human development than the Second Industrial Revolution. *Thirdly*, the greatest power of these technologies is that when they come together, they create new opportunities and further increase each other's power. There are various examples in history of a technology affecting other technologies, such as steam power affecting railways. However, in the 4rd Industrial Revolution, the interaction between technologies is more intense and productive. On the one hand, artificial intelligence accelerates the discovery of new materials, and on the other hand, new materials enable the construction of more powerful computers. Fourth, technologies create similar benefits and challenges. When the articles and speeches about the 4rd Industrial Revolution are examined, it is seen that they are more consumer-oriented. They make life easier, reduce costs and increase consumer choice and quality. But these technologies also have the potential to increase inequality and unemployment. There are various threats to health, security and privacy. Innovations have come one after another in the world economy since the 18th century. Agricultural economy, which started with the agricultural revolution and gained importance with the invention of the heavy plow, was the dominant economic system until the 18th century. By the end of the 18th century, the use of steam technologies started the first industrial revolution. The 2nd industrial revolution took place with the use of electricity in production and the integration of the mass production band system into the manufacturing industry. The 3rd industrial revolution emerges with the use of electronic and automation technologies in the manufacturing industry. In today's 21st century world, the widespread use of information and communication technologies and the development of technologies based on cyber-physical systems enable societies to transition to a new industrial revolution based on digitalization (Uzkurt, 2017, p. 63). However, the evolution of societies into this fourth industrial revolution is possible by ensuring digitalization within the framework of digital transformation.

When the economic results of industrial revolutions from past to present are analyzed, it has been observed that the quality of production has increased, advantages have been achieved in cost and efficiency, and there has been a noticeable increase in the welfare levels of individuals, companies and countries. From this perspective, it is predicted that cost and efficiency advantages will be achieved by integrating cyber-physical systems into the manufacturing industry. At this point, it is thought that the decrease in costs and increase in productivity resulting from digitalization will strengthen countries in international competition and will also make a positive contribution to economic growth.

In this context, digital transformation gains great importance for societies and is defined by different names. For example, while Germany defines this digitalization process as "Industry 4.0", Japan calls this process "Society 5.0" and considers it as a further stage of the transition to an information-intensive social structure. Especially on the production side, the automation process based on the cooperation of manpower and machine power allows companies to reduce their transaction costs and increase their operational efficiency.

3. Digital Technologies

Digital technologies such as cloud computing, big data analytics, artificial intelligence, horizontal and augmented reality, internet of things, vertical integration, cyber security and cyber-physical technologies play a major role in the digital transformation process, which is identified as the digitalization of all areas where economic activities based on production and service are carried out. Accordingly, although all of the digital technologies shown in Table 1 are used for different purposes and in different places, the common feature of all of them is that they refer to information. For this reason, the digital transformation process is often defined using the concepts of "knowledge" and "informatics". The most important feature of digital technologies is that they transform the existing order into a new order. At this point, digital technologies bring about the effect of creative destruction, which is one of the basic concepts of Schumpeterian economics (Taymaz, 2018, s. 12-13).

Table 1. Areas of Use of Digital Technologies in the Economy

Internet of Things Technology and Cyber Physical Systems	Internet of things technology plays a role in the formation of new generation cities, campuses and organized industrial zones, from transportation to energy, from agriculture to animal husbandry, from industry to retail sales, from education to health. Cyber-physical systems ensure the continuous flow of automation and production processes in production.
Horizontal and Vertical Integration	Horizontal and vertical integration provides companies with the advantage of increased efficiency in management and workforce specialization. As a natural result of this, while the production scale of companies increases, their average costs decrease.This shows that horizontal and vertical integration technologies create a huge economy of scale effect in the digital economy.
Big Data Technology and Advanced Analytics	In the digital economy, data flows not only from sensors placed on production lines, but also from electricity meters, security cameras, customer service call recordings, online clicks, point-of-sale registrations, status updates on social media. Facilitating access and analysis of such large data is of critical importance for the competitiveness and expansion of companies across sectors in the digital economy.
Cloud computing	Cloud computing provides users with the opportunity to rent the information and communication technologies they need whenever they want, instead of purchasing them directly. In addition, cloud computing has a critical importance on economic growth in terms of ensuring business flexibility, improving cooperation between institutions and organizations, creating new employment areas, increasing productivity and public sector efficiency in the economy and its positive impact on GDP.
Artificial Intelligence Technology	In the digital economy, it is envisaged that as a result of the widespread use of artificial intelligence technologies, productivity will increase in all sectors based on production and service, errors resulting from manual operations will be minimized, and thus costs will be significantly reduced. For this reason, artificial intelligence technologies are among the priority investment areas of all companies and countries that want to have a strong presence in the digital economy.
3D Printer Technology	Three-dimensional printers meet the needs in every field in a short time. This reduces costs and eliminates production disruptions that may arise from lack of spare parts and intermediate goods in the industrial production process.

Cyber Security Technologies	It can be said that cyber security technologies are technologies that protect IT resources such as software, hardware and data, IT systems and telecommunication networks against cyber attacks. Today, when digitalization is at its highest level in parallel with the widespread use of internet technologies, ensuring cyber security is of critical importance in terms of economy, diplomacy, international law and internal security. Countries with advanced cyber security networks gain economic and strategic gains by acting as playmakers in the international arena in terms of national security.
Virtual Reality and Augmented Reality	While virtual reality technologies aim to replace the real world by meticulously changing it, augmented reality technologies aim to enrich and support the real world. In addition, companies in the manufacturing industry can benefit from augmented reality and virtual reality technologies in planning the production process, designing and producing the product. Thus, by creating a virtual image of the product to be produced, the production can be completed without any errors. In this context, efficiency in production increases, costs decrease and growth is achieved.
Blockchain Technology	Blockchain technology consists of two basic concepts. The first of these is all kinds of content information called blockchain records. This information may consist of values such as asset input, customer information and money transfer. The second concept is the creation of blocks. The creation of blocks is based on the principle of processing the records created from content information within certain time periods and writing them into the blocks, using special cryptographic algorithms and digital signature systems. In this context, there is common information between each block created. In this way, a block chain is created by connecting blocks containing common information to the blocks before and after them with the help of special algorithms. Blockchain technology, which enables the transfer of valuable assets in addition to data transfer in the current internet environment, finds application in the fields of banking and finance today.
Digital Payment Systems	Thanks to digital payment systems, banks, depositors and companies are relieved of financial and non-financial costs related to payment transactions. Keeping records regarding payment transactions, ensuring security, preventing disruptions that may occur due to delays in payment transactions, ensuring transparency in payment transactions, eliminating the risk of non-payment during delivery are other factors that are effective in the spread of digital payment systems.

3.1.Spread Of Digital Technologies

The emergence and spread of digital technologies is causing changes in the way the industry works. Experiencing the digital transformation process transforms traditional strategies and structures and opens the way to new ways of doing business. Digital technologies contribute significantly to improving the quality of the workforce by coding information and facilitating access to information. Digital technologies have specifically led to transformations in educational practices. Digital technologies have greatly reduced the cost of storing and accessing information. For this reason, search costs in the markets have decreased and more harmonious matching between the parties has become possible. One application of this is job and personnel search processes.

The development and spread of technology also brings modeling in two areas to the agenda. On the one hand, there is invention and innovation, which is related to the development and change of technology, and on the other hand, there is the imitation or dissemination of an existing innovation or invention. As a result, the innovation-imitation duo is taken as the starting point in modeling the diffusion of technology. The "blocking effect" caused by the innovation-imitation duo (more precisely, the distinction between the innovative, developed North, representing developed countries, and the imitative, developing South, representing developing countries) is also an important design in associating the issues of international trade channel with the spread of technology. The spread of digital transformation encompasses all aspects of business, regardless of whether it relates to a digital business or not, when the adoption of technology and acceleration of change lead to a completely new market, customer and business.

The change in organizational structures resulting from the spread and application of digital technologies has required a customer-focused strategic business transformation. In reality, digital transformation requires creating a core competency that enables the organization to better cope with change in general and essentially makes the business end-to-end customer-centric. In addition, with digital transformation, it has become difficult to give a clear definition of the concept of workspace or workplace. Post industrial transformation; It has created new forms of employment such as on-call work and job sharing, and the digitalization process has made it possible to work from home. Because; Digitization of information, processes and roles that make up the operations of a business brings digital transformation of the business and business strategy, while also leading to business model changes (Bloomberg, 2018).

3.2. Effects Of Digitalization On The Economy

The ongoing digital transformation of the economy and society provides many advantages to stimulate innovation, deliver efficiency, improve production and services, and in doing so accelerate more inclusive and sustainable growth in the developed or developing economy (Vidas-Bubanja vd., 2019, s. 107-108). Digitalization and globalization of the economy; While it reshaped national sovereignty and eroded material and spiritual understandings, it created a new culture and facilitated the circulation of capital, commodities and people (Brennen and Kreiss, 2014). In recent years, in studies conducted on the effects of the digitalization process on working life, the employment aspect of the issue comes to the fore. Some of these consist of predictions about the future. In order to address the issue in depth from different dimensions, digital transformation and the process described as the fourth industrial revolution must progress.

In other words, in order to evaluate the impact of the digital transformation process on working life and industrial relations, including employment in all its dimensions, working life must become "stabilized" to a certain extent, together with economic, social and cultural structures, in a way that can be described as a transformation.
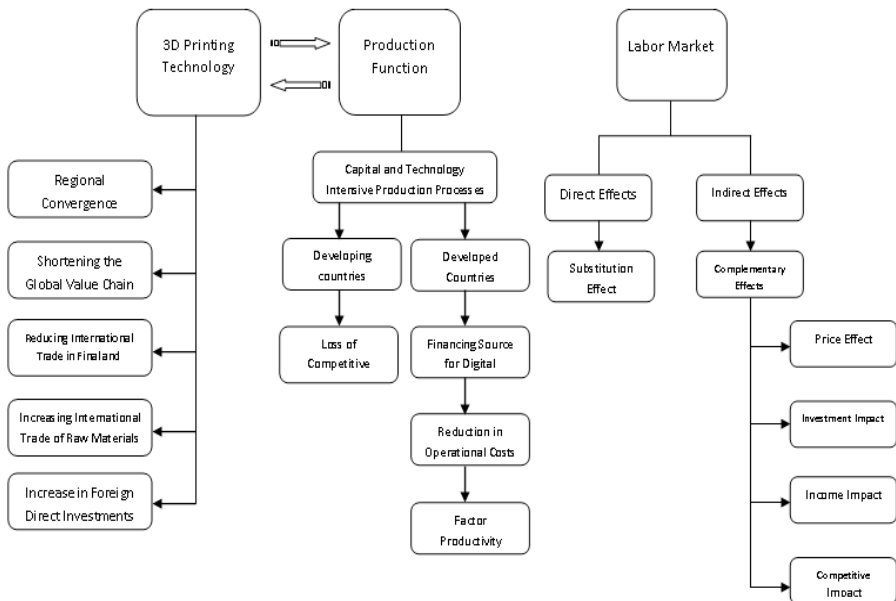
Figure 2: The Effect of Digitalization on the Economy

It can be said that digitalization has multidimensional macroeconomic effects. These effects are mostly related to GDP, consumption, investment, foreign trade, employment, inflation, etc. Production Function Labor Market 3D Printing Technology Shortening the Global Value Chain Reducing International Trade in Final and Intermediate Products Substitution Effect Developed Countries Loss of Competitive Advantage: Cheap Labor Price Effect Income Effect Investment Effect Competition Effect Capital and Technology Direct Intensive Production Processes Effects Indirect Effects, Complementary Effects Developing Countries Regional Convergence Increase in International Trade of Raw Materials Increase in FDI Increase in Financing Source for Digital Infrastructure Investments Decrease in Operational Costs Factor Efficiency is expected to be in macroeconomic areas (Schwab, 2018, p. 38). The effects of digitalization on the macro economy emerge in three ways: labor market, production function and 3D technology, as can be seen in Figure 2.Therefore, under this heading, the macroeconomic effects of digitalization will be examined comprehensively.

3.2.1. The Effect of Digitalization on Production Technology

It is a fact accepted by economic scientists that the increase in the use of digital technology will play an effective role on production processes in the future. At this point, it is stated that digitalization will make production processes capital and technology intensive not only in developed economies but in all world economies. The use of robots, computers and machines instead of labor force causes cheap labor force, which creates a competitive advantage for labor-intensive developing countries, to lose its importance. On the other hand, this process improves the competitive structure of rich developed countries. Developments in digital technologies lead to radical changes in the structures of companies and even institutions governing countries. It is thought that the widespread use of digital technology will provide companies with advantages in operationally important issues such as strategic management, financial management, resource management, information management, risk management, human resources management, development of communication and internal control systems. At this point, digital transformation studies carried out on a company basis are effective in improving the competitiveness performance of companies, increasing growth and market share, and as a result, ensuring company profit maximization (Uzkurt, 2017, p. 113).

The ultimate goal of companies in the digital economy is to gain a competitive advantage over their competitors in the markets. Here, the concept

of competitive advantage refers to companies being at a superior level compared to their competitors in terms of cost, efficiency and market share. At this point, ensuring competitive advantage for companies depends on expanding the use of digital technology in operational processes and having qualified employment that can use these technologies (Uzkurt, 2017, pp. 113-114). In this context, in the digital economy, companies that popularize the use of digital technology, train qualified workforce to use digital technologies and attach importance to R&D activities will achieve maximum efficiency compared to their competitors, reduce their costs and increase their profitability.

3.2.2. The Impact of Digital Technologies on Foreign Trade

Developing internet technology eliminates the borders between countries in foreign trade and allows commercial transactions to be carried out with markets located in the farthest parts of the world (Karagöz, 2007, s. 215). In other words, the widespread use ICT contributes notably to the globalization of the world economy by enabling the cross-border flow of ideas, information, skillfulness and innovations (Ozcan, 2018, s. 94). Digitalization affects foreign trade through three different mechanisms based on ICT. Accordingly, ICT, first of all, encourage countries to export by reducing the fixed costs of economies' entry into international markets. These fixed costs generally include the costs of finding information about markets, advertising and establishing a distribution network. Secondly, the use of ICT in the digital economy plays a role in reducing uncertainties regarding transactions carried out in international markets by planning in advance. Uncertainty in markets largely arises from a lack of information or a delay in the transfer of information. In this context, although digitalization in foreign trade is most simply understood as the representation and promotion of products and companies on online platforms, it is actually too important and comprehensive to fit into such a limited expression, and at the same time, it is a concept with export distances; However, as long as you can close these distances, it is possible to achieve success and sustainable growth. In cases where there are no opportunities to meet and communicate face to face, digital assets can be a very important reference source for factors such as brand perception, product knowledge, company size and reliability. When it comes to marketing and sales, there are companies that have not yet taken sufficient steps towards digitalization and continue with traditional methods. From this perspective, we can talk about a hybrid study. When talking about the effects of digitalization on exports, different gains such as reaching a large number of

people at the same time, developing new ways of doing business, and saving time can be mentioned.
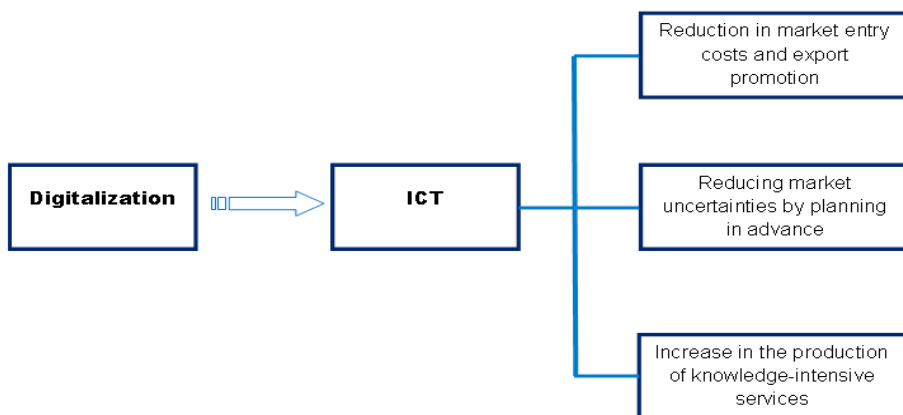
Figure 3: The Impact of Digitalization on Foreign Trade

In addition, the use of ICT makes planning more efficient and accurate by reducing such shortcomings and delays. Finally, in parallel with the advances in the field of ICT, the production of knowledge-intensive services is becoming easier, transaction costs are decreasing and the trade of these services in international markets is increasing. These services include the processing, creation and transmission of information (Liu and Nath, 2013, pp. 67-68).

3.2.3. The Effect of Digitalization on the Labor Market

Digitalization has two different effects on labor markets: direct and indirect. It is emphasized that as human labor is replaced by robots, machines, computers and artificial intelligence in production, there will be a decrease in employment levels and, accordingly, technological unemployment will arise. Economists express this situation as a labor substituting effect of digitalization. The substitution effect is defined as a direct impact of digitalization on labor markets. The indirect impact of digitalization on the labor market arises due to the decrease in production costs in many areas. In this context, the indirect impact of digitalization on the labor market is seen in four different dimensions: price, income, competition and investment impact (Petersen, 2019a).

3.2.4. Impact of Digital Technologies on Public Authority

Recently, the digital age, which has included many innovations from individual life to corporate life, from the procurement to the delivery of services,

from the communication between objects to creating network connections, has also been effective on public administration and policies(Gül, 2017, s. 6). Today, developments, especially in the field of ICT, force public authorities to change politically, socially and economically. For this reason, governments have to take into account the developments in Information and Communication Technology when determining their policies regarding public administration(Kırışık ve Sezer, 2015, s. 200).

With the digitalization of the public sector in the economy, e-government applications, accepted as a policy tool by the government, contribute to public administration in terms of transparency, effectiveness and accountability and create a public administration approach with participatory features (Şahnagil, 2017, s. 84). In this context, it shows the impact of e-government applications on public authority.
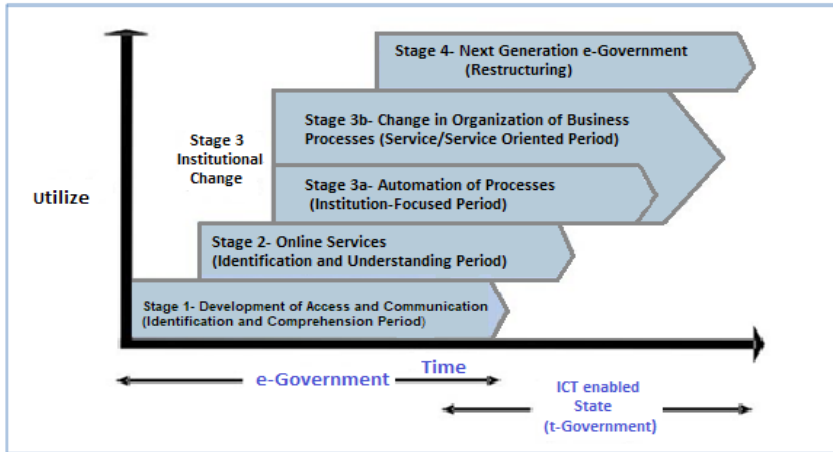
Figure 4: Development Evolution of E-Government

The development of new technologies and the realization of the requirements of the transformation in the public sector with the reflection of the requirements of accessing and using information on the state (Figure 4), started with the establishment of e-government in the first stages of its development to provide the first in-house service. This institutional change has brought about the need for the services that make up this infrastructure to have automation that provides efficiency for the state and the user. In addition to analyzing existing processes and designing these business processes to provide real benefit through effective and fast transactions, in 3 stages; With the help of technology, the state's business processes are tried to be made simpler. This process needs to be managed well. The last stage of the development process is about which users the transformed

state covers and efficiency. E-government applications have now become a power that creates public value and reduces bureaucracy among citizens, non-governmental organizations and the business world within and outside the institution through information technologies (TBD, 2007). Accordingly, developments in the field of ICT change the organizational structure of public institutions and organizations within the scope of e-government application, shape the relations between institutions and contribute to the understanding of management.

3.2.5. The Impact of Digital Technologies on Social Life

As a result of a successful digital transformation process, the distinction between villages and cities resulting from economic and regional differences in the social structure will disappear and regional and social inequalities will decrease (Orhan ve Genç, 2018, s. 271). In addition, the widespread use of digital technology contributes to the development of human capital by creating differences in individuals' future expectations in areas such as health, education, entertainment, communication, entrepreneurship, investment, consumption and savings, which are of great importance for society. As a result, the degree of dependency of individuals in social life decreases as their economic freedom increases. For example, it is thought that thanks to wearable technologies developed for use in the medical field, the labor force participation rate of disabled individuals will increase significantly and, as a result, social inequalities will be eliminated(TBMM, 2012, s. 70).

3.2.6. The Effect of Digital Technologies on the Labor Market and the Relationship between Productivity

While the increase in the production of ICT in the digital era contributes to production, employment and exports, the widespread use of ICT increases productivity, competitiveness and growth (Qiang et al., 2003, p. 2). In the most general terms, productivity defines the quantity of output obtained per unit of input from the production factors used in the manufacture process. The main factors that increase productivity are the inclusion of technological advances in the production process, such as the use of more effective machinery, hardware and software programs, and the training of the existing workforce (Arda, 2011, s. 556).

The digitalization process affects the labor market by changing the employee structure, the methods of doing work, the work itself, and even the distribution of production factors. The fact that there are studies in the literature

that accept technology as the fifth of the production factors, as well as studies that accept it as an auxiliary production factor, has led to the development of a new perspective on production factors. Nowadays, the substitutability of robots with artificial intelligence, in other words "Cobots", in jobs that can be defined as skilled or unskilled performed by human power, has necessitated the inclusion of these steel-collar workers among the production factors. In this context, this part of the study will try to explain the changing structure of employees in the digitalization process, the labor market that is being reshaped as a result of technological developments, and their effects on productivity.

When the effects of technological developments on working life are examined, it is known that each level of mechanization changes the way work is done, and with this effect, many new jobs emerge and at the same time, some of the existing jobs either change or disappear. Failure to achieve a balance between these two results and the fact that the balance predominates in favor of the elimination of existing jobs is an important reason for employment problems in the labor market (Coşan, 2020, s. 235). Mechanization has spread all over the world with the industrial revolution, and machines have taken on important roles in production, especially in the industrial sector, as well as in the agriculture and services sectors. It is known that technology increases labor productivity as well as total factor productivity in production.

Waves of mechanization and automation have either eliminated or replaced jobs in some industries and occupations. In addition, the appropriate recycling of workforce skills, competencies and qualifications has increased machine-human synchronization and significantly prevented unemployment. The most obvious example of this occurred in the 19th and 20th centuries, and a solution was found with the sectoral transition of the workforce to the process of mechanization and automation (Brynjolfsson & McAfee, 2012, p. 37). The basis of the harmony that emerged in these centuries lies in the slow pace of technological transformation. Today, the very high rate of technological change and transformation reduces the speed of adaptation of labor to renewed production methods and jobs in labor markets.

It is possible to examine the mechanization process in two parts. In the "First Age of Mechanization", which continued from the industrial revolution until the end of the 20th century, machines were tools that enabled employees to do their jobs more easily. In the "Second Age of Mechanization", which emerged in the 21st century due to the development of the software industry; Although super technologies such as artificial intelligence and full automation

cause the substitution of machines instead of humans in the production process, they increase production and efficiency. However, in a negative analysis, it is stated that these technologies will cause technological unemployment not only of blue-collar workers but also of white-collar workers (Arthur, 2021).

In 1930, Keynes wrote in his article "Economic Opportunities for Our Grandchildren"; He stated that under the influence of the developments in technology production will increase to a sufficient level after 100 years (for the year 2030) and that this production can even be achieved by reducing the working hours of the workforce to 15 hours per week, but this increase based on productivity in production will create technological unemployment. It seems that this prediction is partially consistent with today's situation. In this context; Considering the processes of mechanization, automation and digitalization, the fact that the amount of production achieved in the USA with the current working hours of the workforce in 1930 was reached in 1977 with the workforce working an average of 15 hours per week, not yet 100 years later, confirms Keynes' prediction that production has increased to a sufficient level in response to the increase in productivity. However, today, average working hours in OECD countries are 34 hours per week. From this point on, technology increases productivity (including labor productivity), as a result of which the amount of production and product increases, but still the working hours of labor do not decrease as Keynes predicted, in other word the prosperity arising from production efficiency does not directly affect labor in the context of working hours. It seems that it is not reflected. Moreover, another point that Keynes failed to grasp here was the varying depth of consumer demand depending on the depth of human wants and desires. The reason why the workforce works 34 hours instead of 15 hours, depending on the amount of production, is the increasing demand for products and services that technology makes cheaper and better. A similar underestimation of demand is thought to lie behind many other unsuccessful predictions of mass unemployment due to automation and digitalization (Bessen, 2019).

In the digitalizing world, in order to describe machines as smart or with artificial intelligence, those machines must first be programmed by a human. Therefore, it is known that machines that are not involved in a software process are still dependent on natural human will and intelligence. The fact that the software is a virtual product and its only cost is the mental investment of human capital, not the material production factors such as raw materials and materials, makes the software different from other products. In addition, the fact that

the software can be copied and used after being created once reduces the cost of human capital and even almost eliminates this cost. The common point of those who study the effects of intangible digital products such as software on productivity is that digital assets positively affect labor productivity and total factor productivity (Bertani, Raberto & Teglio, 2020).

Another important issue that draws attention in the digitalization process and may radically change future production methods is the inclusion of artificial intelligence among the production factors (Acemoglu & Restrepo, 2018, s. 48). In terms of the functionality of artificial intelligence, considering the same quota as labor among production factors also provides us with a foresight on the planned employment structure of the future. In this context, the question of how to preserve human labor, which became evident with the industrial revolution, awaits us as a more important problem to be solved with the digitalization process.

4. Conclusion

It is thought that depending on the increasing use of digital technologies in production processes, the quality of labor demanded and the number of workforce employed will change. In this context, it is stated that as a result of increasing digitalization, disputes may occur between unions and existing labor laws regarding working life. This situation brings legal risks regarding digital transformation. In order to eliminate these risks, it is of great importance to include business managers and employees in the planning for this transformation process. (Verda Hukuk, 2019a).

Another important issue for ensuring a successful digital transformation process is the concept of intellectual property. As a result of the developments in information and communication technologies and digitalization, the beginning of the production of digital works brings with it the copyright problem (Turan, 2016, s. 57). At this point, the concept of intellectual property is a concept that arises due to intellectual accumulation and mental creativity and covers literary and artistic works, industrial designs and scientific inventions(Yücekal, 2003).

In an economy, securing intellectual property rights is possible with an effective patent system. The patent system is a concept used to manage the excludability of technological developments. Accordingly, it is expressed as the inventor of the technological invention selling the right to use the technology in question to another person or institution for a certain period of time and preventing the use of this technology by other persons or institutions during this period. As a result of securing intellectual property rights with patents, the profit

levels of companies with technology increase. In addition, other companies in the economy are increasing their R&D investments to develop technology (Mishkin, 2018, p. 182). In summary, it can be stated that an effective legal system is of critical importance for successful economic development. In today's world, it can be said that the achievement of the purpose of digitalization efforts, whose impact continues to increase day by day, will be possible to a large extent with the effectiveness of the legal system and the protection of property rights.

In order to benefit from the full potential of digital technologies, it is necessary to develop digital technology sectors and increase digital innovation capacity. A structural transformation that will enable the share of digital technology sectors to increase rapidly in the economy will contribute directly or indirectly to productivity and growth, as digital technology sectors will encourage innovation and dissemination.

For the development of digital technology sectors, it is necessary to train the necessary workforce and ensure continuity of demand in these sectors. Public procurement and investments are important policy tools that can be used to ensure this continuity. One of the most important elements of digital transformation is increasing digital innovation capacity. In order to develop these capabilities and follow the latest developments, it is necessary to take part in international innovation networks (which are also an indicator of these capabilities). Policies should be designed to enable researchers and companies to actively participate in international innovation networks.

 In this context, encouraging measures and supports should be developed to disseminate the open source software model, which has become increasingly significant in recent years, and to take part in open source software communities. To ensure digital transformation, education, physical infrastructure and fixed capital investments to train a qualified workforce must be significantly increased. The most important indicator of the state's commitment to digital transformation is in which areas and at what level public and private investments that will ensure digital transformation are made.

Along with all their positive effects, digital technologies can also lead to the centralization and concentration of information and technology due to network externalities and economies of scale. In order for the economic and social potential of digital technologies to be shared equally by the entire society, it is important that competition rules operate properly in the sector.

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NAVIGATING SUSTAINABILITY: EXPLORING THE INTERPLAY BETWEEN CONSUMER BEHAVIOR AND LOGISTICS

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1. Introduction

Sustainability is a concept that refers to the responsible consumption of limited resources and the use of resources to meet the needs of today, while considering the needs of future generations. Especially within the scope of the Sustainable Development Goals published by the United Nations in 2015 (UN, 2015), the importance of sustainability has started to be understood by a wider audience in line with a wide range of objectives ranging from gender equality to clean energy production, decent work and poverty eradication.

Logistics services are a holistic concept that is evaluated within the scope of planning and implementation of the arrival of products and services to the final transportation point by proceeding along the supply chain. Logistics services, which include all the processes that enable products to reach end users, include a

number of elements such as supply chain management, warehousing, inventory management, transportation, distribution, logistics information systems.

There are important links between logistics services and sustainability. An understanding of sustainability that considers economic and social components as well as environmental factors, by definition, aims to rethink and redesign all logistics services. For example, activities considered within the scope of logistics services such as transportation or warehousing, which may cause negative impacts on the natural environment, can be redesigned within the framework of goals such as reducing carbon emissions and focusing on energy efficiency, making them more suitable for sustainability goals. For example, greener alternatives to road transportation, such as sea transportation or railway, have the potential to reduce carbon footprint.

Considering sustainability only in terms of its environmental impact leads to a constricted comprehension. When social and economic sustainability perspectives are combined with environmental aspects, it is possible to reach a more comprehensive understanding of sustainability and it is important to design goals accordingly. For example, optimizing and increasing the efficiency of distribution within logistics service activities can be considered as a method that can significantly reduce carbon emissions associated with fuel consumption and at the same time contribute to the economic sustainability of the business. Similarly, activities focusing on the reuse and efficient recycling of packaging waste are both effective in terms of reducing negative environmental impacts and can be cost-effective considering circular economy principles.

The understanding of sustainability within the scope of logistics services has begun to be taken seriously by businesses due to both the increasing awareness of businesses on this issue and the influence of stakeholders, and a comprehensive literature has been developed in this field. On the other hand, the consumer perspective on logistics services within the scope of sustainability is also very important. Because consumers are considered as a group that directly affects the activities of the enterprises within the microenvironment of the enterprise.

The quality of logistics services is a very important factor in the process of consumer loyalty (Garrouch et al., 2011). Especially in the context of online shopping, it has been stated that logistics service quality is extremely important in the process of consumer purchase intention (Uzel and Tuna, 2014) and satisfaction (Yıldız, 2018). The positive impact of logistics service quality on customer satisfaction leads to higher profitability and success of the business because of lower operational costs (Ratanavilaikul, 2012).

Logistics service quality, which is a factor that directly affects consumer satisfaction, is an area worth examining in terms of consumers' sustainability

expectations. It can be expected that consumers' expectations from logistics services will start to diversify, especially as their awareness of environmental sustainability increases. For example, it is appropriate that logistics solutions that focus on green logistics, low carbon footprint, recycling, etc. increase in popularity due to consumers' increasing environmental sensitivity. However, studies indicate that consumers are not sufficiently aware of the sustainability of logistics services, which is due to a lack of communication on this issue (see Gruchmann et al., 2019).

Although consumers' expectations from logistics services, their perceptions and experiences within the scope of logistics service quality have been the subject of many studies in the literature, it can be stated that evaluations from a sustainability perspective in this field are relatively limited. The current study is designed to examine the structure of research areas at the intersection of sustainable logistics services and consumer behavior.

In the present study, bibliometric analysis is used to examine the literature at the intersection of consumer behavior and sustainable logistics. The R Bibliometrix package and VOSviewer tools were used in the bibliometric analysis to reveal and meaningfully categorize the existing body of knowledge in these fields. The publications in the Web of Science (WoS) database were searched in the middle of November 2023, and answers to the listed research questions regarding the intersection of consumer behavior and sustainable logistics were sought:

RQ1: What are the research field's annual publication and citation trends?

RQ2: Who are the top contributors to the field of research in terms of the amount of publications attributed to their studies?

RQ3: What are the primary sources that contribute to the field of research, given the volume of publications they publish?

RQ4: Which countries have made the most significant contributions to the research field based on their publication numbers and received citations?

RQ5: What are the most frequently used and co-occurring words within the research field?

RQ6: Based on the co-occurrence frequencies of words, what clusters emerge within the research field?

RQ7: What themes have emerged within the research field, and how have these themes evolved?

RQ8: What themes have emerged within the research field, and what are their contributions to the research field and their development levels?

2. Sustainable Logistics and Consumer Behavior

Increasing awareness of the concept of sustainability has brought new problematization areas and solution proposals related to logistics services at the level of businesses and consumers. Byrne et al. (2013), within the framework of a study conducted in an economy that can be considered at the level of developed economies, revealed that majority of businesses are willing to act on the sustainability of processes related to logistics service procurement in industrial markets. Leading retailers operating in developed economies can be considered as businesses that are aware of and take responsibility for environmental sustainability within the framework of logistics services (Styles et al., 2012). On the other hand, Björklund et al. (2016), in their study examining the corporate social responsibility reports of leading retailers on a global scale, stated that the environmental sustainability sensitivity of these retailers in their logistics operations, excluding purchasing processes, is at a questionable level. In this respect, it can be stated that it is not appropriate to make a generalized assessment about the sensitivities of firms.

Studies in the literature indicate that although consumers reflect their sustainability awareness to their shopping practices, they do not reflect their ecological sensitivities to logistics services, which are an important step of shopping processes, as they are not sufficiently aware of the sustainability of logistics processes (Gruchmann et al., 2019). In fact, because of globalization and the proliferation of digital communication, changes in many spheres are dramatically affecting consumers' lifestyles and therefore their consumption preferences. In this context, it is thought that the increase in the ecological awareness of consumers will inevitably be reflected in their attitudes and behaviors regarding logistics services, which constitute an integral part of their consumption preferences (Strube and Wagner, 2019).

Rita and Ramos (2022) found that despite the increasing frequency and quantity of online shopping, there is a dearth of studies with a sustainability perspective in terms of all processes - including logistics services - of this type of shopping. In particular, the study states that the processes that cover the last step that logistics services need to take for customer transportation, called the last mile problem, are the most costly pillar of logistics services, and also mentions the critical importance of green practices in this step. Increasing ecological sensitivities on the part of consumers and the convenience of online shopping in terms of home delivery, ease of returns, etc. create a dilemma for consumers and a need for balance (Freitag and Kotzab, 2020). Some of the sacrifices that greener practices require on the part of consumers have also made it important to

think about the solution to this issue. An example of studies on this subject is the study of Caspersen and Navrud (2021), in which they underline that consumers' ecological sensitivities result in them making trade-offs to situations that may result in relatively lower logistics service quality.

Although the number of studies examining the relationship between individual consumers and the sustainability of logistics services is limited compared to studies focusing on this relationship in the context of industrial markets, the intersection of consumers and the sustainability of logistics services has an important presence in the literature. A detailed review of these studies is provided below.

Consumers' ecological sensitivity has a limited impact on making distribution services more sustainable in terms of natural resource conservation (Sallnäs and Björklund, 2020). This may be due to consumers' lack of detailed knowledge and awareness of these services, as well as the lack of an effective communication network between logistics service providers, manufacturers, retailers and individual consumers. On the other hand, studies focusing on the striking influence of consumers on businesses' decisions have underlined that businesses can make greener decisions within the framework of logistics services thanks to the pressure from consumers with high ecological awareness and sensitivity (Sarjono et al., 2021). It has been found that the most important barrier for consumers to contribute to making logistics services more ecologically sustainable is economic reasons, more so than social or operational reasons. Consumers refrain from taking action on the ecological sustainability of logistics services when it requires them to bear a greater economic burden (Sajid et al., 2021)

In the online shopping process, returns that occur as a result of the product not meeting expectations, being defective, etc. are an important part of logistics services. The additional cost of these returns for businesses and their negative impact on the natural environment is an area worth examining. Related studies emphasize that reverse logistics should be studied carefully as consumers are indifferent to sustainability in logistics (Vijayan et al., 2014).

Packaging, which is considered as an important subtopic of logistics services, is closely related to environmental sustainability and consumer behavior due to its relationship with phenomena such as plastic use and waste generation and management. While there are studies that examine the feasibility and viability of greener packaging options (see Wang and Wang, 2021; Georgakoudis, 2014), there is also a body of literature that focuses on exploring the consumer implications of these options (Bhujbal and Shafighi, 2022) stating

that consumers' level of environmental awareness is highly related to their search for ecological packaging options during purchasing decisions (Martinho et al., 2015). Nevertheless, it is important to underline that, compared to factors such as price, quality and brand, packaging that takes into account ecological sensitivities is considered less important by consumers in terms of purchasing preferences (Mahajan et al. 2023).

3. Methodology

3.1. Data Selection and Editing

This research aims to present a thorough and inclusive review of the field of study that integrates sustainable logistics and consumer behavior and addresses specific research questions.

A dataset aligned with the study's aims was prepared to accomplish this goal by following the steps outlined in Fig.1. Subsequently, an in-depth bibliometric analysis was conducted to examine the studies within the dataset.

During the initial phase of data preparation, keywords corresponding to the research area were identified. Then, these keywords were searched for WoS database in Title, Abstract, Author Keywords, Keywords Plus of studies in the middle of November 2023. The keywords are presented in Table 1.

Planning and Scoping of the Search
-Consumer behavior and sustainable logistics related keywords were determined

Database Selection
-WoS database was selected

Searching Documents
-996 studies were identified based on the search for keywords specified in Title, Abstract, Author Keywords, Keywords Plus

Application of Exclusion Criteria
-813 studies were identified after selection of the related Citation Topics Meso

Screening and Analyzing Studies
-374 studies were included in the final dataset, excluding studies not containing author keywords, out-of-scope, and duplicates.

Figure 1: Data Preparation Methodology
Source: Adapted from (Álvarez-García et al.,2018)

Table 1: Search Keywords

Sets	Keywords
Consumer Behavior	"Consumer" OR "Consumer Behavi*" OR "Consumer Prefer*" OR "Eco-friendly Consum*" OR "Sustainable Consum*" OR "Green Purchas*" OR "Environmental Aware*" OR "Ethical Consum*" OR "Sustainable Retail*" OR "Consumer Satisfac*" OR "Consumer Percep*" OR "Consumer Decision Making*" OR "Eco-conscious Consum*" OR "Responsible Consum*" OR "Sustainable Lifestyle" OR "Pro-environmental Behavi*" OR "Consumer Attitude*" OR "Social Responsibility in Consum*" OR "Green Marketing" OR "Eco-label*"
Sustainable Logistics	"Sustainable Logistic*" OR "Logistics Sustainab*" OR "Sustainable Supply Chain" OR "Sustainability in Supply Chain" OR "Supply Chain Sustainab*" OR "Green Logistic*" OR "Green Transport*" OR "Green Distribution" OR "Environmental Sustainability in Logistic*" OR "Environmental Sustainability in Transportation*" OR "Carbon Footprint in Logistic*" OR "Carbon Footprint in Transportation*" OR "Circular Economy in Logistic*" OR "Circular Economy in Transportation*" OR "Reverse Logistics Sustainab*" OR "Sustainability in Reverse Logistic*" OR "Transportation Sustainab*" OR "Sustainable Transport*" OR "Sustainable Distribution" OR "Sustainability in Transport*" OR "Sustainability in Distribution" OR "Sustainable Freight Transport*" OR "Sustainability in Freight Transport*" OR "Sustainable Last Mile Delivery" OR "Sustainability in Last Mile Delivery" OR "Eco-friendly Distribution" OR "Eco-friendly Logistic*" OR "Eco-friendly Transport*" OR "Sustainable Packag*" OR "Life Cycle Assessment in Logistic*" OR "Life Cycle Assessment in Transport*" OR "Life Cycle Assessment in Distribution" OR "Carbon-neutral Transport*" OR "Carbon-neutral Logistic*" OR "Carbon-neutral Distribution" OR "Sustainable Operations in Logistic*" OR "Environmental Compliance in Logistic*" OR "Green Innovation in Logistic*" OR "Sustainable Warehousi*" OR "Ecological Warehousi*" OR "Eco-friendly Warehousi*" OR "Eco-efficient Logistic*" OR "Socially Responsible Logistic*" OR "Ethical Sourcing in Logistic*" OR "Low Carbon Logistic*" OR "Sustainable Urban Logistic*"

This search reached a total of 996 studies. After selecting relevant Citation Topics Meso - Management, Supply Chain & Logistics, Social Psychology, Power Systems & Electric Vehicles, Transportation, Sustainability Science, Artificial Intelligence & Machine Learning, Agricultural Policy, Food Science & Technology, Design & Manufacturing, Economic Theory, Economics, Environmental Science, Climate Change, Operations Research & Management Science- 813 studies were identified. The search encompassed all document types, languages, and WoS indexes. The resulting dataset was edited. Studies out of the scope, not containing author keywords, were excluded. Duplicate studies were dropped. The final dataset comprised a total of 374 studies. English differences in keywords were edited. For example, "consumer behaviour" was changed to "consumer behavior". Different terms used to express the same concept were standardized. For example, "carbon emissions", "carbon emission", "co(2)e emissions", "co2 emission", "carbon dioxide emissions", "carbon dioxide (co2) emission", "co(2) emission", "co(2)emissions", "co2-emissions" were changed to "co2 emissions". Also, wrongly separated keywords like "sustainable; transportation" were corrected as "sustainable transportation".

3.2. Bibliometric Analysis

Bibliometric analyses offer a valuable tool to explore and answer important questions within a specific research field's academic literature. These analyses reveal how the field has evolved and help identify emerging topics or trends within that study area (Donthu et al., 2021). This study examines the intersection between literature on consumer behavior and sustainable logistics using bibliometric analyses to uncover various aspects of the field. These analyses delve into the number of studies and citations, their annual changes, and the contributions made by prominent authors, sources, and countries within the field. The research explores the most frequently utilized keywords and their co-occurrence patterns, highlighting the prevalent themes in the literature. Furthermore, it aims to identify emerging themes within this field. The investigation employs bibliometric analyses conducted through R Bibliometrix and Vosviewer to provide insights into the scholarly landscape where these two areas intersect.

4. Results

4.1. Dataset Overview

The dataset encompasses 374 studies conducted between 2001 and 2023. Most of these studies were articles, followed by proceeding papers. Document types' distribution is given in Table 2.

Table 2: Distribution of Document Types in the Dataset

Document Types	Number of documents
Article	305
Article; book chapter	8
Article; early access	12
Article; proceedings paper	1
Editorial material	1
Proceedings paper	27
Review	19
Review; early access	1

In the research area, 1,112 authors contributed. Out of 374 studies, 18 were single-authored, while 356 were authored by multiple contributors. The mean count of documents per author was 0.336. The collaboration index, derived from the ratio of the total count of authors involved in multi-authored studies to the overall number of multi-authored studies. (Aria and Cuccurullo, 2019), is 3.07.

4.2. Annually Distribution of Publications

The yearly fluctuations in the volume of studies conducted within the research field are illustrated in Fig.2. Over time, the number of publications in this field displayed varying trends until 2018. From 2018 onwards, publications have consistently increased each year, exceeding the previous year's count. As of the middle of November 2023, the total number of publications has approached the total count for 2022. There is an anticipation that the year-end publication counts for 2023 might exceed that of 2022.
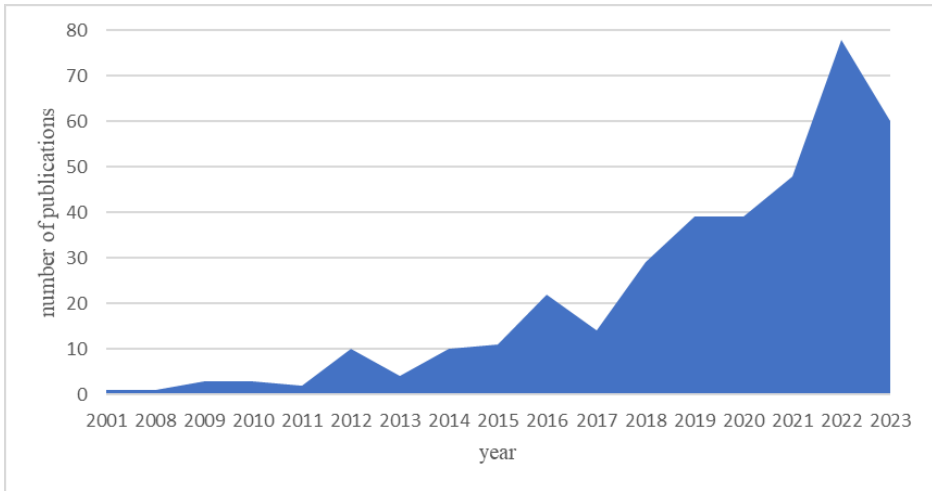
Figure 2: Annual Scientific Production

4.3. Annually Citation Trends

The annual citation trends within the research field were examined using metrics of total publications (TP), total citations (TC), Citations per Paper (CP= TC/TP), and Citations per Paper per Year (CPY = CP/Citable years), as presented in Table 3.

In terms of TP, the most productive year was 2022. However, concerning TC, the year 2019 holds the lead with 1,701 citations, followed by 2018 and 2020. Within the entire dataset, the study with the most extensive citation count in the WoS database up to the retrieval date is the work by Hong and Guo (2019) titled "Green product supply chain contracts considering environmental responsibilities" published in the Omega journal, receiving 382 citations. Regarding CP, the top three years are 2011, 2018, and 2010. Considering CPY, which accounts for citable years, the performance peaks in 2019, followed by 2018 and 2021.

Table 3: Annually Citation Indicators

Year	TP	TC	CP	CY	CPY
2001	1	45	45.00	22	2.05
2008	1	2	2.00	15	0.13
2009	3	29	9.67	14	0.69
2010	3	148	49.33	13	3.79
2011	2	109	54.50	12	4.54
2012	10	300	30.00	11	2.73
2013	4	90	22.50	10	2.25
2014	10	483	48.30	9	5.37
2015	11	496	45.09	8	5.64
2016	22	818	37.18	7	5.31
2017	14	238	17.00	6	2.83
2018	29	1451	50.03	5	10.01
2019	39	1701	43.62	4	10.90
2020	39	1018	26.10	3	8.70
2021	48	936	19.50	2	9.75
2022	78	436	5.59	1	5.59
2023	60	159	2.65		

Although a consistent upward trend in the quantity of studies conducted within the research field emerges from 2018 onwards, this pattern does not align similarly with the CP and CPY indicators. Specifically, CP has been showing a decline over the last five years, while CPY has exhibited a fluctuating trend in recent years. The discrepancy between the increase in the quantity of research conducted and the citations received suggests that the contributions and impact of recent publications within the field might not have reached a satisfactory level.

4.4. The Leading Authors

The leading ten authors who have notably impacted the research field through their substantial number of publications are presented in Fig.3. Heydari Jafar, Obrecht Matevz, Rasti-Barzoki Morteza, and Safarzadeh Soroush are on the top with four publications.
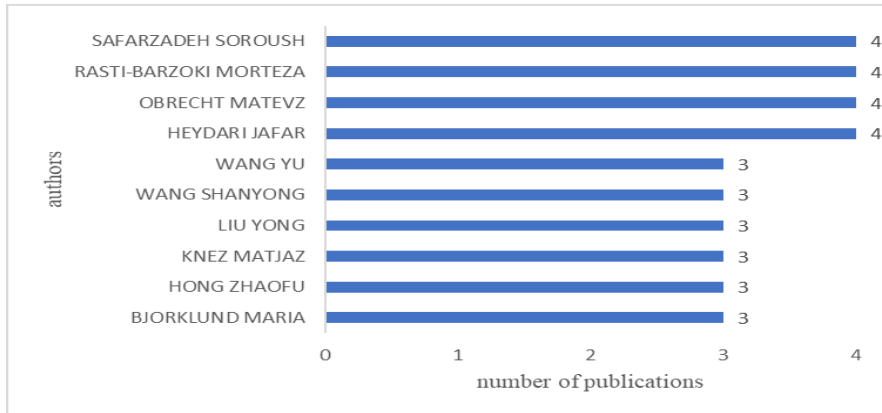
Figure 3: Most Relevant Authors

4.5. The Leading Sources

This study examined the leading sources within the research field by considering the volume of publications they have published. The journal 'Sustainability' notably leads with 46 published articles, succeeded by the 'Journal of Cleaner Production' with 33 publications. These two journals distinctly stand out from the others in the field due to their significantly higher publication counts. Fig.4. illustrates the ranking of the prominent journals within this particular field of study.
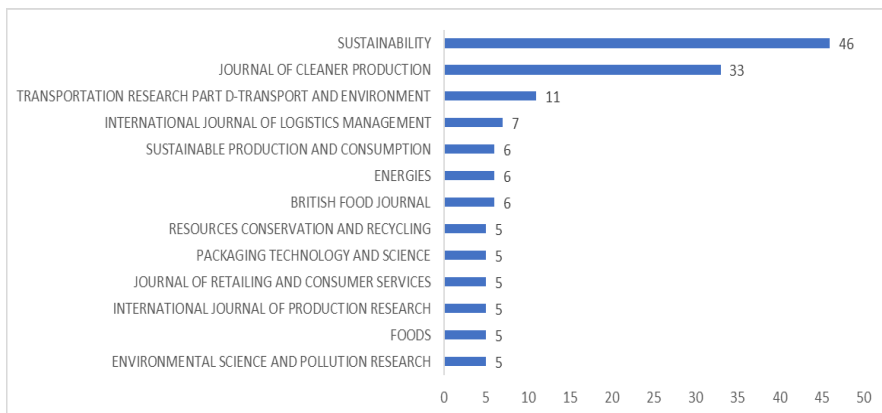
Figure 4: The Leading Sources

4.6. Dominant Contributing Countries

According to the country's scientific production metric, calculated by considering each author's affiliation in a study, China leads in productivity with

225 studies, followed by the USA contributing 128 studies and India with 90 studies. Subsequently, the remaining countries among the top ten include Italy, Germany, the UK, Iran, Sweden, Australia and France. The country specific production is given in Fig.5.

Country Scientific Production
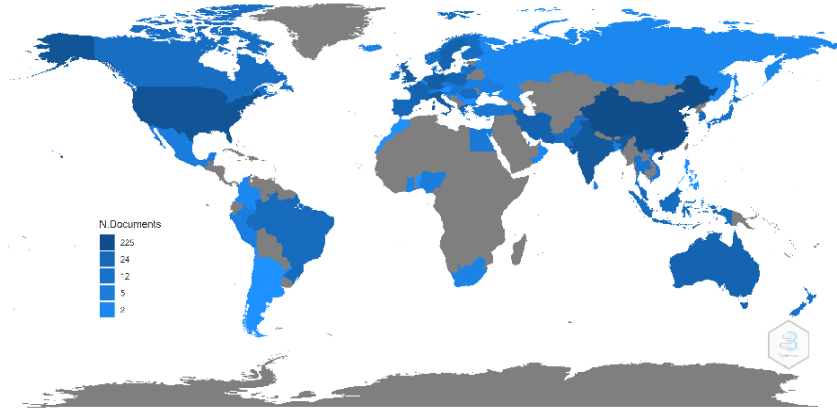
Figure 5: Country Scientific Production

The top ten country list is almost the same on the citation side. The only difference is that the Netherlands and Switzerland were on the list instead of Australia and France. Figure 6 displays the top ten countries and their respective citation counts, which have received the highest citations within the field.
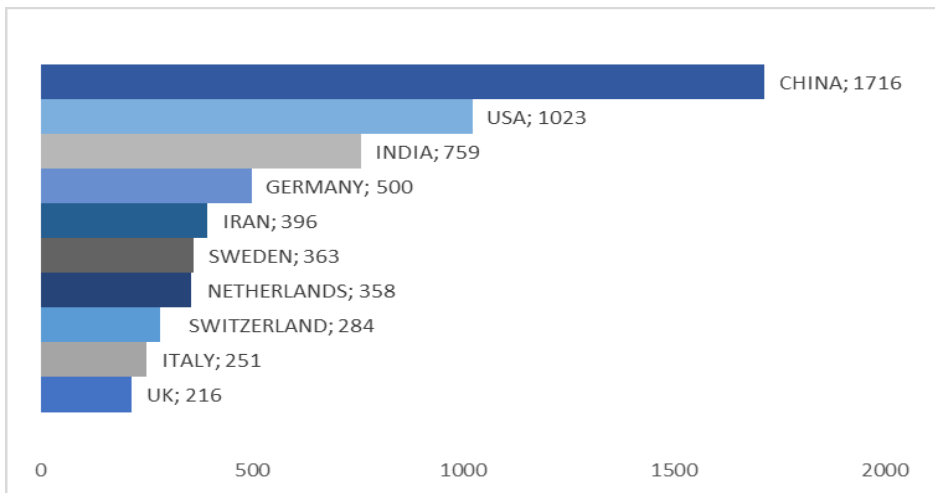
Figure 6: Most Cited Countries

4.7. Most frequent keywords

In the author's keywords parts of the studies within the dataset, 1391 different keywords have been used. Among them, 16 keywords have been mentioned in the author's keywords parts at least 10 times. Sustainability (54), sustainable packaging (30), electric vehicles (25), sustainable supply chain (25), and consumer behavior (22) are the top five keywords in terms of usage frequency. The word cloud based on the most frequent 50 keywords in the author's keywords part is presented in Fig. 7.

Figure 7: Word Cloud

4.8. Keywords Co-occurrence Analysis

A co-occurrence network analysis has been executed to reveal the mostly co-occurred keywords in author's keywords parts of the studies in the dataset. Keywords that appear at least five times have been incorporated into the analysis. The keywords' co-occurrence network is given in Fig.8.

The analysis has resulted in seven clusters. The keywords included in the cluster and their number of occurrences are presented in Fig.9.

Figure 8: Co-occurrence Network of Keywords

The red cluster is related to the intersection of sustainable packaging practices, consumer behavior, environmental considerations, and marketing strategies within the context of eco-friendly and sustainable development initiatives. The green cluster focuses on promoting environmentally friendly transportation methods, particularly emphasizing electric vehicles and sustainable transport options. The blue cluster implies the topics of sustainable supply chain and management with the dimensions of reducing carbon emissions, adopting eco-friendly applications in logistics, and the effects of COVID-19 on supply chain dynamics. The yellow cluster's focus is supply chain and corporate social responsibility. The purple cluster focuses on innovative green practices in supply chain and logistics. The topic of the turquoise cluster is sustainability in packaging and marketing. The orange cluster encompasses research focused on comprehending consumer decision-making through game theory and exploring how government policies influence consumer behaviors.

Cluster 1 (red)	Cluster 2 (green)	Cluster 3 (blue)	Cluster 4 (yellow)
sustainable packaging (30)	electric vehicles (24)	sustainable supply chain (25)	supply chain (12)
sustainable development (16)	sustainable transport (20)	sustainable supply chain management (15)	corporate social responsibility (8)
circular economy (12)	sustainable transportation (20)	sustainable consumption (8)	consumer preferences (7)
consumer perception (10)	environmental concern (9)	co2 emissions (7)	green supply chain management (7)
green logistics (10)	theory of planned behavior (9)	e-commerce (6)	adoption (5)
consumer (8)	environmental awareness (7)	management (6)	india (5)
food packaging (6)	consumer attitude (6)	willingness to pay (6)	performance (5)
eco-friendly packaging (5)	green transportation (6)	covid-19 (5)	survey (5)
environment (5)	pro-environmental behavior (5)	logistics services (5)	
green marketing (5)	sharing economy (5) travel behavior (5)		
packaging design (5)			

Cluster 5 (purple)	Cluster 6 (turquoise)	Cluster 7 (orange)
supply chain management (13)	sustainability (54)	consumer behavior (22)
logistics (9)	packaging (13)	game theory (11)
green (6)	sustainable (6)	pricing (7)
innovation (6)	marketing (5)	government (5)
environmental sustainability (5)	purchase intention (5)	
reverse logistics (5)		

Figure 9: Clusters and Respective Keywords with Frequencies

4.9. Thematic Map

This study has employed a thematic map analysis to uncover the evolutionary trajectories of themes within the research field. A thematic map has four quadrants to locate themes. The quadrant positioned in the top-right indicates the motor themes that are developed advancedly and have critical importance in the research field (Aria et al., 2020). Niche themes, placed in the top-left quadrant of the map, have high density and low centrality, which implies they are highly developed but isolated (Ayan et al., 2022). Themes placed in the bottom-right quadrant represent basic themes that, while not developed, hold significant importance within the research field. On the other hand, themes on the bottom-left, titled emerging or declining themes, exhibit limited development, and offer marginal contributions to the research field (Cobo et al., 2011). The thematic map of the research field is presented in Fig.10.
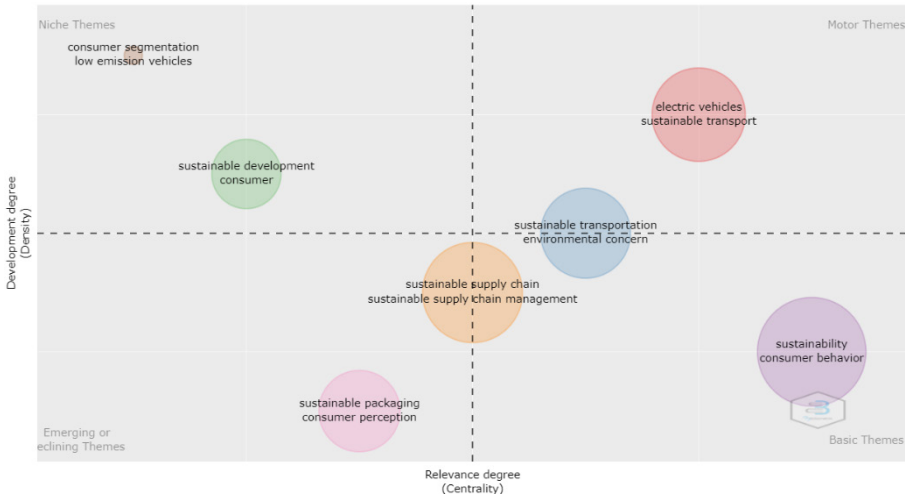
Figure 10: Thematic Map

The themes of "sustainability" and "consumer behavior have gained acknowledgment as crucial focal points but are at a lower level of development. Half of the bubbles of "sustainable transportation" and "environmental concern" themes fall within the motor themes, the other half within the basic themes quadrants. The field's most advanced and contributive themes are "electric vehicles" and "sustainable transport". Consumers' purchase and adoption intentions of electric vehicles, their preferences and attitudes towards electric vehicles, their perceived benefits of using electric vehicles, and climate change sensitivities have been frequently studied in the research field, elevating these themes to become motor themes within the field.

The themes of "sustainable supply chain" and "sustainable supply chain management" lie between emerging or declining themes and basic themes quadrants. Themes with low development and marginal contribution to the field include "sustainable packaging" and "consumer perception." Niche themes in the research field are "sustainable development," "consumer", "consumer segmentation", and "low emission vehicles."

Studies addressing niche themes of "consumer segmentation" and "low emission vehicles" in the dataset explored consumer preferences toward alternative fuel vehicles and suggested potential policy measures to promote the adoption of zero-emission vehicles among diverse consumer segments.

Studies addressing niche themes of "sustainable development" and "consumer" explore consumer behavior and sustainability in various sectors.

One focuses on understanding factors guiding the purchase of environmentally friendly wood products. Another study analyzes limited consumer knowledge's impact on adopting alternative fuel vehicles and their types, particularly among environmentally conscious consumers. Another investigates consumer views on sustainable packaging, emphasizing concerns about excessive plastic use.

5. Conclusions

This study addresses the relationship between consumer behavior and sustainable logistics by utilizing bibliometric analysis to understand the scholarly contributions in this field comprehensively. Sustainability is a concept that has a multidimensional nature, and it has transformative effects on logistics services. The efforts to align with sustainability goals in logistics lead to many applications aiming for various objectives, such as reducing carbon emissions and enhancing energy efficiency. One of the crucial factors shaping sustainability practices in logistics services is consumer behavior. This study highlights the critical role played by consumer perspectives in shaping sustainable logistics. Consumers significantly impact businesses' logistics activities as direct influencers within enterprises' microenvironments. This study aimed to examine the academic literature on the intersection of consumer behavior and sustainable logistics from a broad perspective.

The present study employs bibliometric analysis to reveal the intersection of consumer behavior and sustainable logistics, addressing specific research questions. This research navigates the complex landscape of these interconnected fields by exploring publication trends, contributions of authors and sources, country-wise impacts, prevalent keywords, co-occurrence patterns, themes, and their developmental and contribution levels.

Findings reveal a surge in publications post-2018, signifying heightened scholarly attention in this field. However, the discrepancy between rising publication counts and declining citations per paper suggests a need for a more significant scholarly impact on recent contributions. Noteworthy authors, prolific sources such as 'Sustainability' and 'Journal of Cleaner Production', and leading countries like China, the USA, and India emerge as influential contributors to this research field.

Identifying key themes, such as sustainable packaging, consumer behavior, environmental concerns, and sustainable transportation, highlights their varying developmental levels and contributions to the field. While themes like "electric vehicles" and "sustainable transport" stand as motor themes, indicating advanced

development and critical importance, others, like "sustainable packaging" and "consumer perception," showcase lower developmental stages.

In conclusion, this study provides insight into the complex relationship between consumer behavior and sustainable logistics, highlighting their interdependence and the evolving nature of research within this field. The findings emphasize the need for deeper integration of sustainability within logistics services, driven not only by environmental considerations but also by the convergence of social and economic sustainability facets, ultimately shaping a holistic and resilient framework for the future.

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EFFECTS OF FINTECH COMPANIES ON THE BANKING SECTOR

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1. Introduction

Technology developing with digitalization in the banking and finance sectors is a strategic issue for the banking sector. It both provides opportunities for the opportunities offered by the bank and can pose threats to the commercial existence of the bank. From the perspective of banking industry regulators and public policy, the proliferation of digital banking technology may cause problems with its impact on bank solvency, risks in the banking system and customer protection. In addition, it can make positive contributions to increasing competition and expanding the potential market, which can increase the bank's productivity and efficiency in the financial sector. Banks that adopt digital technology will be able to gain more significant advantages in the future (Wirdiyanti, 2018: 2).

The 2008 crisis deeply affected the financial sector. With the bankruptcy of many banks during the crisis, a trust problem arose in the financial system. In order to correct this problem, improvement steps have begun to be taken in the financial field. With digitalization, financial technology (FinTech) has become critical in the financial sector (Çağıl and Candemir, 2019: 252).

FinTech profoundly affects the worldwide economy and many sectors, including the banking sector. FinTech carries some opportunities and risks for the banking sector. It has the potential to increase competitiveness, innovation and productivity. However, it also brings some risks.

In this section, the conceptual framework regarding digital change and FinTech in the financial sector is explained, and the effects of FinTech on the banking sector and the advantages and risks it carries for banks are discussed.

2. Digital Transformation in the Finance Sector

The incorporation of computer-based technologies into an organization's products, processes and strategies refers to digital transformation. Organizations are undertaking digital transformation to better engage with their workforce and customers, provide them with better services, and improve their competitive capabilities. In challenging economic times, operational efficiency and cost optimization have also become important transformation goals (Pratt, 2023).
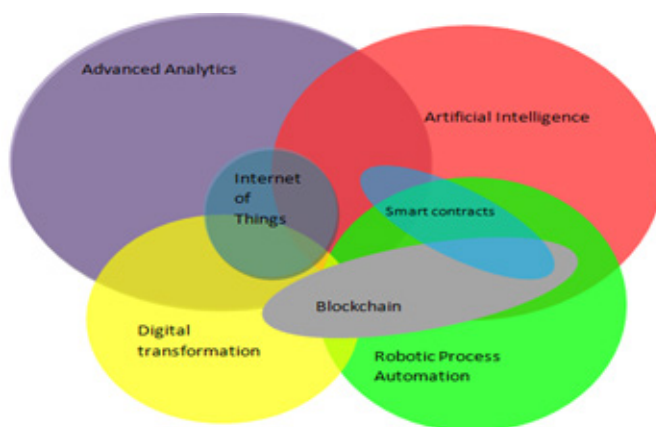
Reference: https://innovatefinance.com/, ey.com/banking, (2016).
Figure 1: Technology-enabled trends that support innovation

Figure 1 explains the interrelated nature and convergence of technology trends. There are various structures within the transformations and changes that occur as a result of innovation.

The financial sector is also experiencing a deep transformation due to digitalization. There are current technologies such as Blockchain and smart contracts that can affect the current situation, create advanced financial solutions and offer different alternatives. These innovative solutions provide a different

level of efficiency, security and convenience than traditional banking systems, and most importantly, time savings. Thus, with the rise of alternative financial solutions such as centralized and decentralized crypto exchanges and NFT marketplaces, change has begun in the financial sector. Subsequently, traditional financial institutions saw the full potential and high demand of these new technologies and realized the need to pursue and implement them to remain competitive. This digital transformation has brought the financial sector to the forefront in technological terms and allowed even the most conservative players to thrive (Klimenko, 2023).

3. Conceptual Framework and Ecosystem of FinTech

The concept of FinTech has been appearing in business magazines lately. It identifies the disruptive challenge that the delivery of cheaper, human-centered financial services poses for the financial sector. This concept has become important for investors who invested in the relevant sector (over 50 billion dollars) between 2010 and 2015 (Accenture, 2015).

The FinTech sector is developing rapidly. There are different definitions of FinTech in the literature. Will only emerging technology-based financial companies be referred to as FinTech? Will established companies also be considered FinTechs if they are developing new technology-based services or products? Opinions differ on these issues. It is also unclear whether there is a market capitalization threshold that can be used to distinguish FinTech from traditional financial intermediaries. Despite differences in definition, there is consensus that FinTech refers to companies that develop financial services and products based on much more intensive use of information technology (Varga, 2017: 22).

Simply put, 'FinTech', 'digital finance' or 'financial technology' is about using newer technologies to transform and innovate the delivery of financial services. We can classify FinTech companies as technology startups, e-commerce companies or large technology companies. These companies are leveraging emerging technologies such as cloud computing, blockchain, artificial intelligence, machine learning, data analytics and robotics to deliver financial services at lower costs for a better value proposition (Pant, 2020: 47).

This transformation, called financial technologies (FinTech) and coming to the fore in the financial sector in general and payment services in particular, requires the competition authorities as well as the legislator and the regulatory authorities of the sector to take various initiatives. Because with FinTech, not

only concerns about financial stability but also concerns about the competitive structure of financial markets come to the fore. In the studies published by the competition authorities of England, Germany, the Netherlands, Spain, Portugal, Canada, Mexico and the European Union (EU) Commission between 2016 and 2020, it is seen that anti-competitive risks in the field of FinTech are mentioned and how competition law tools can be used in this field are discussed (Rekabet Kurumu, 2021: 1-2).

FinTech can also be defined as companies that use technological tools in the provision of financial services and the services or products provided by these companies, in addition to the business models used by traditional institutions. More clearly, the concept of FinTech is the provision of services such as payments, asset management, crowdfunding, lending, capital markets and insurance using innovative technologies such as internet, mobile and data analytics (Yıldız, 2022: 50).

Some other definitions regarding FinTech are given in Table 1.

Table 1. Other Definitions Regarding FinTech

Definitions	Reference	Year
It is the creation and dissemination of current financial technologies, financial instruments, institutions and markets.	Farha Hussain	2015
Explains technology-supported financial solutions. The FinTech concept is not limited to certain sectors.	Arner, DW; Barberis, JN; Buckley, RP	2015
It is defined as a sector consisting of many companies that make financial systems more efficient and useful.	McAuley, D.	2015
It describes a financial services industry born in the 21st century.	Investopedia	2016
It is a service sector that uses information technology and thus aims to increase the efficiency of the financial system.	Kim, Y., Park, Y. J., & Choi, J.	2016
It combines different business models and innovative business models to make the financial system better.	Ernst & Young	2016
It uses modern software and technologies.	FinTech weekly	2016

Reference: Giglio, F. (2022).

Some of the international definitions of FinTech are as follows: IOSCO, the international organizational board of the Securities Commission, stated

that the term FinTech is used to describe various business models and current technological advances that can change the financial services sector. OECD defines FinTech as the innovative application of digital technology for financial services. Finally, the Basel Committee defines FinTech as a company whose main mission is to provide innovative services such as the launch of new technologies in the financial sector (Giglio, 2022: 83).

Understanding the competitive and collaborative elements in FinTech depends on a good explanation of the ecosystem. An effective FinTech ecosystem also helps the FinTech sector develop. In Figure 2, the FinTech ecosystem consists of five main factors. These five main elements that make up the FinTech ecosystem contribute to innovation in a country, stimulate economic activities, facilitate competition and cooperation in the finance and banking sector, and ultimately benefit consumers who benefit from these services (Lee, 2016: 58).
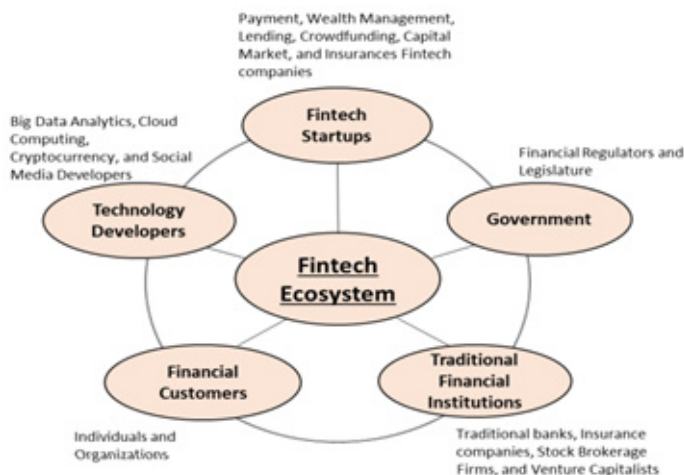
Reference: Lee, 2016.
Figure 2: FinTech Ecosystem

4. FinTech and Banking Sector Relationship

FinTech is accelerating change in the financial sector. The big data explosion takes advantage of technologies that are relevant to individuals and companies, such as artificial intelligence advances, cryptography, computing power, and internet access. The important relationships between these technologies are unlocking new applications, from payments to finance, asset management, insurance and consulting. Widespread adoption of new technologies offers

advantages but also brings risks. FinTech can be extremely beneficial for the efficiency of the financial sector. It can also create targeted, better products and services. However, FinTech applications may have risks such as damaging monetary policy transmission, competition, financial stability and trust (He et al., 2017: 7).

Recently, digitalization in the banking sector reflects the rise of FinTech, which represents a relationship or combination of finance and information technologies. Zavolokina et al. (2016) explained that the FinTech mechanism is specified by the way of creating /changing/ developing a business model. Additionally, FinTech also has a system for disruption or collaboration. Another indicator of FinTech is the impact of IT in the financial sector (Legowo et al., 2021: 95).

Banks and the financial sector need to comply with many regulations. In particular, compliance with local regulations is very important. Otherwise, criminal sanctions may occur. Additionally, it is important in the financial sector for issues such as security and positive customer feedback. Therefore, it is imperative for companies to survive and constantly adapt to innovations and change their processes if necessary. FinTech companies generally specialize in certain subjects and quickly adapt to developments (Paynet, 2023).

FinTech has various impacts on banking. The development of FinTech leads to reduced costs and increased efficiency of banks, increased competition in the banking environment, reduced information asymmetry, and increased financial inclusion. However, it also causes new financial and technological risks for banks.

5. Positive and Negative Effects of FinTech on the Banking Sector

The spread of financial technologies has led to serious changes in the financial services market. This situation has also changed the role of traditional financial institutions and, accordingly, required new approaches and solutions for banks (adapting to rapidly changing conditions, in the field of variability of existing business models). For regulators (related to the exploration of new approaches to control and surveillance), it has opened up the opportunity to produce new solutions to prevent or reduce potential crisis events and accumulated systemic risks (Shmuratko and Sheludko, 2019: 63).

Numerous analysts argue that although FinTech's original goal was to eradicate traditional banks from the market by acquiring a dominant position, there are several cases where we can see partnerships between these companies

and established traditional banking institutions. In this way, FinTech companies have managed to overcome the difficulties they experience in increasing the number of customers by achieving greater economies of scale. According to Vives, the use of new technologies has important contributions for the financial sector and banks, such as reducing transaction costs and the availability of new and better quality products. Thanks to big data and appropriate statistical models, potential debtors can be controlled more effectively. This is extremely important to eliminate the asymmetric information problem. Thanks to new technologies, the business plan can be implemented and presented more efficiently and effectively (Basdekis et al., 2022: 163).

Digital transformation is vital for financial institutions to keep up with FinTech initiatives. Those who enter the industry through digitalization will be known for their agility and customer-focused solutions. Therefore, traditional banks and financial institutions must embrace digital transformation to compete effectively. Digital transformation also brings cost efficiency. Automating routine tasks leads to significant cost savings, and integration of advanced technologies such as blockchain can deliver further savings by reducing fraud and operational risks. Therefore, the role and importance of digital transformation in the financial industry is profound and promises a paradigm shift in service delivery (Balcıoğlu, 2023: 9).

FinTech companies have a significant share in banking services. However, even if there are some exaggerations about FinTech, there are at least three positive factors that the latest technological developments can have a lasting impact on the banking sector. First, the current pace of innovation is faster than in previous decades, and the adoption rate is increasing at the same rate. While ATM adoption has been occurring for over two decades, internet banking and mobile banking have taken center stage in increasingly shorter intervals. Second, a generation of digital natives is growing up with the technological proficiency and innovations at the heart of FinTech innovation. Indeed, one of the drivers of the recent FinTech wave is precisely changing customer behavior and demand for digital financial services. Third, FinTech is actively at the forefront of advances in financial inclusion, with huge potential growth opportunities (Cos, 2019: 2-3).

The overall role of banks in the economy is important. It can be stated that FinTech also encourages individual financial participation by providing efficient financial services. Easier access to financial services allows individuals to manage their money, including income, spending, savings and investment. Higher levels of access to financial services also reflect financial inclusion,

which provides the necessary indicators to improve society's well-being (Lestari and Rahmanto, 2021: 56).

Despite the disruptive power of FinTech that can impact banks' value proposition, banks are large-capitalization giants that they may seek to compete with by creating a similar product. Banks and FinTech competing with each other not only contributes positively to the economy but also provides customers with a more diverse range of services. According to Thomas Nyholm, FinTech does not disrupt the banking industry, but it brings a healthy competitive environment because if FinTech completely disrupts the bank, banks will be in a state of collapse. Financial services of banks are still needed and loyal customers will always remain customers of banks (Siek and Sutanto, 2019: 356).

The emergence of FinTech has ushered in a new era in financial services and challenges the traditional banking system. The tremendous technology offered by FinTech enables users to access financial solutions both faster and more effectively. These developments may negatively affect the banking sector. Many studies have concluded that traditional banks have difficulty adapting to the rapid innovation driven by financial technology due to the stringent regulations and rules they must comply with, making it difficult for them to meet various credit requirements. According to findings by Buchak et al (2018), FinTech is responsible for thirty percent (30%) of the rise of shadow banking in the United States. There has been a decrease in the market share of traditional banks in the residential mortgage market. This is because both shadow banks and FinTech lenders are major players in the industry. The emergence of online lending has led to an innovative and transformative change in the borrowing environment, directly affecting the loan transactions offered by traditional banks. According to Nguyen (2022), the proliferation of the FinTech sector has led to an increase in loans. There is an increase in costs in traditional banks, therefore the inherent risk of bank assets increases. It reveals that when FinTech companies expand in a country, traditional banks experience a decrease in their financial performance, while Islamic banks are relatively unaffected by the developments in the FinTech sector. On the other hand, as FinTech firms increasingly offer financial services that were once the exclusive domain of traditional banks, these activities can pose challenges to banks' traditional business models and affect the stability and efficiency of financial markets. A report by the European Banking Authority states that "banks may need to make significant investments in new technologies and staff to ensure compliance with new regulatory requirements." Small banks may have more difficulty in this regard than large banks because they do not have the

necessary resources. However, ensuring equal conditions for all participants in the market is extremely important for the success of FinTech regulations. This can also prevent unfair competition by ensuring that both traditional banks and FinTech firms are held to the same regulatory standards (Rajapathirana, 2023: 19-20).

The rapid development of FinTech facilitates entry into the financial services market, enabling the emergence of a service area independent of banks and cost-effective new business projects. This situation is a negative factor for the banking sector and requires banks to quickly update their business models in order to maintain their competitiveness. This causes a process that both takes time and increases costs. If competitive measures are not implemented at a high level, FinTech organizations and new entrants will be able to benefit more from innovations and offer lower-cost services that better meet expectations. Thus, there will be significant declines in the market shares or profits of existing financial institutions (Kolesova and Girzheva: 216).

The negative impact of FinTech on the banking sector varies depending on the type of FinTech. However, this negativity is not big. For example, the well-known financial magazine Forbes announced that revenue growth from e-commerce in the US is approximately one-third of bank revenues. Another impact is the decrease in value of the Bank's products. It is a theory that Forbes writer Haering suggests that banks are being disrupted by the "4 horsemen of the e-pocalypse". Haering explained that there are four effects of digital disruption: disintermediation, invisibility, separation and commodification. Disintermediation means that banks gradually lose access to customers as banks can now access financial services outside banks, invisibility means that banks lose brand awareness and reputation as consumers can receive financial services from other providers, segregation means that banks' products are packaged separately. The consumer can now choose from a single provider and finally commoditization means that banks can no longer describe themselves as banks compared to non-bank companies (Siek ve Sutanto, 2019: 357).

FinTech products, supported by advanced technologies and investor funds, help banks accelerate transactions, reduce costs, collect the necessary funding resources, open and manage more savings and current accounts, provide access to emerging markets, and help banks open more savings and current accounts. Traditional banking has difficulty competing with such a highly efficient and well-supported competitor. The only advantage banks still have over FinTech is the level of public trust and proximity to their customers in the physical world (Gavrilova, 2022).

6. Conclusion

The infrastructure of the growth of FinTechs is being prepared with the developing digitalization economy. FinTechs are now a new technology that automated the provision of financial services. The rapidly developing technology with increasing digitalization allows FinTech to adopt quickly and easily among users.

The banking sector has also been experiencing serious changes and significant transformations in the competitive environment recently, with the operation of FinTech companies that offer innovative technologies and services that change the way traditional banks do business. FinTech companies both offer innovations to the financial environment and pose a threat to traditional banks that cannot keep up with the changes and developments or are left behind. FinTech companies offer a comprehensive range of services, from payments and asset management to data analytics and investment banking. The services that FinTech companies provide to customers are faster, easier and more cost-effective than traditional banks. Additionally, FinTech companies can provide personalized services specific to each customer. This situation requires banks to cooperate with FinTech companies rather than compete, and this cooperation has gained great importance recently. As a result of this cooperation, it can benefit from digital platforms to a large extent in matters such as traditional banking approach, customer service style and marketing of products. With FinTech, banks have the opportunity to deliver their products and services to larger audiences and operate more effectively and efficiently than traditional banking methods.

Recently, parallel to the world, there has been increasing cooperation between the banking sector and FinTech companies in Turkey. Banks and FinTech companies are not competitors of each other, on the contrary, they play a complementary role.

Developments in financial technologies can bring difficulties, advantages and risks to the banking sector. In order to remain competitive in today's market, banks need to embrace all the changes in the FinTech field. Because if they cannot keep up with these changes and innovations, they may face the risk of being left behind. By taking advantage of FinTech, banks can create opportunities to renew themselves and grow and gain the advantage of getting ahead of their competitors. In addition, banks finding common ground to cooperate with FinTech companies, preparing studies on collaborations, and determining the necessary details in detail can make positive contributions to the banking sector.

As a result, it is extremely important for banks to engage in financial technology-related activities, adopt these technologies and increasingly continue their collaborations with FinTech companies in order to achieve their desired financial goals, provide better and quality service to their customers, gain a competitive advantage and optimize their business processes.

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THE FUTURE OF WORKFORCE: INVESTIGATION OF THE EFFECT OF ARTIFICIAL INTELLIGENCE ON UNEMPLOYMENT USING DYNAMIC PANEL DATA ANALYSIS

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1. Introduction

This research aims to investigate the effects of research and development spending, artificial intelligence patent filings, and the extent of higher education on the unemployment rates in a group of 26 nations over a span of eight years.

Due to their macroeconomic nature, unemployment rates are highly probable to show a correlation across time, hence in order for us to successfully model this complex relationship, a dynamic panel data model was implemented. The SGMM estimator is introduced by Arellano & Bover (1995) and Blundell & Bond (1998), which will be discussed thoroughly in section 5 on why it was selected for this study, employs the first lagged value of the dependent variable, unemployment in our case, as a regressor alongside the aforementioned other 4 regressors. To ensure the model validity, both autocorrelation and over-identifying restrictions are tested.

However, prior to delving into the technical specifics, comprehending the historical progression of technology and its influence on unemployment rates over time is crucial. For that, we must start by looking into industrial revolutions to comprehend the overall picture.

A series of industrial revolutions have significantly influenced the evolution and transformation of global societies and their economic systems. Distinct in their essence, these revolutions have propelled transformative changes in various domains, thereby elevating living standards and contributing to significant economic development. This section will delve into the pivotal roles of these revolutions, focusing particularly on their implications for labor markets and employment patterns.

The first industrial revolution, spanning from the late 18th to the early 19th century, signaled a profound shift from previous economic structures to a society dominated by mechanical and industrial processes (iED Team, 2019). This period was characterized by groundbreaking advancements in mechanization, notably in the textile industry with the introduction of advanced spinning machines. Moreover, the revolution resulted in significant advancements in the communication and transportation industries, highlighted by the creation of the telegraph and the evolution of the steam engine and railway sector. This progress substantially improved the efficiency and scalability of trade compared to traditional horse-drawn transport. This period was notable for a considerable change in the workforce, gradually moving away from conventional agricultural and artisanal fields toward the burgeoning industrial sectors, particularly textiles and transportation.

The latter half of the 19th century heralded the second industrial revolution, a period distinguished by its unprecedented technological advancements and substantial improvements in social welfare. During this era, critical developments such as the discovery of electricity, the exploration of oil and gas resources, and the initiation of large-scale automobile production, particularly by Henry Ford with his Model T, radically altered the industrial landscape (Ford Motor Company, 2020). These breakthroughs fostered the growth of the steel industry and advancements in chemical synthesis, paving the way for the pharmaceutical industry's emergence and significant progress in medical and healthcare standards (iED Team, 2019). Additionally, innovations in long-distance communication, exemplified by the telephone and radio, propelled globalization and international travel, with the aerospace industry gaining momentum following the Wright brothers' "1903 Wright Flyer" (National Air and Space

Museum, 2023). Echoing the first revolution, the second phase too initiated changes in employment scenarios, with industries such as steel, chemicals, and automotive witnessing new job openings, propelled by developments in electric power, large-scale manufacturing, and transportation systems.

Like its predecessor, the second revolution phase also transformed employment patterns, ushering in new job roles in industries including steel, chemicals, and automotive, shaped by progress in electric power, large-scale manufacturing, and transit systems.. The first nuclear chain reaction, successfully achieved by physicist Enrico Fermi and his team in 1942, opened new avenues for electricity generation and weaponry (Nunez, 2019). Concurrently, the electronics sector experienced a surge with the introduction of vital microchips and processors, leading to the advent of computers. The proliferation of computers extended human capabilities, enabling feats such as the Apollo 11 mission's moon landing in 1969 (NASA, 2008). This era also marked significant advancements in biotechnology, contributing to the saving of millions of lives. Furthermore, the period also saw the initial formation of Artificial Intelligence (AI) and robotics, driven by advancements in programming languages and a rapid increase in computational power, as Moore's law illustrates (Tardi, 2022). The third industrial revolution, by paving the way for automation in areas such as manufacturing, concurrently resulted in the displacement of some manual laborers. At the same time, it underscored the increasing significance of employees in fields like electronics, computing, biotechnology, and the aerospace sector.

The ongoing fourth industrial revolution, called as Industry 4.0, is still at the center of academic debates concerning its differentiation from its predecessor. While there is some debate regarding its exact beginning, the general agreement among numerous academics is that the Internet emerged sometime spanning the close of the 20th and the onset of the 21st centuries, given its significant impact on global economic and social frameworks (Wise, 2023). The internet has revolutionized various life aspects, from e-commerce to augmented reality, fostering an era of unprecedented interconnectedness and collaboration. This transformation is marked by the possible replacement of employees performing regular tasks, owing to progress in automation and AI. Concurrently, it has also generated fresh employment prospects in the fields of technology, data analysis, and the digital industry.

To conclude this section, the takeaway here is that the progression of societies and economies throughout these industrial revolutions has been

characterized by ongoing, transformative alterations, culminating in substantial enhancements in living conditions and economic expansion. Every revolution introduced a distinct collection of technological innovations, causing a dynamic alteration in job trends and the configuration of labor markets.

The subsequent section will explore the profiles of selected countries to analyze how different nations have navigated these industrial revolutions and their resultant impacts on employment trends.

2. Country Profiles

This section aims to delve deeper into the interconnections among education, technological advancements, particularly Artificial Intelligence (AI), and employment outcomes in various global contexts. This draws from an array of scholarly research, illustrating a consistent pattern: higher educational attainment tends to correlate inversely with unemployment rates. Also, the emergence of AI presents a two-fold aspect: it boosts productivity while also bringing forth the concern of job displacement.

To explain these dynamics, this section examines the educational and employment landscapes of selected countries. These international comparisons reveal stark differences, underlining how education levels and AI's influence on job markets shape employment prospects. For instance, in Australia, the unemployment rate for those with tertiary education stands at a lower 3.3%, compared to 5.5% for those lacking post-school qualifications (Australian Bureau of Statistics, 2021). In stark contrast, Belgium grapples with rising unemployment, attributed in part to a digital skills gap as jobs increasingly require automation proficiency (European Commission, 2020b). Similarly, Canadian data shows a stark divide: individuals with at least a bachelor's degree boast an employment rate of 88.8%, significantly outpacing the 46.8% rate for those without a high school diploma (Statista, 2021b). Germany and Spain also exhibit this educational disparity in employment outcomes, with lower unemployment rates among those with tertiary education (Statista, 2021a; Instituto Nacional de Estadistica, 2021). France, meanwhile, faces heightened unemployment due to insufficient digital skills in the workforce, exacerbating the impact of automation (European Commission, 2020b).

This research explores the effect of AI on unemployment, which is dependent on the level of investment in R&D by countries. Countries such as the United States, Canada, and Australia, known for their strong R&D commitments, have experienced notable job losses attributed to AI (Bureau of Labor Statistics,

2021; Brook Institution, 2019; Statista, 2021b; Australian Bureau of Statistics, 2021). Contrastingly, Austria, Belgium, Denmark, and Sweden, which emphasize workforce upskilling, report a less severe impact (Bock-Schappelwein, 2021; European Commission, 2020b). Countries with lower R&D investments, such as Greece and Italy, show a slower AI adoption rate, correlating with a lesser impact on employment (Eurostat, 2021; European Commission, 2020b). Intriguingly, even within countries with high R&D investments like Germany and France, the effects of AI on employment vary, influenced by factors such as industrial focus and innovation strategies (Statista, 2021a).

These findings underline the multifaceted relationship between R&D investment, AI, and employment in the literature, calling for tailored interventions in order to examine. For countries with high technological prowess like the United States, Japan, and Germany, AI adoption could be smoother, potentially lessening employment impacts. However, nations with lesser technological development face greater risks of job displacement due to AI.

The data from various countries underscores the critical role of education and technological progress in shaping employment landscapes. It highlights the necessity of strategically concentrating on skill enhancement, digital literacy, and continuous education to mitigate the potential adverse impacts of automation. This analysis serves as a foundation for the next section, which will provide an in-depth literature review on this subject.

3. Literature Review

Artificial Intelligence (AI) has triggered substantial changes in labor market trends, notably affecting wage gaps, job transitions, and total efficiency. It has been posited that AI adoption is likely to exacerbate the gap between workers with high and low skill levels. This stems from the automation of routine tasks, disproportionately affecting low-skilled jobs and sparing those requiring higher levels of problem-solving and creativity. Such labor market polarization, marked by a decline in middle-skill jobs, has been mentioned in the literature (Webb, 2018). Furthermore, the incorporation of AI is linked to increasing income inequalities, advantaging workers with advanced skills, while leading to wage stagnation and the displacement of those with fewer skills (Webb, 2018; Ernst et al., 2019; Stevenson, 2021).

The impact of AI on income inequality and employment displacement exhibits significant variations across different sectors and geographical regions. Industries heavily dependent on repetitive tasks, like manufacturing and retail,

face a greater risk of job losses due to AI-enabled automation (Acemoglu and Restrepo, 2018). Additionally, the escalation of income disparity is more pronounced in nations with extensive AI adoption and minimal social investment (Georgieff et al., 2020). Conversely, AI-related employment opportunities, especially in advanced technology sectors, often provide higher salaries and greater job stability (Acemoglu et al., 2018).

Worries also revolve around the accumulation of influence and its consequences for market rivalry. The ability of AI to consolidate authority among those with extensive data resources is a major issue (Acemoglu, 2019; Varian, 2020). Although AI has the capability to enhance competitiveness and effectiveness, it equally presents threats of market dominance and barriers to new entrants (Varian, 2020).

The consequences of AI integration for job expansion and workforce efficiency are intricate and varied. Although automation might result in employment reduction in some industries, it concurrently cultivates fresh job prospects and boosts efficiency in others (Bessen, 2017; Graetz and Michaels, 2018). Country-specific factors, such as the extent of AI adoption and human capital levels, significantly influence these outcomes (Georgieff et al., 2020). A significant change in the employment market is the rising need for highly skilled labor, alongside a decrease in opportunities for mid-level skilled jobs (Acemoglu et al., 2018; Bessen, 2017).

Previous research has largely focused on the effects of AI on unemployment within individual country settings, using either time-series or cross-sectional methods of analysis. In contrast, this research proposes a more expansive investigation across a panel of 26 countries[1].

This literature review thus lays the foundational groundwork for the forthcoming section, which will mention the data and variables employed in the research.

4. Data Set and Variables

This section details the data and variables crucial to our study, focusing on the impact of advancements in artificial intelligence (AI) on unemployment rates across a diverse group of 26 countries. Our analysis incorporates four

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1 Australia, Austria, Belgium, Canada, Switzerland, Czechia, Germany, Denmark, Spain, France, the United Kingdom, Greece, Hungary, Ireland, Israel, Italy, Luxembourg, Mexico, Netherlands, Norway, New Zealand, Poland, Slovenia, Sweden, Türkiye, and the United States.

explanatory variables, each offering distinct perspectives on the ramifications of AI proliferation.

The first variable investigates the proportion of the gross domestic product (GDP) allocated to R&D investments, serving as a gauge for the investment intensity in AI-associated endeavors within each country, quantified on a percentile scale for cross-national comparisons (World Bank, 2021b).

The second variable assesses the quantity of AI patent filings in each country over a seven-year period. Patent filings serve as indicators of technological advancement, providing a quantitative measure of a nation's AI developmental trajectory (OECD, 2021a). By examining AI patent applications, we gauge the vigor and pace of AI-related technological advancements.

The third variable centers on the highest educational level achieved by individuals aged 25 to 34, specifically focusing on those with tertiary education. This demographic indicator reflects the pool of skilled labor available and their capacity to integrate and interact with emerging AI technologies (OECD, 2021b). Conversely, the fourth variable assesses the same educational criterion among individuals aged 55-64. This metric provides an understanding of the adaptability and skill acquisition potential of an older population in relation to AI-driven changes in the labor market (OECD, 2020b).

To systematically encapsulate the aforementioned variables, Table 4.1 is presented, which documents these variables alongside their respective descriptions and data sources. Employing these variables lays the groundwork for investigating the link between AI advancement and unemployment trends, shedding light on the multifaceted impact of AI on employment dynamics across the selected 26 countries.

Table 4.1: Data and Variable

Variable Name	Symbol	Description	Sources
Unemployment Rate	Y	The proportion of actively job-seeking, yet unemployed, members of the labor force.	World Bank, 2021a.
R&D% of GDP	X_1	The percentage of a country's GDP spent on research and development, measured in USD.	World Bank, 2021b.
AI Patent Applications	X_2	The annual count of AI-related patent filings per country, based on the IP5 patent families.	OECD, 2021a.
Population rate with Tertiary Education, 25-34	X_3	Population with tertiary education refers to those who have attained the highest education level, categorized by age group.	OECD, 2021b.
Population rate with Tertiary Education, 55-64	X_4		

In order to understand the characteristics of the variables used in our investigation, Table 4.2 has been meticulously crafted to present a descriptive statistics summary. This table summarize basic statistical measures for each variable under consideration. Incorporating these descriptive statistical measures is critical, as they provide essential understanding of the distribution trends and core tendencies of the variables. Such statistical information is crucial in deepening our comprehension of the variables' properties within the ambit of this study.

Table 4.2: Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
Y	8.210	4.790	2.890	27.690
X_1	1.950	0.900	0.328	4.656
X_2	52.375	177.020	0.000	1372.419
X_3	40.245	9.407	17.447	60.916
X_4	25.264	9.741	9.456	48.143
N	n	T		
208	26	8		

Note: 'n' indicate the number of countries, 'T' the duration of study, and 'N' the overall number of observation. 'X_1' is the GDP's R&D spending percentage,

'X_2' the yearly AI patent applications, while 'X_3' and 'X_4' indicate the proportion of people aged 25-34 and 55-64 with tertiary education, respectively.

Across the 26 countries analyzed, the average unemployment rate is recorded as 4.79, providing a consolidated view of the unemployment levels within these nations. Moreover, R&D activities typically receive an average of 0.9% of the GDP across the studied countries.

Further, the mean number of patents filed per country is recorded at 177, representing the mean level of patenting activity and, by extension, the intensity of technological innovation in the sample. Additionally, the mean proportion of the population aged 25 to 34 holding tertiary education is quantified at 9.407, while for the population aged 55-64, it is 9.741. These figures reflect the prevalent educational attainment levels within these specific age groups, offering insights into the educational backdrop of the workforce.

This exploratory data analysis sets the foundation for the following section, which will delve into a comprehensive examination of prospective statistical methodologies appropriate for this study.

5. Method

The System Generalized Method of Moments (SGMM) estimator, is an extension of the Arellano and Bond's Difference GMM estimator, and was introduced by Arellano & Bover (1995) / Blundell & Bond (1998), to control for unobserved panel-level effects and address endogeneity issues (Arellano and Bond, 1991; Arellano & Bover, 1995; Blundell & Bond, 1998). This estimator is particularly known for its efficiency, which is achieved by utilizing additional moment conditions and incorporating both differenced and level equations.

A basic SGMM estimator can be represented in the following equation:

$$Y_{it} = \alpha Y_{i,\,t-1} + X_{it}\beta_i + \mu_i + \varepsilon_{it} \qquad (5.1)$$

Where Y_{it} represents the dependent variable, the coefficient of the lagged dependent variable denoted by α, X_{it} is a set of explanatory variables, β_i is a calculated coefficient of X_{it}, μ_i captures the unobserved panel effect, and ε_{it} is the error term.

The SGMM estimator is obtained through the Generalized Method of Moments (GMM), applied to a system of equations consisting of both differenced and level equations, with lagged levels and differences serving as instruments (Arellano & Bover, 1995; Blundell & Bond, 1998).

In comparison, the Arellano-Bond estimator, developed in 1991, is another GMM-based approach designed for dynamic panel models. This estimator is particularly effective in addressing the endogeneity of explanatory variables in the presence of lagged dependent variables. It differs from SGMM primarily in its use of only the first-differenced equation and its reliance on lagged values of the variables as instruments (Arellano & Bond, 1991).

In our dataset, where N>T, or in other words, where the number of countries far exceed the number of years, the SGMM estimator is considered more suitable, especially in light of Blundell and Bond's observation that SGMM tends to outperform the Arellano-Bond estimator in small samples. The efficiency of SGMM often exceeds that of the Arellano-Bond estimator, attributed to:

• Efficiency in Large Cross-Sections: It exploits the time series characteristics of the data while effectively dealing with cross-section heterogeneity, which is a common feature in large-N datasets.

• Dealing with Endogeneity: Endogeneity occurs when explanatory variables have a correlation with the error term, often stemming from omitted variable bias, measurement inaccuracies, or random fluctuations. SGMM employs internal instruments (delayed values of the explanatory variables) that are less prone to correlation with the error term, particularly in datasets with a large N.

• Robustness to Non-Stationary Variables: Since it utilizes lagged differences as regressors, the SGMM is estimator is effective even if one or more explanatory variables are non-stationary.

The model in the study is as shown in the equation below:

$$Y_{it} = \alpha Y_{i,t-1} + X_{1,it}\,\beta_1 + X_{2,it}\,\beta_2 + X_{3,it}\,\beta_3 + X_{4,it}\,\beta_4 + \mu_i + \varepsilon_{it} \qquad (5.2)$$

Where: X_1 denotes R&D % expenditure of GDP, X_2 denotes annual AI patent filings, and X_3 & X_4 denotes population % with tertiary education aged 25-34 and 55-64, respectively.

The robustness of the SGMM estimator is further enhanced by the utilization of diagnostic tests. These tests include the Arellano-Bond test for autocorrelation and the Sargan–Hansen test for over-identifying restrictions. These tests are crucial for confirming the model's validity and performance. This need for rigorous testing aligns with the earlier noted requirements for the SGMM and Arellano-Bond estimators, which entails confirming the legitimacy

of the instruments and the absence of second-order autocorrelation in the differenced residuals. Moreover, the SGMM's superior efficiency, as observed by Blundell and Bond, is attributed to its ability to integrate additional moment conditions and to handle both levels and differences in the data effectively (Blundell and Bond, 1998).

The Arellano-Bond autocorrelation test is employed to identify any serial correlation in the model's first-differenced error terms. According to Arellano and Bond, the presence of first-order autocorrelation ($AR_{(1)}$) in the first-differenced errors is expected under the GMM framework, while the presence of second-order autocorrelation ($AR_{(2)}$) suggests that the model's instruments are invalid. The absence of $AR_{(2)}$ in the disturbances validates the use of lagged levels as instruments, which is a key assumption of the SGMM estimator (Arellano and Bond, 1991). This test is fundamental for ensuring that the differencing process has successfully eliminated unobserved fixed effects that could otherwise bias the results.

The Sargan–Hansen test, also known as Sargan's J test, was initially developed by Sergan (1958), now often conducted in the form of the Hansen J-test of over-identifying restrictions, provides a means to assess the overall validity of the instrument set. Subsequently, Hansen (1982) expanded on these ideas, demonstrating the test's applicability to general non-linear GMM. As Blundell and Bond (1998) advocate, this test evaluates whether the instruments as a whole are correlated with the error term, which would violate the assumptions underlying the GMM approach. In other words, it tests whether the regressed lagged dependent variable is endogenous or correlated with the error term. Not rejecting the test's null hypothesis suggests that the instrument set is appropriate and that the model is not over-identified.

Both tests are integral to the empirical application of the SGMM estimator. The Arellano-Bond autocorrelation test ensures that the model does not suffer from endogeneity due to serial correlation, while the Sargan–Hansen test of over-identifying restrictions confirms the exogeneity of the instrument set. Together, they provide a rigorous framework for assessing the reliability of the SGMM estimates.

Having established our theoretical framework, we now turn to the findings section, where we will examine the results of the SGMM estimation along with the outcomes of the diagnostic tests.

6. Findings

Building on the groundwork laid in sections 4 and 5, this section delves into the application of the SGMM estimator to model the relationship between unemployment rates (our dependent variable) and four key explanatory variables: R&D% of GDP, AI Patent Applications, and the populations with Tertiary Education in the 25-34 and 55-64 age brackets. The outcomes of this estimation are systematically detailed in table 6.1. Additionally, the findings from the Arellano-Bond test for autocorrelation and the Sargan–Hansen test for over-identifying restrictions are comprehensively presented in tables 6.2 and 6.3, respectively.

Table 6.1 presents the detailed SGMM estimation results. These results encapsulate the multifaceted influences exerted by the aforementioned variables on unemployment rates across a set of 26 countries and over an 8-year time frame. The table meticulously reports the coefficients of each variable, along with their corresponding standard errors and p-values, offering a comprehensive view of the statistical significance and magnitude of each variable's impact on unemployment.

Table 6.1: SGMM estimation results

Variable	Coefficient	Standard Error	t-statistics	P-value
Y_{t-1}	1.137	0.013	88.49	0.000*
X_1	-0.707	0.175	-4.03	0.000*
X_2	0.000	0.004	-1.01	0.310
X_3	0.056	0.014	3.99	0.000*
X_4	-0.162	0.022	-7.23	0.000*
Observations	182	Wald χ^2 28401.671		
Instruments	31	Prob. 0.0000		

Note: * denote 99% statistical significance, ** indicate 95% significance, and *** mark 90% significance levels. 'X_1' is the GDP's R&D spending percentage, 'X_2' the yearly AI patent applications, while 'X_3' and 'X_4' indicate the proportion of people aged 25-34 and 55-64 with tertiary education, respectively.

This study centers on unemployment as the dependent variable, measured as a proportion of the entire workforce. The estimator is deemed to be valid since its Wald χ^2 p-value is significant at a 1% level.

The significant inclusion of the lagged dependent variable, evidenced by a coefficient of 1.137 highlights unemployment's persistence over time.

This suggests that previous unemployment rates have a continuous impact on current ones.

A crucial aspect of this research is the analysis of R&D spending's impact on unemployment. The derived coefficient of -0.707 for R&D expenditure, expressed as a percentage of GDP, indicates a reverse co-movement with unemployment. This aligns with the idea that increased R&D investment fosters economic innovation and job creation, thereby reducing unemployment. This finding resonates with economic theories that identify R&D as an essential catalyst for job creation.

However, AI patent applications did not demonstrate a significant impact on unemployment rates at a 1% level. This could be attributed to factors like the early stages of AI development during the study period or the lagged effect of patent applications on labor markets, warranting further exploration into how AI advancements affect employment across different time frames and sectors.

The model further investigates the link between education and unemployment, focusing on two age groups: 25-34 and 55-64 years. For the 25-34 age group, a positive coefficient of 0.056 suggests that greater levels of tertiary education correlate with increased unemployment, possibly indicating a skills mismatch or elevated job expectations among educated young adults. In contrast, the 55-64 age cohort shows a negative coefficient of -0.162, implying that higher education in this demographic is associated with lower unemployment, likely due to their greater adaptability and experience.

Next, we will delve into the interpretations of the tests conducted. The Arellano-Bond test of autocorrelation was applied to the first-differenced errors. The outcomes of this test are presented in Table 6.2, as detailed below.

Table 6.2: Autocorrelation Test

Order	Z-value	P-value
1	0.906	0.365
2	-1.438	0.150

Note: * denote 99% statistical significance, ** indicate 95% significance, and *** mark 90% significance levels.

The findings from the Arellano-Bond autocorrelation test on first-differenced errors indicate an absence of autocorrelation evidence in the model. This conclusion was reached from the test statistics for both the first-order $(AR_{(1)})$ and second-order $(AR_{(2)})$ lags.

For $AR_{(1)}$, the Z-statistic is 0.906 with a P-value of 0.365, indicating that there is no statistically significant autocorrelation at the first lag. Similarly, for $AR_{(2)}$, the Z-statistic is -1.438 with a P-value of 0.150, which also does not provide sufficient evidence to reject the null hypothesis of no autocorrelation at the second lag.

The absence of autocorrelation at both lags is a favorable indication for the specified model, suggesting that the first-differencing transformation and instrumental variable technique have appropriately addressed any autocorrelation in the panel dataset. This enhances the credibility of the model's estimations.

Also in the analysis, The Sargan–Hansen test has been conducted. The results of this test are succinctly summarized in Table 6.3.

Table 6.3: Sargan-Hansen Test of Overidentifying Restrictions

$\chi^2_{(26)}$ value	P-value
23.083	0.6283

Note: * denote 99% statistical significance, ** indicate 95% significance, and *** mark 90% significance levels.

Empirically, the Sargan–Hansen test yields a Chi-squared statistic of 23.083 with 26 degrees of freedom, resulting in a P-value of 0.6283. Since the P-value exceeds the 1% significance level, we fail to reject the null hypothesis, suggesting that the overidentifying restrictions are indeed valid. This implies that the instruments used in the model are unrelated with the residual, and as such, they are appropriately exogenous. The model does not appear to be over-identified, indicating that the instrumental variables provide a good fit for the endogenous predictor — the lagged unemployment rate — in the estimation.

7. Conclusion

This comprehensive study, utilizing the SGMM estimator, has provided valuable insights into the dynamics of unemployment in relation to R&D expenditure, AI patent applications, and educational levels in different age groups. The persistence of unemployment is a key takeaway from this research. The study reveals that the lagged unemployment (endogenous) variable, with a coefficient of 1.137, highlights the continuity of unemployment issues over time. This finding is crucial for policymakers, as it suggests that addressing current unemployment rates is essential for reducing future unemployment. This underlines the cyclical nature of unemployment and the need for sustained economic policies to tackle it.

Another significant aspect of this study is the inverse relationship between R&D expenditure and unemployment. The negative coefficient of -0.707 for R&D expenditure, as a percentage of GDP, suggests that increased investment in R&D is inversely related to unemployment rates. This aligns with economic theories that posit R&D as a catalyst for job creation and innovation, thereby providing a strategic avenue for reducing unemployment. In contrast, the study found that AI patent applications did not significantly impact unemployment rates. This unexpected result indicates the need for further exploration into the influence of technological advancements, such as AI, on employment. It points to potential factors such as the developmental stage of AI or the time-lagged effects of technological innovations on the labor market, which could vary across different sectors and time frames. Furthermore, the study highlights the differing impacts of tertiary education on unemployment in various age groups. For the younger age group (25-34 years), a higher level of education correlates with increased unemployment, which might be attributed to a mismatch in skills or elevated job expectations among educated young adults. On the other hand, for the older cohort (55-64 years), higher education levels are linked to lower unemployment rates, likely due to their greater adaptability and accumulated experience in the workforce.

Fundamentally, this study reveals how investing in research and development, understanding the evolving role of technologies such as artificial intelligence, and recognizing the varying impact of education across age groups can collectively shape the unemployment landscape in significant ways.

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AIR POLLUTION PREDICTION WITH MARKOV ANALYSIS: AN APPLICATION ON KONYA PROVINCE

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1. Introduction

Sustaining biological diversity, increasing the quality of life, protecting human and environmental health is possible with good air quality and the continuity of this air quality. Itis a known fact that air pollution has a great impact on human health. It can be shown as a reason that not only leaves permanent effects on the health of living things, but also endangers their lives. There are many factors that cause air pollution. While certain natural events cause air pollution and increase the air pollutant values in the air are among these factors, activities created by artificial means, which we call environmental factors, also cause air pollution. Volcanic activities, forest fires and desert storms are examples of natural events that cause air pollution. However, since these situations are temporary, air pollutants cannot remain suspended in the atmosphere for a long time and therefore do not pose a major problem. Environmental factors that have a significant impact on air pollution include transportation activities that increase with the development of technology, increase in fuel consumption,traffic density and population of the relevant province, and construction activities that ocur with urbanization (İbret and Aydınözü 2009). In addition, in regions where industrial activities are

intense, the negative impact of the smallest accumulation on the environment is an undeniable fact due to the use of metal in the relevant factories and the biological accumulation caused by this metal use (Seçik, 2021).

The situation defined as air pollution actually occurs as a result of the increase ofcertain substances that naturally exist in the air and is greatly affected by environmental factors. Air pollutants that cause air pollution are divided into two groups as gases and particulate matter. Gases includes Sulfur dioxide (SO_2), Nitrogen oxides (NO_X),Hydrocarbons, Carbon monoxide (CO), Ozone and Volatile organic compounds (VOCs).Particulate matter is divided into two as PM_{10} and $PM_{2.5}$ values (Zencirci and Işıklı, 2017). Particulate matter 10 (PM_{10}) refers to solid and liquid particles in the air smaller than 10 micrometers and 10 micrometers (Kotan and Erener, 2023). $PM_{2.5}$ refers to these particles being smaller than 2.5 micrometers and 2.5 micrometers.

The effects of the above mentioned air pollutant parameters on human health areshown in Table 1.

Table 1. Health Effects of Air Pollutants

Air Pollutants	Root Cause	Health Impact
Sulfur dioxide	Fossil fuels	Respiratory diseases
Nitrogen oxides	Vehicle emissions	Eye and respiratory diseases, acid Rain
Particulate Matter	Industry, fuel use, chemical use	Cancer, heart problems,respiratory diseases
Carbon Monoxide	Vehicle emissions, incompletecombustion product	Decrease in the amount ofoxygen in the blood andconsequent serious damage to thetissues and body
Ozone	Changes in nitrogen oxides due totraffic density with sunlight	Respiratory system problems,eye and nose irritations

The effect of particulate matter (PM) in the air on living organisms and theenvironment varies depending on the increase or decrease of particulate matter. While an increase in these substances creates a negative effect in the air, a decrease or less is a desirable situation. It should be determined in which range the particulate matter value falls among the index values specified by the Ministry of Environment, Urbanization and Climate Change and accordingly, ways to improve or protect air quality should be applied.

Since Konya province is located in the Central Anatolia Region, it is a province where seasonal differences are felt intensely. The use of fuels such as coal, petroleum and naturalgas, which increases with the sudden change in air temperatures in winter months, is shown among the reasons that cause air pollution (Çiftçi et al. 2013). Konya province is known as the center of industrial activities such as automotive parts industry, agriculture, machinery, metal casting in Central Anatolia Region. At the same time, since the population of Konya constitutes approximately 2.6% of Turkey's population, when we consider the traffic density, there are many more reasons that affect air quality and cause air pollution in Konya province.

The colors symbolized according to the air quality index values determined according to the Ministry of Environment, Urbanization and Climate Change are green if the air quality is good, yellow if the air quality is moderate, orange if the air quality is sensitive, red if the air quality is unhealthy, purple if the air quality is bad, and brown if the air quality is dangerous.Figure 1 shows the air quality index values of Konya province for the period January 2022.

Figure 1. Konya Province Air Quality Index

2. Literature Review

In the literature, many studies have been conducted on air pollution and the causes of air pollution and Markov Chain.

In Manisalidis et al. (2020), the effects of air pollution on humans, the environment and the atmosphere were explained and information was given about the 6 main air pollutants identified by the World Health Organization (WHO). In line with this information, the negative effects of each air pollutant on the environment were discussed and policy recommendations were made.

Akpinar et al. (2009), conducted a study for Elazığ province and examined how the components of air pollution change in winter months by linear and nonlinear regression analysis. The data range of SO_2 and airborne suspended particles, which are among the components used in the analysis, covers the years 2003-2005 and the monthly change of these components was examined and the effect of changing meteorological factors in winter months was investigated. The results show that the meteorological factors affect the air pollution in the winter months of Elazığ province, but there is a weak relationship between these pollution components and meteorological factors.

Kliengchuay et al. (2021), in the study, air pollution (PM_{10}) and weather data for the years 2011-2018 for Chiang Rai city in Thailand were taken hourly and then Multiple linear regression model was applied and it was concluded that there is a negative relationship between air pollution and weather and as a result of seasonal comparisons, PM_{10} value is less in summer and more in winter.

Irmak and Aydilek (2019), in this study, the data of certain air pollutant gases affecting the air quality for Adana province were taken and different machine learning algorithms were applied to these data to determine whether the air quality is good or bad, and the same process was applied to each algorithm. As a result of the analysis, it was decided that the fastest algorithm was linear regression.

In the study of Yağmur (2022), the 2020-2021 period of Istanbul province was included in the analysis and $PM_{2,5}$ values, one of the air pollution components, were analyzed with the help of machine learning algorithms. The relationship between $PM_{2,5}$ and other components (NO_X, PM_{10} , SO_2), which are thought to be related to PM , was also examined. In addition, it was estimated which machine learning algorithm would give better results and it was concluded that the Random Forest Algorithm gave better results.

Gökçek et al. (2022), in this study for Kayseri province, PM_{10} values, one of the components of air pollution, were analyzed by machine learning algorithm and the data range covers the years 2010-2018. Using the data of these years,

air pollution forecast for 2019 was made and air pollution values were found for 3 different regions of Kayseri province. As a result of the analysis, it was concluded that PM_{10} values are higher in winter months compared to summer months, machine learning analysis is successful in predicting air pollution and the value of this air pollution component exceeds the specified limit.

Özbek et al. (2017), analyzed 1-year air quality values of Adıyaman, Gaziantep, Kilis,Şanlıurfa and Mardin provinces. Sulfur dioxide and particulate matter 10 values of these provinces were examined and included in the analysis. The differences of these components according to the provinces investigated were investigated. The provinces were compared according to the limits of air pollution components determined by the World Health Organization and as a result of this comparison, it was concluded that Adıyaman, Gaziantep,Kilis, Şanlıurfa and Mardin provinces exceeded the given limits and air pollution was intense in these provinces. The seasonal differences of each province and the effect of these differences on air pollution in these provinces are explained. It is also stated that Gaziantep and Mardin provinces have the highest particulate matter value and the air pollution of these provinces is higher than the air pollution of other provinces.

Elbir et al. (2010), conducted a study on the traffic density of the city of Izmir and the traffic density data of 65 main streets in the city center were included in the analysis. Among the 65 streets included in this study, the 24-hour vehicle counting of 19 streets with higher traffic density was carried out with the help of certain devices. As a result of this counting, it was determined when the traffic density was the highest, how many vehicles were traveling on the streets and on which streets this density was higher. In addition, outdoor air quality measurements were made and PM_{10}, CO, SO_2, NO_X and O_3 air pollutants were measured together with meteorological factors. It was concluded that the density of these air pollutants changed due to reasons such as streets with vehicle density, motor vehicle differences.

Özel (2019), conducted a study for Ankara province and investigated the air pollutants of Bahçelievler station of Ankara province. These measured air pollutants include PM_{10}, SO_2, NO, NO_2, NO_X, CO. The data cover the period January - December 2017 and the data were taken 24 hours a day and included in the analysis. Markov Chains method was used in the analysis. Air quality was classified according to the air quality index values obtained from the Ministry of Environment and Urbanization. With Markov analysis, air pollution values in Ankara one day later were calculated and it was determined that air pollution was not endangered and policy recommendations were made.

Kıral (2018), in his study, it was aimed to calculate the divorce rates in 27 European Countries and Turkey by using the Markov Chain model. By making divorce rate and stationarity estimates, the change and rate of increase of these rates over the years togetherwith transition matrices were observed according to the countries and related comments and suggestions were made.

In Alyousifi et al. (2021), the air quality index data of the city of Klana in Malaysia were collected based on the years 2012-2014. There are 5 different air pollutants among the index data. These are; SO_2 , NO_2, CO, O_3 and PM_{10} air pollutants. In the analysis, daily and hourly values were measured and Fuzzy Markov chain modeling was used. As a result of this analysis, it was concluded that the Fuzzy Markov Chain model is a good alternative for air pollution detection among other models.

Kıral (2018), aimed to investigate the mobile operator preferences of individuals living in Adana province. In the study, a survey was conducted on 750 people using 2017 data. Transition probability and frequency matrices of Turkcell, Vodafone and Türk Telekommobile operators were created with the Markov chain method and the state probabilities of themost preferred operators and the operators that may be preferred in the following years werecalculated and then interpreted.

Uzun and Kıral (2017), in the study, gold prices ($/ounce) are taken from the IstanbulGold Exchange and the data range is monthly, covering the period January 2003 – January2017. Fuzzy Markov chain modeling is used in the analysis and monthly transition matrices ofgold prices are evaluated.

Kıral et al. (2018), in this study, it was aimed to investigate whether the lower class numerical courses of the graduates and 4th year students of Çukurova University Faculty of Economics and Administrative Sciences, Department of Econometrics between the periods of 2004-2015 affect the Mathematical Economics 1-2, Econometrics 1-2 and Time Series 1-2 courses and also their success status. Using the Markov Chain method, transition frequency, probability and stationary matrices between courses were created. As a result of the analysis, the probabilities of success in the long and short term and the success rates in the transitions between courses were calculated and interpreted.

Dağlıoğlu and Kıral (2018), aimed to investigate to what extent the dollar exchange rate, interest rate and money supply will affect the BIST 100 index with the Hidden Markov model. The data covers the period between December 2005 and November 2017. In the analysis, observation probabilities were

calculated using 3 different algorithms of the Hidden Markov model. Then, the rate of change of the index was estimated and interpreted. It is explained which of these 3 different algorithms can give more effective results.

3. Data and Methods

In this study, dataon particulate matter 10 (PM_{10}), one of the components of airpollution, were obtained from the Ministry of Environment, Urbanization and ClimateChange. Although the data received for Konya province covers a 2-year period between 2021 -2023 on an daily basis, the data range is between 01.05.2021-11.05.2023. There are deficiencies in the collected data and these deficiencies were completed with the help of Microsoft Excel Program. The daily change of particulate matter 10 (PM_{10}) data in Konya province was analyzed by Markov Chains method. With the help of the commands created in the Excel program, the transitions between states were counted and then the transition frequency matrix (TFM) of the states was created with these numbers. Transition probability matrix (TPM) was also created using the obtained frequency matrix and total number of transitions. State analysis and interpretations were made on the TPM and then the steady state matrix was obtained by taking the TPM powers and stationarity interpretations were made. The air quality index values to be used and interpreted in the estimation of the study together with the Markov Chain and its explanation are shown in Table 2.

Table 2. Air Quality Index Values

Values	Index	Description
0-50	Good	Air quality is satisfactory and air pollution poseslittle or no risk.
51-100	Moderate	For a very small number of people with good airquality but who are unusually sensitive to airpollution, moderate health concerns may arise forsome pollutants.
101-150	Sensitive	Health impacts may occur for vulnerable groups. Thegeneral public is unlikely to be affected.
151-200	Unhealthy	Everyone can start to experience health effects, withserious health effects for vulnerable groups.
201-300	Bad	Could create a health emergency. The entire population is likely to be affected.
301-500	Dangerous	Health alert: Everyone can face serious health impacts.

In the study, the air quality index values shown in Table 1: Good (G), Moderate (M),Sensitive (H), Unhealthy (U), Bad (B) and Dangerous (D).

The line graph of particulate matter (PM_{10}) data, one of the air pollution componentsof Konya province, according to the years determined is shown in Figure 2.
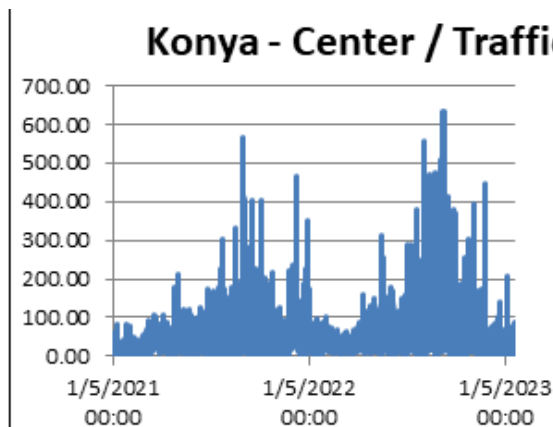
Figure 2. Particulate Matter Line Graph

The classification of air quality index values according to 5 different air pollutants is shown in Table 3. In the study, the analysis was carried out according to the index cut-off points of PM_{10} air pollutant.

Table 3. National Air Quality Index Breakpoints

AQI	SO_2 (mg/m^3) 1 Hour average	NO_2 (mg/m^3) 1 Hour average	CO (mg/m^3) 8 Hours average	O_3 (mg/m^3) 8 Hours average	PM_{10} (mg/m^3) 24 Hours average.
Good	0-100	0-100	0-5500	0-120	0-50
Moderate	101-250	101-200	5501-10000	121-160	51-100
Sensitive	251-500	201-500	10001-16000	161-180	101-260
Unhealty	501-850	501-1000	16001-24000	181-240	261-400
Bad	851-1100	1001-2000	24001-32000	241-700	401-520
Dangerous	>1100	>2000	>32000	>700	>520

While calculating the data in the Excel program, the relevant formulas for the MarkovChain method were used.

While creating the data table in the Excel program, the date column is between01.05.2021- 11.05.2023 and covers cells A3- A17929. A column was also created for Konyaparticulate matter (PM$_{10}$) data and this column covers cells B3- B17929.

To assign data according to national air quality index cut offpoints,=IF(B3<=50;"G";IF(B3<=100;"M";IF(B3<=260;"S";IF(B3<=400;"U";IF(B3<=52 0;"B";"D")))))) this calculation was used. In this formula, <=50indicates good air quality, <=100indicates moderate air quality, <=260indicates sensitive air quality, <=400indicates unhealthy air quality, <=520indicates bad air quality and values equal to or greater than 520 indicate dangerous air quality.

To determine the good-to-good transition states of the data; =IF(AND(C3="G";C4="G");1;0), Transition state from the middle to the mid- dle; =IF(AND($C3="M";$C4="M");1;0),Transition state from sensitive to sensitive;=IF(AND($C3="S";$C4="S");1;0), Transition state from unhealthy to unhealthy; =IF(AND($C3="U";$C4="U");1;0), Bad-to-bad transition state; =IF(AND($C3="B";$C4="B");1;0), Transition status from dangerous todan- gerouswas calculated with the formulas =IF(AND($C3="D";$C4="D");1;0) Air quality index values: Good (G), Moderate (M), Sensitive (S), Unhealthy (U), Bad (B) and Dangerous (D), as well as other transition states of the data; G-M, G-S, G-U, G-B, G-D, M-G, M-S, M-U, M-B, M-D, S-G, S-M, S-U, S-B, S-D, U-G, U- M, U-S, U-B, U-D, B-G, B-M, B-S, B-U, B-D, D-G, D-M, D-S, D-U, D-B were calculated with the formula mentioned above.

In order to find the sum of the transition from good to better, the relevant cell was selected and the transitions were counted using the formula =SUM(D4:D17929) in the Excel Program. The same process was applied for the other transitions and the calculation was made for the relevant cells and the Transition Frequency Matrix (TFM) and Transition Probability Matrix (TPM) were created. The stationarity was also calculated with the help of the Formula =MMULT(L44:Q49;C5:H10).

3.1. Markov Chains

The method used to define the probabilities that may occur in the future in a stochastic process by using the current state probabilities for the process is called Markov Chain (Özel,2019). It is a method that helps predict the long-term situation of movements between different situations that may occur over time

and unpredictable situations (Alp ve Öz, 2009). In order to create and analyze the model, it is necessary to calculate the transition probability from one state to another in the stochastic process. The process consists of random variables. If the probabilistic value of the transition from the current state to the next state can be calculated only depending on the current state and independently of the previous states, this model has the Markov feature. (Ross, 2007: 181). Transition probability and transition frequency matrices are created and the forecast is evaluated.

For every i and j $\in$ A, $0 \leq$ n in a countable set A,

$$P\left\{K_{n+1} = j \middle| K_0, ..., K_n\right\} = P\left\{K_{n+1} = j \middle| K_n\right\} \tag{1}$$

$$P\{K_{n+1} = j \mid K_n = i\} = P_{ij} \tag{2}$$

Ensuring equality process is called a Markov Chain. The probabilities of the future situation are calculated based on the current situation. It is shown that the probability of chain P_{ij} passing through state i is conditionally independent, and that the probability of this transition depends on time (n).

p_{ij} is the probability of the chain moving from state i to state j.

$$0 \leq p_{ij} \leq 1, \qquad\qquad i, j \geq 0 \tag{3}$$

Transition probability matrix P of a Markov chain and the transition matrix is shownas follows;

$$P = \begin{bmatrix} p_{11} & \cdots & p_{1n} \\ \vdots & \ddots & \vdots \\ p_{n1} & \cdots & p_{nn} \end{bmatrix} \tag{4}$$

$$p_{ij} = \frac{n_{ij}}{\sum n_{ij}} \tag{5}$$

The transition probability matrix (TPM) formula created using the obtained frequency matrix and the total number of transitions is given in condition 5 (Kıral, 2018).

The transition frequency matrix (TFM) of the data was created with certain commands in the Excel program.

Excel program was used to create the limit matrix and it was calculated as follows;

$$\text{when} \quad \text{Lim}_{m \to \infty} \quad P^m = P^k \qquad\qquad (6)$$

P^k shows the equilibrium state of the P matrix. Excel program was used to find the limit matrix. If there is a positive integer k, P is called a stationary matrix of order k.

4. Findings

In the study, Markov Chain estimation was made by utilizing PM_{10} air pollutant values. By creating the necessary commands in the Excel program and using the 2-year daily data of PM_{10} air pollutant obtained from the Ministry of Environment, Urbanization and Climate Change for Konya province, transition frequency matrix, transition probability matrix were created with 6 different states according to air quality index values and stationarity stateswere calculated. The transition frequency matrix created with the help of the data is given in Table 4.

Table 4. Transition Frequency Matrix

TFM	G	M	S	U	B	D	TOTAL
G	438	69	6	0	0	0	513
M	61	48	27	1	0	0	137
S	14	19	45	3	0	0	81
U	0	1	3	5	0	0	9
B	0	0	0	0	0	0	0
D	0	0	0	0	0	0	0

The transition probability matrix was constructed using the transition frequency matrixand the estimation results are given in Table 5.

Table 5. Transition Probability Matrix

TPM	G	M	S	U	B	D
G	0.8538	0.1345	0.0117	0	0	0
M	0.4453	0.3504	0.1971	0.0073	0	0
S	0.1728	0.2346	0.5556	0.037	0	0
U	0	0.1111	0.3333	0.5556	0	0
B	0	0	0	0	0	0
D	0	0	0	0	0	0

The transition frequency matrix results are shown in Table 4 and the transition fromgood air quality to good air quality for 513 days is 438 days, from good to moderateis 69 days, from good to sensitive is 6 days. For 137 days, the transition from moderate to moderate air quality is 48 days, from moderate to good air quality is 61 days, from moderate to unhealthy air qualityis 1 day, from moderate to sensitive air quality is 27 days. For 81 days, the transition from sensitive to good air quality was 14 days, from sensitive to moderate was 19 days. For 9 days, the transition from unhealthyto unhealthy is 5 days, from unhealthy to sensitive air quality is 3 days. As seen in the table, there are no transitions from good air quality to dangerous air quality, from moderate air quality to bad air quality, from moderate air quality to dangerous air quality, from bad air quality to good air quality, from bad air quality to moderate air quality, from dangerous air quality to good, moderate and sensitive air quality. At the sametime, transitions from good air quality to bad air quality, from sensitive air quality to dangerous air quality, from unhealthy air quality to good and dangerous air quality, and from dangerous air quality to unhealthy air quality are almost non-existent.

According to Table 5, When the PM10 value in Konya is good, the probabilities of being good, moderate and sensitive after 1 day will be 0.8538, 0.1345 and 0.0117, respectively.If the air quality is moderate, the probabilities of being good, medium and sensitive after 1 day are respectively; 0.4453, 0.3504 and 0.1971. When the air quality is sensitive, the probability of it being sensitive after 1 day is 0.5556,When PM10 is sensitive, the probabilities of being good, medium, sensitive and unhealthy after 1 day are 0.1728, 0.2346, 0.5556 and 0.037, respectively. While the PM10 value is unhealthy, the probabilities of being good, moderate, sensitive and unhealthy after 1 day will be 0, 0.1111, 0.3333 and 0.5556, respectively. Whereas the probability of the air quality being dangerous after 1 day according to PM10 values was not seen in the analysis results.The highest probability for a Good to Good transition is 0.8538, while Sensitive to Sensitive and Unhealthy to Unhealthy transitions have an equal probability of 0.5556. Considering the Medium status of the air quality, the probability of remaining at Good is 0.4453 and the probability of remaining at Medium is 0.3504. According to the condition specified in condition (6), the stationarity states are calculated and then the equilibrium state probabilities are found and the results are shown in Table 6.

Table 6. Equilibrium State Probabilities

AQI Values	Equilibrium State Probability
Good	0.69
Moderate	0.18
Sensitive	0.10
Unhealty	0.01
Bad	0
Dangerous	0

When we look at the stationary values, it is concluded that the probability of air quality being good in the long term with the PM_{10} value, which is one of the air pollutants in Konya province, is 0.69 with the highest probability, the probability of being moderate is 0.18, the probability of being sensitive is 0.10, the probability of being unhealthy is 0.01.

5. Conclusion and Evaluation

In this study, it is aimed to investigate to what extent the particulate matter PM_{10} value, which is one of the main components of air pollution, affects the air pollution of Konya province and the daily change of this value in Konya province is analyzed by Markov Chainmethod. The data range is between 01.05.2021 - 11.05.2023 and the data were obtainedfrom the Ministry of Environment, Urbanization and Climate Change.According to the ranges of PM10 values, 6 states are defined: Good, Moderate, Sensitive, Unhealty, Bad and Dangerous. Transition frequency matrix and transition probability matrix were created by counting the transitions between states with the help of commands in the Microsoft Excel program.By taking the powers of the transition probability matrix, it was calculated to be stationary to the 27th order.

When we examine the transition frequency matrix, we see that situations B and D do not occur. This means that the average of 740 daily data is less than 401. For example, on December 25-28, 2021, PM_{10} data reached 300 mg/m^3 and was in the unhealthy category. Likewise, on November 30, 2022, it reached levels that would negatively affect human health. There are a total of 9 observations falling into the unhealthy category, and these observations are mostly seen in the winter months. The smallest observations, periods when air quality can be described as good, generally coincide with the spring and summer months. On 03.03.2022, the PM10 value of Konya was measured as 1,89, and

it was concluded that the average air quality was good that day. The arithmetic average of the data was calculated as 50,21 and it is possible to say that the air quality is good between 2021-2023. In the Transition Frequency Matrix, it was seen that there was good air quality in 513 states, medium air quality in 137 states, sensitive air quality in 81 states and unhealthy air quality in 9 states. When we examine the transition probability matrix, we see that the highest probability values, except for remaining in the middle state in transitions, are on the diagonal of the matrix. While the highest probability for transitions from Good to Good is 0.8538, transitions from Sensitive to Sensitive and from Unhealthy to Unhealthy have an equal probability of 0.5556. Considering the Medium status of the air quality, the probability of remaining at Good is 0.4453 and the probability of remaining at Medium is 0.3504.

It is calculated that PM10 values in Konya province will be stable after 27 days and the limit will be Good with a probability of 0.69, Medium with a probability of 0.18, Sensitive with a probability of 0.10, and Unhealthy with a probability of 0.01.As a result, we can say that PM10 values in air pollution components generally remain at the same level as Konya.

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THE NEXUS OF MILITARY EXPENDITURES WITH ECONOMIC GROWTH AND INTERNATIONAL TRADE IN TURKEY: AN EXAMINATION OF ASYMMETRICAL RELATIONSHIPS

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1. Introduction

The living being against which humans have fought the most is humanity itself, throughout human history. Therefore, humans and war have been walking together since the outset of human history (Safran and Aktaş, 2012). Nowadays, countries attach importance to the military industry in order to protect themselves from the attacks of other countries and the dangers of terrorism, as well as to ensure the internal security of the country, due to the warrior mentality of humanity. In this regard, the military industry is an important industrial sector that provides military tools and services that are important for the security of countries (Baran, 2018).

Researchers particularly examine what the levels of military expenditures (ME) and military production should be in all countries of the world (Asiloğulları and Ceyhan, 2019). Each unit of military input costs creates an opportunity cost for expenditures in the civilian sector (Deger and Sen, 1995). For this reason, decision-makers will need to accurately analyze how the share distribution of scarce resources will be between other goods and services and military services (Asiloğulları and Ceyhan, 2019).

Today, there are some arguments with positive and negative views about the military industry and its expenditures. However, the military and aerospace industry is an essential issue not only to ensure national security but also to contribute positively to economic growth (EG), in the 21st century. EG is defined as the expansion of the total production volume, and thus, it plays the role of increasing per capita income and increasing the welfare of countries by increasing the EG rate more than the population growth rate (Seyidoğlu, 2003). The level of technology that countries have has made significant contributions to their EG with technological advances in the 21st century (Algan et al., 2017). Therefore, the main element of EG is technological innovations, which are matter in the military industry military industry (Yeldan, 2010).

ME not only support the military industry of countries, but also provide vitality to economic life by providing support to other heavy industries. In this context, the paper aims to bring out the asymmetric effects of EG and Trade openness (TO) on ME in Turkey.

2. Literature Review

Although there are many studies on ME in the literature, there are also studies in other countries examining various aspects of ME and their effects on the economy. EG levels of countries have increased with the increase in international trade volume along with the globalization process. In this context, the nexus among the ME, EG and international trade is evaluated in this section. Although there are some studies in the literature examining the nexus among the ME, EG and international trade, studies that analyze the relationship between these variables asymmetrically are rare.

Exploring the nexus between ME and EG, Sümer (2005) investigated the effects of countries' ME on EG. Eventually, it is stated that the effect of ME of developed countries on EG is positive.

Görkem and Işık (2008) examined the nexus between ME and EG in Turkey in their study covering the period between 1968 and 2006. The causality relationship between two variables through the VAR model is investigated with Granger causality analysis. According to the analysis results, they revealed that there is no causal relationship between ME and EG in our country in the relevant period.

Stating that military services are very important for countries to ensure both their domestic and international security, Başar and Künü (2012) demonstrated that countries that want to maintain their independence must strengthen their

military services. While they stated that ME have a substantial share in the country's economy, they stated that the excess of ME in the budget affects other items. As a result of the panel data analysis, they concluded that arms and equipment imports should be reduced in order for the Turkish economy to grow taking into account interest factors and foreign borrowing.

Erdem and Sezgin (2018), who examined the nexus between ME and EG, discussed the situation of ME in countries in their study. Consequentially, it is determined that there has been a decreasing trend in the United States' ME in recent years, but it is still the country with the largest ME in the world. However, it is stated that there has been a deviation in the nexus between ME and EG in Turkey over the years and that this relationship has been decreasing in recent years.

Hatemi-J et al. (2018) examined the ME-EG relationship for the six countries that spent the most on military in the world in the period 1988-2013. As a consequence of the analysis, it is found that the hypothesis based on ME was supported in China and Japan, while the hypothesis based on growth was supported in four countries: France, Russia, Saudi Arabia and the USA.

Analyzing the nexus between ME and EG for Turkey, Köse et al. (2019) examined Turkey's ME between 2000 and 2016 with data from ME sources and budget. Engle Granger cointegration, Toda and Yamamoto and Hacker and Hatemi-J causality tests are used in the analyses. According to the findings, it is stated that there is no relationship between ME and EG in Turkey.

Sezgin and Yağtu (2019), stating that countries determine their ME in line with global developments, investigated the impact of ME on EG. Addressing the 1980-2016 period, Sezgin and Yağtu (2019) tested the nexus between ME and EG in Turkey with Granger causality analysis. In line with the findings, it is ascertained that there is a unidirectional causality relationship from EG to ME in the short term in Turkey.

Köse et al. (2020) evaluated the nexus between ME and EG in G-8 countries. According to the Dumitrescu-Hurlin causality test, they revealed that there was no possible causal relationship between the variables.

Emphasizing the geopolitical importance of Turkey, Bayram (2020) states that there are military risks in the geographical region. The research, based on literature review, states that ME made in different time periods have a positive impact on exports in the short and long term as technological development in the military industry increases. It has also been stated that the share of imports has decreased with the localization of the military industry. To result of the

research, it is seen that investment in the military industry has a reducing effect on the current account deficit, which is an indicator of EG, in the short and long term, and it is stated that it has a positive contribution to the current account balance.

Stating that ME necessary to ensure national and regional security have an substantial place in the economies of states, Baltacı and Hayaloğlu (2021) analyzed the nexus among the ME, EG and current account balance in the fragile five countries. In the study, dynamic panel data analysis method is used using data from the period 2000-2017. According to the result of the analysis, they mentioned that there is a negative relationship between ME and EG and current account balance for the fragile five countries.

Sürücü et al. (2022) revealed that ME affect the parameters of each country's economy differently. In this context, they examined the nexus between ME and EG in their studies. The nexus between ME and EG of China and Turkey, which showed the largest increase in ME worldwide in the period between 2000 and 2020, is examined within the scope of their research. To results, it is revealed that there is a relationship between ME and EG in China, but such a nexus is not observed in Turkey.

Stating that the relationship between macroeconomic indicators and ME has been widely researched in developed countries, Taçyıldız and Çukur (2022) analyzed this relationship for the 2000-2020 period in Turkey in their study. As a consequence of the analysis, a bidirectional relationship is determined between ME and EG in Turkey.

Yardimci (2022), who states that ME will have a positive impact on EG if they are directed to domestically produced products, likewise indicates that EG will have a positive affect on ME in the long term. The nexus between ME and EG is tested for Turkey in line with the Benoit hypothesis within the scope of the study. To result of the study, it is revealed that there is a bidirectional relationship between ME and EG. Thus, it has been revealed that the Benoit Hypothesis is valid for the Turkish economy.

3. Data and Methodology

It is possible to encounter a few number of theoretical and empirical studies on the effects of EG and TO on ME. The model considered within this study is given in equation (1):

$$lnME_t = \beta_0 + \beta_1 lnEG_t + \beta_2 TO_t + \varepsilon \tag{1}$$

where "t" refer the time. The stochastic term is represented by ε and *lnME*, *lnEG* and *TO* indicate ME, gross domestic product and TO in the equations respectively. Data on Turkey's ME, EG and TO included in the model are gained from the World Bank database.

Zivot and Andrews (Z&A) (1992) unit root test, which tests the stationarity of the series in the presence of structural breaks, is applied in order to test the series with structural breaks occurring in Turkey. Two models of the Zivot and Andrews (1992) unit root test is used within the scope of the analyses. Model A tests only a break in the constant and model C tests a break in both the constant and the trend. Model A and model C put forward by Zivot and Andrews (1992) are as follows (2, 3);

$$\text{Model A} \Rightarrow \Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \theta DU_t + \sum_{i=1}^{m} \alpha_i \, \Delta Y_{t-i} + \varepsilon_t \tag{2}$$

$$\text{Model B} \Rightarrow \Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \theta DU_t + \gamma DT_t + \sum_{i=1}^{m} \alpha_i \, \Delta Y_{t-i} + \varepsilon_t \tag{3}$$

The literature review on the nexus among the ME, EG and TO has revealed the necessity of using a different method other than traditional linear methods in determining these relationships. Because the existing literature points to the existence of an asymmetrical relationship among the ME, EG and TO. Accordingly, the "nonlinear autoregressive distributed lag" approach (NARDL), which also takes into account a possible asymmetric relationship between dependent and independent variables and created by Shin et al. (2014), is used in this study, which researchs the effect of EG and TO on ME in the Turkish economy for the period 1960-2022. The research model created in this context is given below (4):

$$\begin{aligned}
\Delta lnME_t = \beta_0 &+ \sum_{k=1}^{n} \beta_{1,k} \, \Delta lnME_{t-k} + \sum_{k=0}^{n} \beta_{2,k} \, \Delta NEGlnEG_{t-k} + \\
&\sum_{k=0}^{n} \beta_{3,k} \, \Delta POSlnEG_{t-k} + \sum_{k=0}^{n} \beta_{4,k} \, \Delta NEGTO_{t-k} + \\
&\sum_{k=0}^{n} \beta_{5,k} \, \Delta POSTO_{t-k} + \alpha_1 lnME_{t-1} + \alpha_2 NEGEG_{t-1} + \\
&\alpha_3 POSEG_{t-1} + \alpha_4 NEGTO_{t-1} + \alpha_5 POSTO_{t-1} + \varepsilon_t \tag{4}
\end{aligned}$$

Here, negative and positive EG and TO are obtained as follows (5,6):

$$NEGlnEG = \sum_{j=1}^{t} min(\Delta lnEG_j, 0)$$

$$POSlnEG = \sum_{j=1}^{t} max(\Delta lnEG_j, 0) \tag{5}$$

$$NEGTO = \sum_{j=1}^{t} min(\Delta TO_j, 0)$$

$$POSTO = \sum_{j=1}^{t} max(\Delta TO_j, 0) \tag{6}$$

A nonlinear ARDL model is defined with equation (4). This model, which includes the positive and negative components of EG and TO, creates a non-linear structure and also includes both short- and long-term non-linear effects of the variables.

NARDL approach is an estimation that can be used to reveal short- and long-term relationships among the dependent and independent variables. In addition, it differs from other cointegration methods in that it clarifies whether the short- and long-term relationships in question have a symmetric or asymmetric structure. According to the method, it is first investigated whether there is an asymmetric relationship among the variables, and short- and long-term coefficients are estimated according to the result.

4. Empirical Findings

Zivot & Andrews (1992) unit root test internally determines the breaking points in the series. Thus, the breaking point is predicted internally rather than externally. A data-driven algorithm is used to predict the breaking point.

Table 1. Z&A Unit Root Test Results

Variables	Z&A (Level)			Z&A (First Difference)			Model
	Breakpoint	k	Test Statistic	Breakpoint	k	Test Statistic	Model
lnME	1971	0	-3.118	1975	0	-9.148	A
lnME	1973	0	-3.317	1975	0	-9.062	C
lnEG	1971	0	-2.349	1979	0	-7.859	A
lnEG	2004	0	-3.086	2001	0	-8.382	C
TO	1979	0	-5.443	1980	0	-8.408	A
TO	1979	0	-6.733	1980	0	-7.929	C
Critical	Model A => %10 : -4.194 ; %5 : -4.444 ; %1 : -4.949						
Values	Model C => %10 : -4.894 ; %5 : -5.176 ; %1 : -5.719						

Table 1 includes the results of the Z&A (1992) unit root test, which tests the stationarity of the series in the model under one structural break. To the test results; ME and EG contain unit roots under one structural break, in other words, they are not stationary at their levels. However, it is seen that they become stationary, when the differences of the series are taken. On the other hand, it has been determined that TO does not contain a unit root under a single structural break, and it is observed that the relevant series is stationary at its level.

Analyzing the structural break dates for the series, it is seen that there are structural breaks in the TO variable in 1979 and 1980. This findings reveals

that there has been a structural change in the TO variable as a result of Turkey's adoption of the export-based industrialization strategy and opening up to international trade as of 1980. On the other hand, it is determined that there are structural breaks in ME and EG variables in 1971, 1973, 1975, 2001 and 2004. The fact that the structural break dates occurred in the specified period shows that structural transformations are experienced in the period when the Turkish economy is transformed and the effects of economic crises are felt.

ARDL approach is preferred in the study because the variables have different degrees of stationarity. NARDL estimation method is used, since it is aimed to estimate the asymmetric effects of EG and TO on ME.

Table 2. NARDL Estimation Results

Dependent Variable= lnmilitary		
Short-Term Coefficients		
Independent Variables	**Coefficient**	**Prob.**
ECT	-0.377***	0.000
ΔlnME(-1)	0.232**	0.042
ΔPOSlnEG$_t$	0.649***	0.000
ΔNEGlnEG$_t$	0.652***	0.003
ΔPOSlnEG$_{t-1}$	0.267*	0.074
ΔNEGlnEG$_{t-1}$	-0.932***	0.001
ΔPOSTO$_t$	-0.058	0.684
ΔNEGTO$_t$	-0.002	0.994
Long-Term Coefficients		
POSlnEG$_t$	1.056***	0.000
NEGlnEG$_t$	2.082***	0.000
POSTO$_t$	0.514***	0.002
NEGTO$_t$	0.545	0.237
Constant	19.002***	0.000
Diagnostic Tests		
F-Statistic (Bound Test)	3.999**	
R²	0.713	
Breusch/Pagan Heteroscedasticity	0.951	
Breusch-Godfrey Serial Correlation	1.509	
Ramsey RESET	1.569	

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

The F-statistic, which shows whether there is a cointegration relationship among the variables, is above the upper critical value at the 5% significance level in Table 2. Therefore, the null hypothesis that there is no cointegration relationship between the variables is rejected. In other words, there appears to be a long-term relationship between ME, EG and international trade in the period 1960-2022.

After proving the existence of a long-term relationship between the variables, the NARDL long-term model is estimated. The findings in the table give the results of the positive and negative components of EG and international trade on ME in the long term. Accordingly, 1% increase or a positive shock in EG increases ME by approximately 1.056% in the long run. On the other hand, 1% decrease or a negative shock in EG increases ME by approximately 2.082% in the long run. In addition, 1% increase or a positive shock in international trade raises ME by nearly 0.514% in the long run.

It can be seen that the error correction coefficient obtained from the error correction model in Table 2 is negative (-0.377) and statistically significant at the 1% level. This shows that the coefficients converge to equilibrium values in the long run.
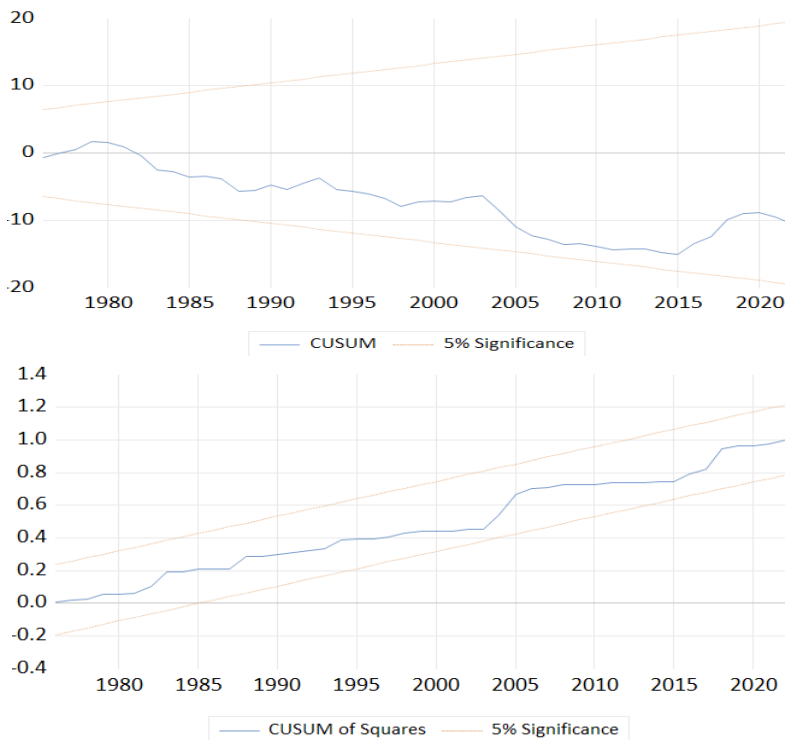
Figure 1. CUSUM and CUSUM of Squares Results

The stability of the coefficients obtained from the estimation of the model is analyzed with CUSUM (cumulative sum) and CUSUMSQ (cumulative sum of squares) tests. The CUSUM test chart in Figure 1 shows that the obtained parameters are stable at the 5% significance level. In addition, the graph presented for the CUSUMSQ test supports the CUSUM test, indicating that the parameters are stable at the 5% significance level.

5. Conclusion

There has been a debate for many years about the impact of ME and the military industry on EG. Although some researchers have found positive results regarding this relationship, there are also some who have found negative results in some aspects. At such a point, it is stated that there is a connection between Turkey's ME and EG and there will be a relationship in the future.

There has been an increase in ME in Turkey in the 21st century and it takes the lead among developing countries. However, it should be known that if developments can be made in the military industry at a certain level by learning the technology, which is the driving force of the industry, and integrating the technology into the relevant sector, the export level can reach important points with these expenditures and sector vitality. It is seen that the ratio of Turkey's ME to gross domestic product has increased over the years. Based on this point, we can state that correct investments in technology are important in the military industry.

Evaluating the TO, technology, which can be described as a driving force if more importance is given to this situation due to the necessity of learning by doing and being involved, has the feature of turning the terms of foreign trade in favor of the country. In this regard, the analysis results show that increasing military industry investments by raising TO is an important policy for decision makers in Turkey.

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EVALUATION OF THE EFFECTS OF AGRICULTURAL INFORMATION SOURCES IN THE EXTENSION OF PRODUCERS[*]

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1. Introduction

Humanity's desire to use nature in its favor dates to as old as human history. Using nature in ancient times was only for their own survival motives. Human beings, who have discovered what they can do as time progresses, have always turned it into an ambition to achieve better to benefit from the knowledge and experience gained before. As a result, there have been great rapid changes. Experience and knowledge, which were scarce at first, were shared and spread, albeit from a limited window. The power of civilizations is always permanent if it is supported by new knowledge and experience. The problem of meeting the unlimited demands of civilizations with limited resources should be announced to all humanity by the communication resources of the newly acquired techniques and tactics, thus enabling us to use limited resources more efficiently (Bulut, 2006). In all world civilizations, it is seen that most of the society and population live in rural areas, deal with

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[*] This study is derived from the master thesis titled "Evaluation of the effects of agricultural information sources in the extension of producers in Ceyhan district of Adana province".

land and agriculture, and moreover, agriculture and agricultural activities form the basis of the economy. It emerges as an absolute part and result of food, natural resources, and environmental systems, which have been the unchanging basic element of life since the first humans and necessary for the maintenance of human life (Budak, 2020). The agricultural sector is a very important sector in Turkey as well as in the world and is one of the main sources of economic income. The agricultural sector is the sector where food, which is the continuation and development of humanity and even the beginning of everything, comes from. In addition to nutrition, it is important in terms of increasing farmers' incomes, creating employment, reducing migration from rural to urban areas, and preventing urban population growth (Sezgin, 2010; Torun & Taluğ, 2005). Since Turkey is a developing country, the agricultural sector has an important role in the country's economy. In addition, the agricultural sector has a great place and importance in the country's economy in the 2000s as a sector that includes 35% of the total population, provides job opportunities to 48% of total civilian employment, constitutes 12% of the total gross product and 7% of total exports (Ateş, & Doğutaş, 2020; Yalcin & Boz, 2007). In societies where the agricultural sector is important, agricultural extension studies are also of great importance. The general objectives of agricultural extension include increasing productivity in agricultural production, ensuring efficiency in marketing, distribution, and consumption, increasing efficiency in the protection and use of natural resources, contributing to the resource development of producers, and increasing the welfare level of the producer and his family (Şimşek, 2019; Yılmaz et al, 2009).

Communication and communication resources are very important for the agricultural sector as well as in many sectors. For agriculture to develop and grow and to feed the increasing world population, agricultural communication resources must be fast, reliable, and accurate. When we look at Turkey, the Ministry of Agriculture is largely carried out by the agricultural extension studies offered by the state. However, extension activities are also carried out by private consultancy units, producer organizations, universities, or other non-governmental organizations (Derman, 2010). The continuity of the agricultural information system is essential and the interaction between the researcher-publisher-producer must be firmly established for the innovations to be accepted by the producers. Ensuring the participation of producers in the studies is also an important factor (Torun & Taluğ, 2005; AL-Sharafat, et al, 2012).

2. The Importance of Extension in terms of Agricultural Production

Agricultural activities in Turkey are carried out by socio-economic units formed by family businesses living in rural areas. The fact that family ties are strong in rural areas compared to urban life and that people who produce are in constant communication with each other play an important role in the concentration of information flow in agricultural activities between family members or other producing people. Information obtained from elderly family members and experienced producers is referred to as information obtained from traditional sources. This information lacks the conditions necessary for the adaptation of the innovations brought by modern science to the agricultural system. There are organizations that are professionally interested in agricultural technologies and modernize these technologies over time (Kurt, 2020). Agricultural extension activities have important tasks in the development process of rural communities. General objectives of agricultural extension; to increase productivity in agricultural production, to provide efficiency in marketing, distribution, and consumption, to increase efficiency in the protection and use of natural resources, to contribute to the resource development of producers, to make the life of the producer and his family regular and happy (Alagöz, 2005). The path to agricultural development is through the more effective dissemination of technical knowledge and the limitation of the separation in productivity between individual farmers and regions (Yener, 2017; Alyu, 2009). Proper use of agricultural resources and direct the agricultural sector in line with developing techniques by analyzing the opportunities in the market correctly will be possible thanks to the application of agricultural knowledge and innovations including modern technologies (Gülter, et al. 2010; Eryılmaz et al, 2020).

It is of great importance to receive, develop, share, and use information in the agricultural sector. Efficiency in the flow of information and technology in agricultural activity plays a role in accelerating agricultural development and improving the quality of life. Therefore, it is necessary to know how farmers use information sources to realize agricultural production (Andrew, & Munir, 2002; Torun, 2011). Turkey is among the few countries in the world in terms of the value created by the agricultural sector. Despite such a great value, the reason why the potential cannot be adequately evaluated is the structural problems in agriculture. Due to the lack of effective agricultural organizations, factors such as low organizational commitment of producers, inability to create an adequate environment for entrepreneurship and innovation, excessive fluctuations and uncertainties in farmers' income, low level of education, aging in agriculture

and social security negatively affect the agricultural work of farmers in their enterprises. In addition, the disconnection and distrust in producer-researcher-publisher communication have led manufacturers to informal information sources (Özdemir & Kan, 2020; Mokotjo, & Kalusopa, 2010).

Adana province is in the Mediterranean Region in the south of Turkey. Seyhan, Yüreğir, Çukurova, Sarıçam and Karaisalı districts are the central districts. Adana consists of a total of 15 districts. According to the data of the Turkish Statistical Institute (TurkStat), the population of Adana is 2,258,718; The male population is 1,127,516, while the female population is 1,131,202. Located 43 km east of Adana, Ceyhan is located around the Ceyhan River. According to TurkStat data, the total population of Ceyhan is 161,159. The total agricultural area of the district is 877,686 decares and economic activities are mostly based on agriculture. According to the estimates for 2020 in Ceyhan district, an increase of 7.3% in cereals and other plant products, 0.8% in vegetables and 5.3% in fruits is predicted compared to the previous year (TÜİK, 2020). The number of producers registered with the ÇKS in the district is 5024 and the land registered with the ÇKS is 617,218 decares. The ratio of the area covered by agricultural areas to the total land is 89.46%. Approximately 90% of the areas within the research area are used for agricultural purposes. Ceyhan, which ranks 186th among 872 districts according to the socio-economic development ranking of the districts in Turkey, is the most important district of Adana in this respect. Ceyhan district ranks 16th in the country in agricultural production. When the distribution of agricultural areas in terms of usage was examined, it was seen that 93% of agricultural areas were allocated to cereals and other plant products in 2018. In this product group, especially cotton, corn, wheat, sunflower and peanuts are important products (Gündüz, 2019). A total of 1,148,960 decares of grain and other plant products produced in Ceyhan district of Adana province, a total of 10,673 decares of greenhouse agricultural area, 46,832 decares of collective fruit area, and a total of 18,988 decares of cultivated vegetable area. The total number of sheep and cattle in Ceyhan district is 88,859.

The aim of this study is to determine the information sources used by the producers in important agricultural products (plant and animal production) in Ceyhan district of Adana province, and to evaluate these information sources and activities used to obtain better quality products and efficiency from production. It is aimed to determine the availability of modern information sources as well as traditional information sources, which are among the basic information sources used by producers in the region, and the effectiveness of

the prominent information sources used by producers in agricultural extension in the region.

The number of farmers registered with the ÇKS (Farmer Registration System) in Ceyhan is 5024. The producers participating in the study were determined by sampling from this framework list. From the total number of enterprises determined in the research region, 85 producers determined by Simple Random Sampling were evaluated by dividing them into 3 according to their business income groups. The 5-point Likert scale was used to evaluate the information sources used by the producers in agricultural extension. According to various demographic characteristics of business groups such as income, age, and education, the difference in publication information sources was analyzed by comparing them with the t-test.

3. Characteristics of the Producers Participating in the Research

3.1. Socio-Economic Structure

45.9% of the producers participating in the study are high school graduates and constitute the largest group. Therefore, it can be said that most farmers have a high school education level. 30.6% of the producers have a bachelor's degree, which can be said to be a very good rate. Of the remaining producers, 18.8% were primary school graduates and 4.7% were associate degree graduates. In the distribution of a total of 85 producers by age groups, 42.4% are in the 21-45 age range. 49.2% are between the ages of 46-66 and constitute the most populous group. The rate of those aged 67 and over is only 8.2%. It can be said that the level of education of producers does not change much depending on the distribution of income. 45.9% of the producers participating in the survey are high school graduates and constitute the largest group. Therefore, it can be said that the majority of farmers have a high school education level. 30.6% of the producers have a bachelor's degree, which can be said to be a very good rate. Of the remaining producers, 18.8% were primary school graduates and 4.7% were associate degree graduates. It is seen that approximately 97% of the producers have less than 7 family members. It cannot be said that the number of family members varies much in terms of income level among the participants. Among the producers interviewed, those with 8 or more family members are only 3.5%. 91.8% of the family members working in the enterprise vary between 1-3 people, and 8.2% of them employ 4 or more people. According to the results obtained, there is generally the use of foreign labor other than family members

in enterprises. It has been observed that the enterprises where only family labor is used are generally livestock enterprises.

3.2. Agricultural Production Structure

While the producer engaged in plant production was 74.1%, the producer engaged in animal production was 25.9%. The number of farmers engaged in plant production is more than 3 times the number of farmers engaged in animal production. It shows that the most plant production is made in the region. Most of the farmers engaged in crop production are engaged in field agriculture. The proportion of farmers with 1-20 years of experience is 72.9%. The proportion of those with years of experience between the ages of 21-40 is 24.7%. The proportion of manufacturers with 41 or more years of experience is only 2.4%. It has been determined that the average experience of manufacturers is 19 years. It can be said that the social security situation of the producers is in good condition. While 31% of farmers have non-agricultural income; 69% do not have a non-agricultural income. As the income level decreases, the number of employees in non-agricultural jobs increases. More field crops are produced in Ceyhan district. According to the study, corn was the most preferred product for cultivation by the farmers in the region. It can be said that the reasons for this are the high yield, the high number of enterprises that buy grain corn, the fact that there is no market shortage in sales, and the fact that the corn plant requires less effort than other plants. The most planted garden plant product in the research area was tangerine. In the research conducted on the field plant type, it was seen that the product that generated the most income in 2020 was peanuts.

3.3. Producers' Information Sources in Crop Production

Producers may face many problems while producing crops. To solve these problems, manufacturers exchange information with various places and try to solve their problems. There are many sources of information that can be obtained while producing crops (Cengiz, 2018). The resources used by the producers in the research region to solve their problems are given in Table 1. In the table, it is seen that the 63 producers who participated in the survey according to income groups are fertilizer/pesticide dealers with an average of 4.30 information sources used in terms of crop production. It is seen that the least referenced source of information consists of printed publications with an average of 2.95. When analyzed according to the income groups of the enterprises, it was determined that the most applied information source of the

first group with an average of 4.26 was fertilizer pesticide dealers, and the least information source was neighbors with an average of 3.11. When the second income group was examined, it was determined that the most used information source was fertilizer pesticide dealers with an average of 4.15, while the least used information source was printed publications with an average of 2.95. III. In the income group, the most used source of information is fertilizer pesticide dealers with an average of 4.32 and the least used information source is printed publications with an average of 2.86. In terms of income groups, there is no difference between the most used information sources between the groups, and fertilizer/pesticide dealers are preferred as the most referenced information source in all income groups. The difference between income groups was found to be statistically significant at the level of 0.01% for all the information sources consulted.

Table 1. Producers' sources of information in crop production

| Information Sources | Income groups (₺) | | | | | | | |
| | I | | II | | III | | Total | |
	Avr.	N	Avr.	N	Avr.	N	Avr.	N
Fertilizer/pesticide dealers	4.30	27	4.15	20	4.32	16	4.30	63
Provincial/District Directorates of Agriculture	4.26	27	4.00	20	4.11	16	4.13	63
Broker and traders	3.59	27	3.05	20	3.36	16	3.38	63
Relatives	3.33	27	3.35	20	3.37	16	3.37	63
Consultant	3.22	27	3.50	20	3.26	16	3.27	63
Information communication applications	3.22	27	3.10	20	3.07	16	3.17	63
Neighbors	3.11	27	3.15	20	2.98	16	3.02	63
Audiovisual broadcasts	3.19	27	3.00	20	2.94	16	2.98	63
Printed publications	3.33	27	2.95	20	2.86	16	2.95	63

1: Very unimportant, 2: Unimportant, 3: Medium level, 4: Important, 5: Very important.

3.4. Producers' Information Sources in Animal Production

Animal foods play a very important role in meeting the nutritional needs of human life. Conscious animal production ensures that the nutritional needs of people are fully met in terms of animal food and that farmers engaged in animal production earn better profits. Various sources of information are needed for

conscious animal production. The sources of information of farmers engaged in animal production are given in Table 2. According to the data obtained from 22 farmers engaged in animal production, other sources of information, except for fertilizer/pesticide dealers, were found to be more important than the average value. Among the information sources of farmers engaged in animal production, the provincial/district directorates of agriculture are the most important source of information with an average of 4.41. The second source of information for producers was their neighbors with an average of 4.18, followed by relatives with an average of 4.09. Paid consultants are also another important source of information with an average of 3.77. The least important source of information was fertilizer-pesticide dealers with an average score of 2.18. It has received this value because this occupational group is not very related to animal production. In the research area, it was concluded that the Directorate of Agriculture, neighbors, and relatives were the most effective among the main sources of information in terms of animal husbandry.

Table 2. Producers' sources of information on animal production

	Income groups (₺)						Total	
	I		II		I		II	
Information Sources	Avr.	N	Avr.	N	Avr.	N	Avr.	N
Provincial/District Directorates of Agriculture	4.32	19	5.00	3	0	0	4.41	22
Neighbors	4.16	19	4.33	3	0	0	4.18	22
Relatives	4.05	19	4.33	3	0	0	4.09	22
Consultant	3.74	19	4.00	3	0	0	3.77	22
Audiovisual broadcasts	3.58	19	4.33	3	0	0	3.69	22
Printed publications	3.53	19	4.67	3	0	0	3.68	22
Audiovisual broadcasts	3.42	19	4.67	3	0	0	3.59	22
Broker and traders	3.32	19	5.00	3	0	0	3.55	22
Fertilizer/pesticide dealers	2.11	19	2.67	3	0	0	2.18	22

1: Very unimportant, 2: Unimportant, 3: Medium level, 4: Important, 5: Very important.

3.5. Frequency of Communication with Agricultural Information Sources

There may be a need to get information or consult at various time intervals to obtain information while doing agricultural production (Durmuş, 2018). For

this reason, the time intervals at which the producers meet with the information sources were examined. According to the results given in Table 3, the most interviewed information source for all three income groups was relatives with an average of 4.80. Accordingly, it can be said that producers talk about their problems in production with their relatives at least once every fifteen days. As a result of the spread of the internet and the development of information and communication technologies, manufacturers can find many production problems they encounter on the internet. As a result of this, information communication technology applications ranked second with an average of 4.55 among the information sources applied by manufacturers. The brokers and traders that manufacturers refer to as a source of information have been the source of information interviewed at the longest time intervals with an average of 2.45. The difference between income groups was found to be statistically significant at the level of 0.01% for all the information sources consulted.

Table 3. Frequency of communication of producers with agricultural information sources

Information Sources	Income groups (₺)						Total	
	I		II		III			
	Avr.	N	Ort.	Avr.	N	N	Avr.	N
Relatives	5.20	46	4.57	23	4.06	26	4.80	85
Information communication applications	4.85	46	4.57	23	3.69	26	4.55	85
Neighbors	4.98	46	4.0	23	3.44	26	4.42	85
Audiovisual broadcasts	4.63	46	4.35	23	3.44	26	4.33	85
Printed publications	4.57	46	4.09	23	2.44	26	4.04	85
Provincial/District Directorates of Agriculture	3.59	46	3.57	23	2.50	26	3.38	85
Consultant	3.00	46	2.57	23	3.20	26	2.99	85
Fertilizer/pesticide dealers	2.76	46	3.48	23	2.81	26	2.96	85
Broker and traders	2.37	46	2.83	23	2.13	26	2.45	85

1: Never, 2: During the production season, 3: Once every two months, 4: Once a month, 5: Once every fortnight, 6: Once a week, 7: A few times a week

3.6. Frequency of Agricultural Information Needs

A lot of information is needed when making agricultural production, and this information differs in crop production and animal production (Isaac,

2012). In most cases, there may be common needs in the enterprises where both agricultural production is carried out together. Table 4 sets out the frequency of information needs according to the branch of production and in general. According to the results, the frequency of information needs in crop production was 3.88 on average, which was close to the frequent need for information. The need for information on animal production is rarely an option with 2.25. The level of information requirement for general issues related to agricultural production is also often close to the option of 3.93. The reason why this answer is higher than other options is the need for general information issues of both plant and animal farmers. The reason why the need for information on animal production is low is that the producers participating in the survey think that they do or will produce plant production rather than animal production. The difference between income groups was found to be statistically significant at the level of 0.01% for all the information sources consulted.

Table 4. Frequency of producers' need for agricultural information

| | Income groups (₺) | | | | | | Total | |
| | I | | II | | III | | | |
Information Sources	Avr.	N	Avr.	N	Avr.	N	Avr.	N
Crop production	3.50	46	4.22	23	4.50	16	3.88	85
Animal production	2.37	46	2.09	23	2.13	16	2.25	85
General topics of agriculture	2.37	46	4.00	23	4.25	16	3.93	85

1: Never, 2: Rarely, 3: Sometimes, 4: Often, 5: Always

3.7. Information Topics Needed in Crop Production

Producers engaged in plant production need information on various subjects from the beginning to the end of production. Some of the issues that are considered important are given in Table 5. Accordingly, when the three income groups were examined, the area where the producers wanted to get the most information was the issues related to diseases and pests with an average of 4.32. In second place, the most needed issue was maintenance operations with 3.92. Seed and seedling selection issues have also been among the information that producers frequently need. Crop production inputs are sometimes among the information needed. Crop producers need harvesting operations and product price information with an average of 2.73. Accordingly, producers generally

try to solve harvest works and price information in their own traditional ways without resorting to others.

Table 5. Information topics that producers need in crop production

Information Sources	Income groups (₺)							
	I		II		III		Total	
	Avr.	N	Ort.	Avr.	N	N	Avr.	N
Disease/Pest control	4.26	27	4.25	20	4.50	16	4.32	63
Maintenance operations (watering, fertilizing, etc.)	4.26	27	3.60	20	3.75	16	3.92	63
Seed and Seedling Selection	3.93	27	3.70	20	3.88	16	3.84	63
Crop production inputs jobs	3.48	27	3.00	20	3.13	16	3.24	63
Sowing/planting operations	3.70	27	2.90	20	2.81	16	3.22	63
Soil analysis/tillage works	3.44	27	2.80	20	3.13	16	3.16	63
Harvesting operations	3.19	27	2.70	20	2.19	16	2.73	63
Product price information	2.78	27	2.95	20	2.38	16	2.73	63
Transportation/Marketing operations	3.00	27	2.45	20	1.81	16	2.52	63

1: Never, 2: Rarely, 3: Sometimes, 4: Often, 5: Always

3.8. Information Sources Needed in Animal Production

Producers engaged in animal production need a lot of animal production information for quality and high efficiency. The issues that are considered important by the animal producers in the research area are given in Table 6. It was observed that the most needed information of livestock producers was about animal diseases and their treatment with an average of 3.95. The second important information requirement is animal feeding with a mean of 3.86. These two issues are one of the areas where livestock producers often have problems and need information. Breeding animal selection topics ranked third in the ranking of information needs with an average of 3.82. The least needed information was animal shelter with an average of 3.27. It is understood that animal producers do not need much information on animal shelter issues or that there is only a need for shelter facility in this area.

Table 6. Information topics needed in animal production

Information Sources	Income groups (₺)							
	I		II		III		Total	
	Avr.	N	Ort.	Avr.	N	N	Avr.	N
Animal diseases/treatment	3.89	19	4.33	3	0	0	3.95	22
Animal feeding	3.79	19	4.33	3	0	0	3.86	22
Selection of breeding animals	3.63	19	5.00	3	0	0	3.82	22
Jobs related to animal products	3.84	19	3.33	3	0	0	3.77	22
Other input jobs in livestock	3.53	19	4.33	3	0	0	3.64	22
Marketing animals and products	3.42	19	4.67	3	0	0	3.59	22
Feed preparation/supply	3.42	19	4.00	3	0	0	3.50	22
Animal shelter operations	3.32	19	3.00	3	0	0	3.27	22

1: Never, 2: Rarely, 3: Sometimes, 4: Often, 5: Always

3.9. Factors Affecting the Adoption of Innovations

As in every sector, the acceptance and implementation of innovations takes place in the agricultural sector over time and innovations cannot be expected to be adopted at once. People adopt and accept change in various time periods and begin to implement it in their lives or work. Various factors are effective in adopting and using an innovation in agriculture (Sivakami, & Karthikeyan, 2009; Dogançukuru, 2009). Some of these elements that are considered important in the research have been identified and given in Table 7. According to the results obtained, the accessibility of information was in the first place with an average of 4.73. In addition to the accessibility of information, for innovation to be adopted and implemented, it is necessary to understand the innovation and penetrate people's minds. The second most important issue in the adoption of innovation is the option of easy application of information with an average of 4.59. It is important for manufacturers to be able to apply information easily and easily. Because convenience ensures that everyone can apply it and that application errors are few, and that more audiences adopt it. The third important factor in the adoption of innovations is the previous application of knowledge in the environment with an average of 4.49. The implementation of innovation by environmental manufacturers allows other manufacturers to see that information and evaluate the results. This has an additional impact on manufacturers implementing innovations. Another factor that was effective in the adoption of innovations was the novelty of information with an average of 4.42. The novelty of the information attracts the attention of the producer,

and the farmer will be interested in doing a job that he has been doing with the same method for a long time with a new method or tool. The cheapness of the innovations was the option that the manufacturers gave the lowest average with an average of 4.16. The difference between income groups was found to be statistically significant at the level of 0.01% for all the information sources consulted.

Table 7. Factors influencing the adoption of innovations

Information Sources	Income groups (₺)							
	I		II		III		Total	
	Avr.	N	Ort.	Avr.	N	N	Avr.	N
Accessibility of information	4.72	46	4.70	23	4.81	16	4.73	85
Easy application of knowledge	4.59	46	4.48	23	4.75	16	4.59	85
Knowledge has been applied around	4.54	46	4.35	23	4.56	16	4.49	85
Innovation of knowledge	4.39	46	4.39	23	4.56	16	4.42	85
Information is cheap	3.98	46	4.43	23	4.31	16	4.16	85

1: Very important, 2: Unimportant, 3: Medium, 4: Important, 5: Very important

3.10. Effective Information Sources on Manufacturers

There are many sources of information that farmers engaged in crop and animal production use to obtain information (Elly, & Epafra Silayo, 2013; Ergen, 2004). The most important of these are examined in Table 8. According to the data obtained, the most important source of information among the producers of Ceyhan district is the provincial-district directorates, which are public institutions with an average of 3.98. It was determined that the second most important source of information was fertilizer and pesticide dealers with an average of 3.74. It was observed that the third effective source of information on producers was relatives with a mean of 3.46. It has been revealed that the most ineffective source of information on manufacturers is visual and audio broadcasts with an average score of 2.88. Although producers meet with their relatives and neighbors more frequently, it is seen that they prefer provincial/district directorates and fertilizer pesticide dealers, whose knowledge and experience they rely on, rather than the information sources they constantly meet. It can be said that the frequency of interviews with information sources has little effect on farmers' practices. The difference between income groups was found to be statistically significant at the level of 0.01% for all the information sources consulted.

Table 8. Information sources that have an impact on producers

Information Sources	Income groups (₺)						Total	
	I		II		III			
	Avr.	N	Ort.	Avr.	N	N	Avr.	N
Provincial/District Directorates of Agriculture	4.13	26	3.87	23	3.69	16	3.98	85
Fertilizer/pesticide dealers	3.48	26	4.04	23	4.06	16	3.74	85
Relatives	3.61	26	3.30	23	3.25	16	3.46	85
Consultant	3.48	26	3.43	23	3.56	16	3.34	85
Broker and traders	3.20	26	3.22	23	3.25	16	3.21	85
Neighbors	3.39	26	3.09	23	2.75	16	3.19	85
Information communication applications	3.07	26	3.04	23	2.63	16	2.98	85
Printed publications	3.02	26	2.87	23	2.56	16	2.89	85
Audiovisual broadcasts	3.04	26	2.83	23	2.50	16	2.88	85

1: Very ineffective, 2: Ineffective, 3: Moderate, 4: Effective, 5: Very effective

4. Conclusion

Agriculture is the first step of civilization in the transition to social life. Agriculture, which forms the basis of food and life, has developed with the increase in communication and the sharing of information. As in every business line in Turkey, it is very difficult to reach accurate information in the field of agriculture. Turkey is not yet at the desired level to access and apply information. Agricultural consultancy services and seminars provided by the Ministry are not sufficient for farmers. The accuracy, understanding and application of the information obtained from the information source is important for farmers. At the same time, as in other countries, the adoption and implementation of agricultural innovations in Turkey will increase productivity in agriculture, make more economical production, facilitate the work of farmers, and ensure that Turkey has cleaner and more protected soils in the future. The first priority for farmers to adopt innovations is to ensure that the innovation is carried out by government institutions that are correct and reliable, and that the innovations are explained to the producers of the region frequently and through various farm meetings, and that the innovation to be recommended with the pioneer farmers is tried in an exemplary way, that the positive data obtained is shared with the farmers, that the reduction in labor force is seen by the farmer as well as the

financial return of the innovation, and that the innovations are adopted more easily.

In the study, it was seen that the most frequently interviewed source of information was relatives. This shows that farmers do not make decisions alone and consult their close circles. Although informing farmers alone has a certain effect in terms of production and yield, it reveals the necessity of informing the people with whom farmers meet the most. It has been seen in the study that the most needed issue of farmers engaged in crop production is diseases and pests. In this regard, our agriculture and district directorates should examine and determine the diseases and membranes that may occur in the product to be planted by the farmer from the planting time to the harvest, and meetings should be held with our farmers, information about diseases and pests should be given and methods of control should be explained, and at the same time, the importance of collective struggle should be explained. There should always be institutions where the farmer can call and get information about diseases and pests, and the state should give special incentives for the establishment of these institutions. As a result of the meeting with the farmers engaged in animal production, the most needed issue was animal diseases and treatment procedures and animal nutrition. In this regard, explaining the animal disease symptoms and treatment methods of the Ministry of Agriculture to the farmer will allow him to intervene at the initial stage of the disease and increase the recovery rates of the animals, decrease the mortality rates, and allow the farmer to be less affected by the drug costs. At the same time, farmers should be informed by the ministry about animal nutrition and feed. Because the correct execution of animal feeding processes increases the meat and milk yield of the animals. In this way, farmers will be able to earn more income from animal production.

The farmer's source of information in crop production has been fertilizer pesticide dealers. The information that farmers receive from fertilizer and pesticide dealers has several drawbacks. As a result, fertilizer and pesticide dealers are commercial organizations focused on making money, and to make more money, they may recommend fertilizers that are not very necessary, pesticides that do not have a lot of effect, and this can cause financial damage to farmers and irreversible damage to the cultivated lands. To prevent farmers from encountering such objectionable situations, they should be informed and made aware by the staff of the public broadcasting organization. In addition, the extension and training staff in the Directorates of Agriculture should be well-equipped and easily accessible at least as much as fertilizer/pesticide dealers. It

can be seen as an effective solution that paid consultants to producers produce solutions to agricultural problems as an alternative and are more benefical to producers. Considering the enterprises that carry out plant and animal production separately or make mixed production in the research area, it has been considered important to consider the need for information in both branches of production and the solution proposals of the problems experienced together or in two parts, and to consider the type of enterprise in the agricultural extension and training programs to be made.

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THE REFLECTION OF THE SUPPORT POLICIES APPLIED IN OLIVE AND OLIVE OIL TO THE PRODUCERS[*]

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1. Introduction

The history of olives, the world's healthiest and most natural source of vegetable oil, dates to 8,000 years ago. Olive, which is the source of many legends in its historical development, has been included in the inscriptions of ancient civilizations and holy books. In addition, the olive has been considered the 'Symbol of Peace' for centuries as a white dove returns to Noah's ark with an olive branch in its mouth, as a sign of post-flood vitality. Known as the first trees and whose homeland is the Southeastern Anatolia region of Turkey, the olive has spread from the cities of Hatay, K. Maraş and Mardin to the world and has become the native plant of the Mediterranean basin, which has a climate with abundant rainfall, a warm winter, a dry and hot summer, short spring, and a long autumn. In other continents, it can only be grown in regions resembling the Mediterranean climate (Shobolul & Mendilcioğlu, 1985; Mendilcioglu, 1990; Canözer & Özahçı, 1991).

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[*] This study is derived from the master thesis titled "The Reflection of the Support Policies Applied in Olive and Olive Oil to the Producers in Altınözü, Hatay Province".

Olives are a key crop socially, economically, and environmentally in the Mediterranean basin and are an important source of rural employment. Products such as olive oil derived from olives have attracted many consumers in recent years (Pleguezuelo et al., 2018; Abel, 2009)). As human beings have discovered the benefits of olives, the importance given to olives has increased continuously. In recent years, the awareness of healthy and long life has played a decisive role in the nutrition policies of countries (Carmona-Torresa et al. 2016). The adoption of olives and olive oil, which are among the basic elements of the Mediterranean-style diet, and the increase in the interest in the consumption of these products cause an increase in the amount of consumption in olive and olive oil producing countries in the world or the participation of new consumer countries in the olive and olive oil market (Tunalıoğlu, 2009). Olive, which can be grown ecologically in certain regions of the world and by a small number of countries, makes a significant economic contribution to the countries where it is produced. Olives and olive oil also play an important role in the economic and social development of Turkey since they feed the population, meet the raw material needs of the agriculture-based industrial sector, contribute to exports with their potential structure and provide employment, etc. (Özışık & Öztürk, 2011).

The most important factors on the quantity and quality characteristics of agricultural products are the inputs used in production and the level of technology. However, even in the most developed countries, the level of technology cannot provide full assurance against the characteristics of the agricultural sector and the risks it faces, and this situation requires the support and protection of the sector. On the other hand, the long production process in the sector, the low rate of monetary return, and insufficient capital accumulation and investments increase the importance of support and incentives. The Agricultural Sector has a great importance in the economic life of all countries, regardless of their level of development. This sector, which produces the foodstuffs necessary for human nutrition and the raw materials required for the industry, creates employment both within its own structure and in other sectors. In order to develop the agricultural sector that provides these and similar benefits, all countries implement comprehensive agricultural policies. Support policies have an important place in agricultural policies (Abay et al., 2005). For many years, the agricultural sector in Turkey has been supported by different policies but changing national and international conditions have brought different policy approaches and reforms to the agenda in the agricultural sector in Turkey.

Agricultural support policies implemented until the early 2000s; The fact that the supports provided are not adequately reflected in the target audience, the inability to achieve the determined objectives has lost its effect with the heavy financial burden it brings to public resources and has come to the fore as factors that prevent developmental goals (Ören & Binici, 2004). A country that wants to sustain its agricultural sector, feed its population, and compete in world markets must maintain support, protection, and incentive practices (Yorgun, 2006). Although the objectives and policy instruments of agricultural supports differ according to countries, they have an important place in the economic policies of all countries. It has been observed that contributing to the solution of the priority problems of the agricultural sector with agricultural supports, increasing the effectiveness of the implemented policies, and facilitating the adaptation of the sector to these policies can only be implemented with programs that will provide economic and social efficiency and productivity conditions (Gül Yavuz et al., 2016).

In Turkey, olive oil was supported continuously until 1986 as one of the 24 agricultural products included in the scope of support for the first time in 1966 and was removed from the scope of support between 1987 and 1990. Olive oil, which was included in the scope of support in 1991, was excluded from the scope of support again with the decisions of April 5, 1994. Support practices in olives have been replaced by union purchase prices from time to time, and since 1998, support payments have been converted into premium payments. It is aimed to comply with the World Trade Organization (WTO) and EU Common Agricultural Policies with premium payments, to increase tax revenues by registering the economy, to ensure that agricultural records and inventories are kept, to protect producers and industrialists at the same time, to encourage production and to provide raw materials to the industry at world prices. Although it changes periodically, the amounts of the supports made directly per kg to olive oil producers under the name of "support premium" were determined, while domestic and foreign market prices, production costs and budget opportunities were taken into consideration.

Practices to increase agricultural production in Turkey are carried out through the Ministry of Agriculture and Forestry. Especially since the beginning of the 2000s, to increase the supply of products, the use of certified seeds, fertilizer, and diesel support, as well as the practice of differential payment (premium payment) have constituted important elements of the agricultural support studies carried out. However, there are not enough studies to determine

the extent to which these practices are reflected in the agricultural income of the producer in Turkey and how they affect agricultural production (Semerci et al., 2012).

According to TurkStat 2020 data in Turkey, 1,316,626 tons of olives are produced on an area of 887,076 ha in 41 provinces. Manisa, Aydın, Balıkesir, İzmir, Hatay and Bursa are the provinces where olive production is mainly made. 5.1% of Turkey's olive production is produced in Hatay province (TÜİK, 2021). In Hatay province, 67,212 tons of olive production is mainly carried out in the districts of Altınözü, Yayladağı, Kırıkhan, Antakya, Hassa and Samandağ on an area of 55,679 ha. 13,166 tons and 19.5% of Hatay province's olive production is produced in Altınözü district. Altınözü district is the most important district center where olive production is made in Hatay province. According to the 2018 data of Hatay Provincial Directorate of Agriculture and Forestry, there are 8,336 olive producing enterprises registered with the ÇKS in Hatay province, and 3,632 of these enterprises have benefited from olive oil support. Of the 3,632 olive producers benefiting from the support in Hatay province, 2,568 (70%) produce in Altınözü district.

The Ministry of Agriculture and Forestry provides direct support for olive oil per kg within the scope of Difference Payment Supports, per decare for those who establish olive orchards within the scope of Certified Saplings/ Seedlings and Standard Sapling Use Support, and per decare within the scope of Rehabilitation of Traditional Olive Gardens Support (Ergün, & Tunalıoğlu, 2016).In this context, in the data obtained from the Altınözü District Directorate of Agriculture and Forestry, it is stated that Altınözü olive producers did not benefit from the Support for the Rehabilitation of Traditional Olive Orchards, that they benefited from the Certified Sapling/Seedling and Standard Sapling Use Support and olive orchard facility support until 2016, that there were no producers who benefited from the support application despite the continuation of the support application after this year, and that the producers still benefit from the olive oil support within the scope of the Difference Payment Supports. It has been determined that it has benefited. In 2018, a total of 7,646,073.34 TL olive oil support payments were made to 2,568 producers in Altınözü district.

In this study, it is aimed to determine the tendencies of olive producers to support, to determine the problems faced by the producers in accessing supports, to reveal their thoughts on support policies, to investigate the effectiveness of support activities for olives, to investigate the adequacy of support tools and to guide the support policies to be carried out.

2. Research Area and Sampling

Altınözü is in the south of Hatay province, 22 km from Antakya. The Syrian state is bordered by the Syrian state in the east and south of Altınözü District, Antakya in the north and west, and Yayladağı district in the southwest. The border length of Altınözü with Syria is 75 km, of which 50 km is the Orontes River. According to TurkStat data, when the olive growing data of Altınözü district between 2004 and 2020 were examined, it was observed that the oil olive production area was 170,798 as of 2020, an increase of 15% compared to 2004, and that the oil olive areas contracted or remained constant until 2011 but started to increase since 2012. It has been observed that the table olive production area is 20,845 as of 2020 and has been on an upward trend since 2004. It has been determined that the number of oil olive trees, which was 2,123,500 in 2004, increased 2.25 times in 2020 to 4,782,483, and the number of table trees, which was 354,000 in 2004, was 485,050 as of 2020. As of 2020, Altınözü district has a total of 5,267,533 olive trees. As of 2020, the olive grove area available in Altınözü District corresponds to 34.42% of the olive grove area and 32.05% of the tree area in Hatay province (TÜİK, 2021).

The main material of the study consists of the data obtained because of the surveys conducted from the olive producers who benefit from olive supplements in the Altınözü district of Hatay province and are determined by the "Stratified Sampling Method". The support data of olive producers in Altınözü district were obtained from Hatay Province Directorate of Agriculture and Forestry, Plant Production and Plant Health Branch Directorate and Altınözü District Directorate of Agriculture and Forestry. In determining the olive grove areas subject to support based on agricultural enterprises, the calculation was made with the data finalized in December 2018. Accordingly, it was determined from the 2018 olive oil support lists kept by the relevant units that 2,568 enterprises benefited from the supports. The survey application of the research was completed in the January-February period of 2019. The secondary data of the research consist of research projects, theses, articles, compilations, and seminars conducted by Hatay Provincial Directorate of Agriculture and Forestry, Altınözü District Directorate of Agriculture and Forestry, TÜİK records and other researchers related to olives and olive oil.

As a result of the calculation made using the formula of the Neyman Method, various alternative layers were created, and examinations were made in determining the sample volume and it was deemed appropriate to work on 3 layers. According to the boundaries of these layers, it was determined that the

sample volume was 55 with a 95% confidence interval and a 10% deviation from the mean. The determined sample volume was distributed to the layers with the "Neyman Method" and the number of enterprises that should be surveyed according to the determined layer widths and the distribution according to the enterprise widths are shown in Table 1. In the study, 16 neighborhoods were selected from 48 neighborhoods in Altınözü district, namely Altınkaya, Babatorun, Gangenli, Günvuran, Kamberli, Keskincik, Kılıçtutan, Mayadalı, Oymaklı, Sarıbük, Seferli, Sivrikavak, Tokdemir, Toprakhisar, Yarseli and Yolağzı, by Gayeli Sampling Method.

Table1. Total number of producer and sampling

Farm width (da)	Total farmers	Number of samples	Rate (%)
<20 da	934	20	36.4
21-60 da	893	19	34.5
>61 da	741	16	29.1
Total	2,568	55	100.0

2.1. Agricultural Supporting in Olives in the Research Area

When the supports made to olive cultivation in Altınözü district are examined; It has been determined that the producers who produce olives in the district benefit from the Certified Sapling/Seedling and Standard Sapling Usage Support, olive garden facility support and olive oil support within the scope of Difference Payment Supports. Although there are no producers who have benefited from the support of the Certified Sapling/Seedling and Standard Sapling Usage Support and olive orchard facility support since 2016, which continues to be implemented by the Ministry of Agriculture and Forestry, it is understood that the producers continue to benefit from the olive oil support within the scope of the Difference Payment Supports.

The exact results of olive oil support obtained from Altınözü District Directorate of Agriculture and Forestry and Hatay Provincial Directorate of Agriculture and Forestry Plant Production and Plant Health Branch Directorate are given in Table 4.4 over the years. According to the table, while 2,618 producers benefited from the support in 2005, there was a decrease of approximately 50% in the number of producers benefiting from the support in 2006, 2007 and 2008. Since 2009, the number of producers benefiting from the support has started to increase and in 2018, 2,568 producers benefited from the support. It has been observed that when the amount of support paid per kg increases, the number

of producers benefiting from the support also increases, and when it decreases, the number of producers benefiting from the support also decreases. In 2005, 1,295,709.59 TL support payments were made, while in 2006, when the Support Amount Paid per Kg (kg/TL) was reduced from 0.25 TL to 0.10 TL, the amount of support paid decreased by 75% to 331,675.14 TL. In 2018, a support payment of 0.80 TL per kg was made to olive oil, a total of 7,646,073.34 TL in the district. olive oil support payment has been made (Anonymous, 2009). When the real support amounts calculated based on 2005 are examined; The amount of real support paid in Altınözü district increased by 184% in 2018 compared to 2005. It was determined that there was no significant relationship between the Support Amount Paid per Kg (Kg/TL) and the production quantities and the support amount and the production quantities. The Support Amount Paid Per Kg does not have a positive or negative effect on production. Since olive is a perennial plant, it will take 8-10 years for newly established olive groves to participate in production, so it is not possible to see the effect of such supports in a short time as in annual plants.

Within the scope of Certified/Standard Sapling Support, support payments are made to producers who establish gardens using olive saplings. According to the data obtained from Altınözü District Directorate of Agriculture and Forestry, 25,599.90 TL support payment was made to 5 producers in Altınözü District in 2007, and the highest support payment was made to 57 producers in 2008 with 258,719.90 TL. Most recently, in 2016, 2,336.60 TL support payments were made to 3 producers. According to the data obtained, after 2016, there are no producers in Altınözü district who benefit from the support by using olive saplings within the scope of support.

3. Socio-Economic Characteristics of Farm and Farmers

It is understood that the period of starting farming and the period of starting olive cultivation are the same, so they started farming by producing olives. It has been determined that 92.7% of the producers started farming and olive cultivation before the year 2000 and have more than 20 years of experience in both farming and olive cultivation. When the ages of the operators are examined; It is understood that 12.7% are in the 31-40 age range, 34.5% are in the 41-50 age range, 43.6% are in the 51-60 age range and 9.1% are over 60 years old. The average age of all operators is 50.4 years. In general, 63.6% of the operators are primary school graduates, 12.7% are secondary school graduates, 9.1% are high school graduates, 3.6% are associate degree

graduates and 10.9% are undergraduate graduates. When the total number of family members of the farmers is examined; In general, 3.6% of the farmers families consist of 2 people, 16.4% 3 people, 14.5% 4 people, 10.9% 5 people, 16.4% 6 people, 25.5% 7 people, 10.9% 8 people and 1.8% 10 people. It was determined that the enterprises in the study earned annual agricultural income between 10,000.00 TL and 350,000.00 TL and the average of the farm was 79,818.18 TL. According to the farm groups, the annual agricultural income of the enterprises in the 1st group (20<) varies between 10,000.00 TL and 40,000.00 TL and the average is 18,950.00 TL. Annual agricultural income in 2 groups (20-60 da) varies between 25,000.00 TL and 120,000.00 TL, and the average of enterprises is 65,052.63 TL. In the enterprises in the 3rd group, the annual agricultural income varies between 75,000.00 TL and 350,000.00 TL and the average of the farmers is 173,437.50 TL. It has been determined that the enterprises participating in the research have at least 16 years, maximum 46 years, and an average of 29 years of experience in agricultural activities and olive production. 1 group (20< da) famers have at least 19 years, maximum 46 years and an average of 29 years, 2nd group (20-60) famers have at least 16 years, maximum 42 years and an average of 26 years, 3rd group (60>) enterprises have at least 27 years, maximum 38 years, and an average of 32 years of experience in agricultural activities and olive production. When the non-agricultural working status of the operators is examined; In general, it was determined that 32.7% of them worked in various non-agricultural jobs and 67.3% of them were engaged only in agricultural activities. 25% of the operators in the 1st group (20<), 36.8% in the 2nd group (20-60 da) and 37.5% of the operators in the 3rd group (60>) work in non-agricultural jobs. When the data on population and family labor force in the study area are examined, there are 78 people in the 1st group (20<), 53.8% of them are male and 46.2% are female, and 59 male labor force units (EIB) have a labor force. There are 84 people in the 2nd group (20-60 years), 53.6% of whom are male and 46.4% of whom are female, and there is a workforce of 64.5 EIB in this group. In the 3rd group (60>60), there were 56 people, 57.1% of whom were male, 42.9% of whom were female, and who had 42.3 EIB workforce. In general, when the family workforce was examined, it was determined that there was a total of 218 people in the famers participating in the study, 54.6% of them were men, 45.4% were women, and there was a 165.8 EIB workforce. When the non-agricultural work of family members is examined; 43.6% of the family labor force in group 1 (20 <20 da), 11.9% in group 2 (20-60 da), and 20.1% in general work in non-

agricultural work, generally working in olive harvest and earning an average income of 4,056.81 TL (Table 4.22). A total of 17 people, 4 in the 1st group (<20), 7 in the 2nd group (20-60), and 6 in the 3rd group (60>), work in non-agricultural jobs and earn an average income of 57,176.47 TL.

3.1. Producers' Information on Olive Growing Activity

Considering all the producers participating in the study, 98.2% of the olive groves are of oil quality and 1.8% of them are of oil and table quality. While the average number of olive grove parcels per farmer is 6.5, farmers have a minimum of 1 and a maximum of 30 parcels. The average olive grove area is 52.50 da, the farmer with the least olive grove area is 4 da, and the enterprise with the highest olive grove area is 230 da. Producers' olive tree holdings range from a minimum of 100 to a maximum of 7,500 and there are an average of 1,608 olive trees per farm. 85.5% of the land is property and 14.5% is rented. It has been determined that the rent of the olive grove is 150 TL on average. All the olive groves in the farmers are dry, and the average value of 1 decare of land is 7,218 TL. The average grain yield per tree is 21.21 kg, and a grain yield of at least 10 kg and a maximum of 32 kg has been obtained. When the groups are examined, the number of olive grove areas and trees is different because the business groups are determined according to the olive grove areas. When the number of parcels is examined, it is understood that the enterprises are very fragmented, and the 3rd group (60>) has the highest number of parcels with an average of 11.37 pieces. The fact that the production areas are very fragmented is not a very desirable situation as it increases production costs. With an average grain yield of 23 kg per tree, the highest yield is seen in the enterprises in the 2nd group (20-60 da).

3.2. Olive Producers' Utilization of Agricultural Supports and Their Satisfaction

All the participating producers benefit from the "Olive Oil Difference Payment Support" and 98.2% benefit from the "Fertilizer-Diesel Support" at the highest rate. Apart from these supports, there are producers who benefit from other agricultural supports at very low rates. For this reason, the satisfaction status of the enterprises participating in the research regarding the Olive Oil Difference Payment Support and Fertilizer-Diesel Support, which they benefit from the most, was examined (Table 2).

Table 2. Producers' utilization of agricultural supports

Farm groups (da)		Fertilizer-diesel subsidy		Total	Olive oil difference payment support		Total
Yes		No		Yes	No		Total
<20	n	20	0	20	20	0	20
	%	100.0	0.0	100.0	100.0	0.0	100.0
20-60	n	19	0	19	19	0	19
	%	100.0	0.0	100.0	100.0	0.0	100.0
>60	n	15	1	16	16	0	16
	%	93.8	6.2	100.0	100.0	0.0	100.0
General	n	54	1	55	55	0	55
	%	98.2	1.8	100.0	100.0	0.0	100.0

According to Table 3, 30% of the producers in group 1 (20< da) benefiting from the Olive Oil Difference Payment Support are dissatisfied, 15% are undecided and 55% are satisfied, with an average score of 3.25, close to the undecided response. 5.3% of the producers in the 2nd group (20-60 da) were not satisfied at all, 42.1% were not satisfied, 15.8% were undecided, and 36.8% were satisfied, and the average score of this type of support was undecided with 2.84. 6.4% of the producers in group 3 (60> are not satisfied, 31.2% are dissatisfied, 31.2% are undecided, 31.2% are satisfied, and we can say that they are undecided since the average score is 2.87. In general, 3.6% of the producers are not satisfied at all, 34.5% are not satisfied, 20% are undecided, 41.9% are satisfied and the average score is undecided with 3. The producers in the 1st group (20< da) were the most satisfied with the Olive Oil Difference Payment Support, while the least satisfaction was seen in the producers in the 2nd group (20-60 da). The difference in olive oil support satisfaction between producer groups was not found to be statistically significant.

Table 3. Producers' satisfaction with olive oil support

Farm groups (da)		1	2	3	4	5	Average
<20	n	0	6	3	11	0	3.25
	%	0.0	30.0	15.0	55.0	0.0	
20-60	n	1	8	3	7	0	2.84
	%	5.3	42.1	15.8	36.8	0.0	
>60	n	1	5	5	5	0	2.87
	%	6.4	31.2	31.2	31.2	0.0	
General	n	2	19	11	23	0	3.00
	%	3.6	34.5	20.0	41.9	0.0	

1: Not at all satisfied, 2: Not satisfied, 3: Undecided, 4: Satisfied, 5: Very satisfied

According to Table 4, 25% of the producers in group 1 (20<) benefiting from the Fertilizer-Diesel Support are not satisfied, 15% are undecided and 60% are satisfied, with an average score of 3.35. 5.3% of the producers in the 2nd group (20-60 da) were not satisfied at all, 47.4% were not satisfied, 26.3% were undecided, and 21.1% were satisfied. The average score of the producers in this group is 2.63, which is between undecided and dissatisfied. 6.7% of the producers in the 3rd group (60> are not satisfied, 26.7% are not satisfied, 46.6% are undecided and 20% are satisfied. The average score of this group is undecided with 2.80. In general, 3.7% of the producers were not satisfied at all, 33.3% were not satisfied, 27.8% were undecided, and 35.2% were satisfied, and the average score was calculated as undecided with a score of 2.94. The producers in the 1st group (20<) were the most satisfied with the Diesel and Fertilizer Subsidy, and the least satisfaction was seen among the producers in the 2nd group (20-60 da).

Table 4. Satisfaction of producers with diesel-fertilizer subsidy

Farm groups (da)		1	2	3	4	5	Average
<20	n	0	5	3	12	0	3.35
	%	0.0	25.0	15.0	60.0	0.0	
20-60	n	1	8	3	7	0	2.63
	%	5.3	47.4	26.3	21.1	0.0	
>60	n	1	4	7	3	0	2.8
	%	6.7	26.7	46.6	20.0	0.0	
Genel	n	2	18	15	19	0	2.94
	%	3.7	33.3	27.8	35.2	0.0	

1: Not at all satisfied, 2: Not satisfied, 3: Undecided, 4: Satisfied, 5: Very satisfied

When the priority problems related to olive supports are examined; The primary answers of the producers are the low amount of support for the enterprises in the 1st group (20<), the inability to register the olive groves in the ÇKS and the failure to pay the supports on time, the inability to register the olive groves in the ÇKS for the producers in the 2nd group (20-60 da), the low amount of support, the fake producers, the low amount of support for the producers in the 3rd group (60>), the inability to register the olive groves in the ÇKS and the fraudulent of the producers, when examined in general On the other hand, the inability to register olive grove areas with the ÇKS, the low amount of support and the fraudulent nature of the producers emerged as priority problems for the producers (Table 5).

Table 5. Problems faced by producers in olive support

Problems	Farm groups (da)			General
	<20	20-60	>60	
Failure to pay subsidies on time	2.05	2.05	1.75	1.96
Lack of support amounts	3.75	3.95	4.31	3.98
Agriculture and Forestry Provincial/District Eng. Failure to Inform	1.15	1.05	1.19	1.13
Lengthy application time	1.15	1.05	1.13	1.11
Counterfeiting of Producers	1.85	2.26	2.63	2.22
Failure to register Olive Grove Areas with ÇKS	3.75	4.63	3.63	4.02
No problem	1.20	1.00	1.00	1.07

1: Strongly disagree 2: Disagree 3: Undecided 4: Agree 5: Strongly agree

The purposes for which the producers participating in the research use the supports they have received are shown in Table 6, and it is seen that the producers in the 1st group (20<) spend the supports mostly on non-agricultural areas and then on the purchase of fertilizers, fuel and pesticides. It is seen that the producers in the 2nd group (20-60 da) use the supports for fertilizer, non-agricultural use, fuel oil and pesticides, respectively. It is seen that the producers in the 3rd group (60>) spend the support they receive for harvesting, fuel, fertilizer, and temporary workers. In general, it is seen that producers spend the most support in non-agricultural areas for the purchase of fuel, fertilizer, and pesticides.

Table 6. How olive producers use the supports they receive

Farm groups (da)	Fertilizer	Pesticides	Temporary worker wages	Fuel	Harvest fee	Non-agricultural use
<20	3.25	2.05	1.40	2.20	1.10	3.75
20-60	3.57	2.36	1.31	3.15	2.00	3.21
>60	3.87	3.25	3.75	3.87	3.87	3.00
General	2.54	2.50	2.05	3.01	2.21	3.34

1: Strongly disagree 2: Disagree 3: Undecided 4: Agree 5: Strongly agree

According to Table 7, 20% of the producers in the 1st group (20 <20) state that the support for olive cultivation is sufficient, while 80% state that it is

insufficient, and according to those who think that it is insufficient, it is thought that the amount of support (olive oil difference payment) should be 1.55 TL. All of the producers in the 2nd group (20-60 da) state that the support for olive cultivation is insufficient, and according to those who think that it is insufficient, it is thought that the amount of support (olive oil difference payment) should be 1.55 TL. 18.8% of the enterprises in the 3rd group (60>) state that the support for olive cultivation is sufficient, while 81.2% state that it is insufficient, and according to those who think that it is insufficient, it is thought that the amount of support (olive oil difference payment) should be 1.61 TL. When examined in general; 12.7% of the producers stated that the support for olive cultivation was sufficient, while 87.3% stated that it was insufficient, and according to those who think that it is insufficient, it is thought that the amount of support (olive oil difference payment) should be 1.57 TL.

Table 7. Adequacy of the amount of support applied to olives

Farm groups (da)		Yes	No	Total	Recommendation subsidy amount
<20	n	4	16	20	1.55
	%	20.0	80.0	100.0	
20-60	n	0	19	19	1.55
	%	0.0	100.0	100.0	
>60	n	3	13	16	1.61
	%	18.8	81.2	100.0	
General	n	7	48	55	1.57
	%	12.7	87.3	100.0	

When the opinions of the producers participating in the research about the support policies applied are examined; 95% of the producers in the 1st group (20<) and all the farmers in the 2nd and 3rd groups, and 98.2% of the producers in the overall evaluation, stated that they were satisfied with the support policies implemented for olive cultivation (Table 8). This situation shows that the complaints among olive producers are in other areas. Producers are powerless, especially in terms of product marketing or selling their products at their value in the markets. Producers who cannot reach sufficient income at the end of the production season have difficulty in developing their farm and production techniques in the following production periods.

Table 8. Producers' satisfaction with olive support policies

Farm groups (da)		Yes	No	Total
<20	n	19	1	20
	%	95.0	5.0	100.0
20-60	n	19	0	19
	%	100.0	0.0	100.0
>60	n	16	0	16
	%	100.0	0.0	100.0
Genel	n	54	1	55
	%	98.2	1.8	100.0

4. Conclusion

Since supporting olive producers has a positive contribution to olive and olive oil production, more support is needed to protect producers in the face of increasing production costs. In addition to encouraging olive cultivation and increasing the production of olives and olive oil, the quality of the products obtained (grain olives and olive oil) should be increased. For this reason, it is necessary to take measures to increase the quality of olive oil. It is understood that the quality of olive oil decreases due to the long duration of the harvest due to the inability of the producers to find sufficient labor in olives and the fact that the collected olives are kept in sacks causes molds. The low quality of olive oil means that the sales price has also decreased. The difficulty in supplying labor in the olive harvest reveals the importance of mechanization, as in other branches of agricultural production. The topographic structure of Altınözü district generally consists of small elevations and hills. In partially flat or low-slope areas, it will be appropriate to harvest with an olive harvester on the back of a tractor, and in more inclined areas, with olive picking and shaking machines that can be carried on the back. Awareness should be created in manufacturers on this issue and the supply of these machines should be encouraged. In addition, to make them available to small businesses, it can provide a solution by establishing a machine park of harvesting machines and other needed machines within the Cooperative, Municipality or District Directorate of Agriculture and Forestry and making them available to producers at low rental prices. Producers should be encouraged to establish new olive facilities in accordance with machine harvesting as much as possible. Again, to increase the quality of olives, it should be prevented from collecting olives in sacks that prevent ventilation and cause mold after harvest. By harvesting in plastic crates instead of sacks, the decrease

in olive oil quality caused by mold can be prevented. For this reason, for the use of plastic cases by manufacturers to become permanent, plastic cases should be donated to manufacturers or they should be provided with plastic cases at low prices.

Another of the biggest problems of olive production is periodicity, that is, irregular yielding or olives producing less or no product one year and one year. Olive Oil Difference Payment Support is applied over the amount of olive oil produced and sold in olive grove areas registered with the ÇKS. For this reason, while support is taken normally in years when the product is high, support is taken very little in years when the product is low. However, the producer uses the same inputs every year, except for a few expenditure items. Although the costs increase every year depending on the input prices, the supports are taken one year normally and one year less, thus creating an imbalance. To prevent this unbalanced situation, it may be more appropriate to switch to the Area-Based Support Model instead of the current support model. In this way, fluctuations and imbalances that occur can be eliminated.

The number of producers trained in olive cultivation is very low. In line with the needs of the producers, courses and trainings on modern olive techniques should be organized. It is seen that the yields obtained in the olive groves in the research region have decreased a lot in recent years due to drought. To reduce yield losses caused by drought and to increase yield, irrigation should be done in areas with water resources. Training activities should be organized for olive irrigation, and excursions should be made to the areas where olive irrigation is carried out. Irrigation plans can be prepared, and producers can be ensured to comply with these plans.

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THE SIMILARITIES AND DIFFERENCES BETWEEN THE ECONOMIC POLICIES IN THE PERIODS OF ATATURK AND THE ITTIHAT-TERAKKI

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1. Introduction

Before analyzing 19th century economic policies in the Ottoman Empire, it is useful to first briefly recall the dominant economic thought systems of the period. In the last quarter of the 18th century, before the emergence of the classical school of economics under the leadership of Adam Smith, there were some economic movements, although not systematically enough. If the emergence of classical economics is to be called the modern period, the first building block of the economic schools that can be expressed as the early modern (pre-modern) period is Mercantilism, which emerged in the 16-18th century. This economic approach emerged at a time when feudalism was beginning to collapse and nation states were emerging. Mercantilism, which measures wealth by the precious metals owned by states and advocates the state to play an active role in the economy, is similar to the Keynesian economic view in this sense. This economic approach, which prioritized trade but shaped it on the axis of protectionism and tariffs, also contributed significantly to the dissolution of feudal relations and became the preparer of the great economic, social and political changes that would take place in Europe. However, Mercantilism did not emerge simultaneously in all countries over this three hundred year period.

The 18th century was a period of tough competition between Britain and France in foreign trade, and this economic conflict of interest led to the Seven

Years' War, which started between the two countries in the period 1756-1763 and then spread to other countries, especially Russia, Austria, Prussia and Sweden. The biggest reason for this war, which can be called the first global war in history, is that both countries entered the colonial race and could not agree on this issue. There was a fierce competition especially over North America and India. This war between European states spread to other continents, especially North America and the Indian subcontinent, with the use of colonies. Britain emerged victorious from this war and France weakened as an empire. Britain gained territories in Canada, America and India and became the most powerful European state in the world. Prussia was another winner of the war and became a military power in the following period. In France, mounting debts and economic difficulties after the war paved the way for the French Revolution. Similarly, due to the high cost of the war, Britain demanded new taxes from the people in America, which led to increased dissatisfaction among the local population and sparked the developments that would later lead to the American War of Independence.

As a reaction to Mercantilism, whose greatest representatives were the English Thomas Mun, the French Jean-Baptiste Colbert and the Italian Antonia Serra, Physiocracy came to the fore in the second half of the 18th century. This economic tradition, which advocated a single type of tax and argued that taxes should be levied only on agriculture, was against state intervention and in favor of the natural economic order.

At the beginning of the 19th century, only Paris and London had a population of more than 500,000 in Europe, while the majority of the population in Germany, France and Russia were still engaged in agriculture. For this reason, it is not a coincidence that Physiocracy, which gave special importance to agriculture, first emerged in an agricultural country like France instead of England, which was becoming an industrialized and increasingly urbanized country. While the Mercantilists emphasized trade and industry, the Physiocrats argued that agriculture was the most important sector in the economy. At the same time, they found the restrictions on land wrong and expressed that they should be abolished. These demands would only be realized as a result of the French Revolution. Richard Cantillon, Francois Quesnay and Jacques Turgot are the greatest representatives of this economic school. This system of economic thought, which argues that nature has laws that operate according to its own order and sees the intervention of states in economic life by imposing artificial laws that are incompatible with nature as unnecessary, has similarities with the

"laissez-faire laissez-passe" perspective of classical economics, which defends the free market economy that will emerge after it in this context.

The 19th century was a period when trade between Western European countries and developing countries gained momentum, and it was also a period when developed countries, particularly the UK, started to invest and lend to third world countries from the last quarter of the century. Global economies developed in the nearly one hundred years from 1820 to just before World War I, driven by the Industrial Revolution and increased foreign trade relations. However, while the income gap between developing countries was about 2 times in the 1820s, by 1913, for example, the income gap between the US and Asian and developing countries had increased from 2 times to 7-8 times (Maddison, 2007).

During the 19th century, the value of British exports increased nearly thirty-fold and the share of exports in national income rose to 40%. In the 1870s, Britain alone accounted for 40% of Western Europe's total exports (Berend, 2011: 32). From the last quarter of the 19th century, Western Europe, led by Britain, France and Germany, was joined by the Scandinavian countries, Russia and Italy, which achieved high growth rates and closed the gap with Western Europe, while Spain, Portugal and the Balkan countries lagged behind in the industrialization drive in the early 20th century.

While the 20th century was still a period of widespread colonialism, it was also a time when ideas of autonomy and independence began to emerge, especially in its early years. In 1913, the per capita income of the four former colonies - the USA, Canada, New Zealand and Austria - exceeded the average income of Western Europe by 45%. Before the war, Europe accounted for 43% of the world's production, but after the war, this share dropped to 34%, falling behind the United States, which accounted for 42% (Berend, 2011: 54-55).

The increase in national income per capita in the world was 0.1% in the 18th century, 0.9% in the 19th century and 1.9% in the 20th century. Although a sustainable growth path was achieved in the 19th century, unlike in previous centuries, it was only in the 20th century that economic growth became a visible economic reality for a large part of the population. If we take a closer look at the 20th century, especially in the period 1950-1970, Europe experienced its heyday and achieved an annual growth rate of 3.8%, followed by Asia with an average annual growth rate of 3.5% (Piketty, 2014: 92).

Although growth rates of 1 to 2 percent may sound low, a sustainable annual growth rate of 1 to 1.5 percent over a period of 30-40 years can enable countries to become advanced economies and sharply increase their

welfare. As a matter of fact, Europe, North America and Japan have taken their places among today's developed and rich countries because they were able to maintain sustainable growth rates of 1 - 1.5% for 30-40 years (Piketty, 2014: 100-101).

In the 16th and 17th centuries, when mercantilism dominated the world, this doctrine was the dominant economic policy in the Ottoman Empire. During this period, the Ottoman government implemented various measures to encourage exports of goods and services and discourage imports. These policies included imposing high tariffs on foreign goods, encouraging domestic industries, and regulating trade by establishing monopolies and guilds. The Ottoman Empire had a rudimentary industrial sector, but the government made efforts to promote industrialization. They established factories and workshops, especially in textiles and metalworking, to provide employment opportunities and promote economic growth.

Mercantilism provided an economic framework for feudalism, where feudal lords sought to maximize their wealth by exporting agricultural products and importing luxury goods. In the long run, however, the rise of mercantilism contributed to the decline of feudalism in the long run. As trade became more important, the importance of land ownership declined, making it a less attractive system for many feudal lords. As feudalism weakened, so did the rigid social hierarchies that supported it, leading to the rise of the bourgeoisie and the emergence of capitalism. In other words, mercantilism encouraged economic activity by providing an economic framework for feudalism, but it also contributed to the rise of centralized administrative structures. The administrative structure of the Ottoman Empire, on the other hand, was not exactly feudal, although there were some similarities. For example, land was considered the property of the sultan and provinces with large territories were administered by governors under the sultan's orders. In this system, landowners were not directly connected to a landowner as in the West and were obliged to pay taxes to the state.

2. Economic Policies in the Ottoman Period (19 th Century)

From the 13th century onwards, in the 'Ahilik' system, which was implemented in Anatolia, first in the Seljuks and then in the Ottomans, and which was a form of professional organization in commercial life, the artisan lodges came to the fore with their semi-autonomous nature and had significant effects on the Ottoman economy and social structure. This system was also used as an effective tool to maintain social balance and solve social problems. On the fiscal

side, fiscal policies in the Ottoman Empire underwent significant changes over time. In the imperial budget, which was largely financed by direct taxes such as iltizam (land tax) and kharaj (crop tax), the jizya tax levied on non-Muslims and the oshür tax levied on Muslims had an important place. In addition, since the Ottoman Empire was located along important trade routes around the world, trade and customs taxes were other important sources of revenue.

Ottoman finances began to deteriorate from the 17th century onwards as a result of inefficiency in tax collections, inadequacy in financial audits, increased military expenditures, weakening economic activity as a result of the inability to keep up with the Industrial Revolution in Europe, decline in the value of money due to excessive money supply, and rapidly increasing foreign borrowing starting with the Crimean War.

In 1820, the national income per capita in the Ottoman Empire was 720 dollars, while in Western Europe it was 1,200 dollars. By 1913, the national income per capita in the Ottoman Empire (the area within today's Turkey) had risen to 1,150 dollars, while in Western Europe it reached 3,460 dollars. In other words, in the period in question, the rate of increase in annual per capita national income in Western Europe was 1.2%, in the USA 1.6%, in Asia 0.2%, while in the Ottoman Empire it was 0.5% (Pamuk, 2006:235). Although this growth rate is considered low compared to Western countries, it was an important development that reflected a sustainable positive growth trend in the Ottoman Empire compared to previous periods.

The fact that the price of agricultural goods remained relatively more expensive than other commodity groups after the Industrial Revolution was an important advantage for an economy with almost 90% of its national income based on agriculture. The expansion of agricultural production areas in the country during this period also positively supported this growth. Again, the foreign trade openness, which was only 4% in the 1820s, reached 25% before World War I, which contributed to economic growth (Eldem, 1970).

The main growth/welfare increase in this period was due to industrialization and the resulting increase in productivity. Although the Ottoman Empire expanded the scope and legal infrastructure of activities to facilitate foreign trade, no comprehensive steps were taken towards industrialization in this period, and growth was allowed to be achieved through agriculture and trade. Among the reasons for the lack of industrialization in the Ottoman Empire, the agreements with Western countries played a major role. Due to the low customs tariffs imposed on the goods of these countries, domestic producers could not be protected.

In the 18th century, the balance in the agreements and commercial relations between the Ottoman Empire and European states began to work against the Ottoman Empire. The commercial privileges that started with France in 1569 and England in 1583 continued with the Netherlands in 1612, Spain in 1782 and Russia in 1783 (Tezel, 1982: 60-61). As a result of these developments, the sultan's authority over the Ottoman economy weakened in the 18th century compared to the 16th and 17th centuries and foreign capitalists began to have more rights over the economy.

In the 18th century, the Ottoman Empire concluded trade agreements with other major states, and in the 19th century, European states began to conclude trade agreements among themselves. First, the German Customs Union (Zollverein) was established in 1818, and afterwards (1818-1833) trade restrictions were reduced and foreign trade was liberalized. The Zollverein also meant laying the foundations of the German state, which was not yet established until the last quarter of the 19th century. Subsequently, Britain and France signed free trade agreements in 1860 and France signed free trade agreements with other European countries (Belgium, Prussia, the Netherlands and Italy) between 1862 and 1865. However, this process of reciprocal opening in foreign trade did not last long, and in the period 1879-1901, Germany, France and Italy raised their tariff rates that hindered foreign trade. Britain had a comparative advantage in foreign trade compared to other countries since it started the Industrial Revolution before other countries. Therefore, the liberalization of foreign trade was most desired by the UK, and as can be seen in the figures in Table 1, the lowest tariff rates were observed in the United Kingdom. Unlike today, the highest rates were in the USA, which was one of the new world countries of that period.

Table.1: Average Customs Tariff Rates (1875-1914) (%)

	1875–9	1880–4	1885–9	1890–4	1895–9	1900–4	1905–9	1910–4	Average
Australia	9.7	9.2	10.7	12.8	14.2	19.0	19.7	19.0	14.3
Canada	15.7	16.9	18.1	19.0	19.5	19.3	19.3	19.5	18.4
Denmark	11.9	11.6	12.6	9.2	9.0	8.1	6.8	5.0	9.3
France	5.2	6.0	7.9	9.7	10.4	8.6	8.5	8.9	8.2
Germany	3.7	6.1	8.2	8.9	9.3	8.4	7.6	7.0	7.4
Italy	7.9	8.3	9.0	9.6	10.2	10.8	11.7	11.7	9.9
Norway	10.2	12.6	11.1	11.2	11.6	11.7	11.5	12.8	11.6
Sweden	9.7	10.5	10.7	10.7	11.4	10.7	9.5	8.4	10.2
UK	5.3	4.8	5.3	4.8	4.8	6.1	5.3	4.8	5.1
USA	29.4	29.1	29.9	23.5	22.7	26.8	23.0	18.3	25.4
Average	10.9	11.5	12.4	11.9	12.3	13.0	12.3	11.5	12.0

Source: O'Rourke, K. H. (2000: 461)

In the last quarter of the 19th century, the general tendency was that taking a protectionist position in foreign trade would allow countries to realize an industrial move from within. The German economist Friedrich List was one of the leading proponents of this view. One of the first important representatives of development economics, he advocated economic nationalism, which would later dominate the economic policies of the Committee of Union and Progress. List, who conducted his economic studies at a time when Germany had not yet established its national unity, but at the same time, three major social developments were taking place, namely the American, French and Industrial Revolutions, also witnessed the emergence of classical economics, which advocated liberalization in foreign trade. In his work, he argued against the paradigm that free trade would lead to economic growth by emphasizing that protectionist policies in foreign trade contributed significantly to the economic growth of the USA.

In the West, capital accumulation occurred first and the industrial revolution followed on the back of this accumulated capital stock. In the Ottoman Empire, on the other hand, the confiscation system was used when necessary to prevent the concentration of capital in certain hands. Confiscation was first adopted during the reign of Sultan Mehmet the Conqueror and the state confiscated the assets of people who made unfair profits. In the Ottoman Empire, this system was first used against Çandarlı Halil Pasha and his family. In the 17th and 18th centuries, this practice was expanded and continued, and the confiscation system was abolished with the Tanzimat Decree in 1839.

While in the 18th century and even in the early years of the 19th century, it was possible to talk about the existence of a protectionist economic policy in the Ottoman Empire, especially with the Baltalimanı Trade Agreement signed with the UK in 1838, the economy started to open up to the outside world and the market economy gained more and more weight. In other words, before 1838, the Ottoman Empire was a self-sufficient economy that was not completely closed to the outside world. Before 1838, exports could only be made within certain borders (after sufficient supply of goods to the public). Europe's foreign lending began around the same time as the Ottoman Empire's foreign borrowing after the Crimean War. Beginning in 1854, the Ottoman economy started to borrow from abroad, and when it was unable to repay the increasing debts in the following years, it lost its financial independence with the establishment of the Düyun-u Umumiye in 1881. The year 1881 can actually be considered as a milestone for the Ottoman Empire in terms of debt repayments. Until this date,

the Ottoman Empire was a net borrower from abroad, but with the establishment of this institution, the control of financial resources passed into the hands of foreign countries. As a result of this development, the Ottoman Empire became a net debt payer until World War I.

The last quarter of the 19th century was the period when the global financial network emerged. Indeed, just before World War I, the ratio of foreign investment to GDP was 248% in Argentina, 146% in Canada, 120% in Mexico, 98% in the Ottoman Empire and 80% in Australia (Twomey, 2000). An analysis of the nature of the external borrowings made in the Ottoman Empire between 1854 and 1914 reveals that 69% of the external borrowings were used for the repayment of old debts, 12% for the financing of annual budget and treasury deficits and 7% for military expenditures. In investment expenditures, on the other hand, only 12% of the foreign borrowings could be utilized and this ratio remained at a very low level for the country's economy to reach the modern level of development (Özdemir, 2009).

As a result of the competition brought by the industrial revolution and the free trade agreements signed between countries, domestic merchants lost their ability to compete in domestic and foreign markets in the 19th century and the country's balance of payments balance began to deteriorate. As a result of the growing external deficit, when the necessity of financing wars was added to this, foreign borrowing began to be used intensively.

In the last quarter of the 19th and early 20th centuries, Britain was the largest exporter of capital. In this period, the share of British capital in global capital exports reached as high as 80%, and when one considers that the share of the US, the largest global economic power today, was around 25% in the early 2000s, the power of the UK in the 19th and 20th centuries can be better understood. In 1870, total capital abroad accounted for only 7% of world GDP, while in 1900-1914 it rose to 20%. This figure collapsed sharply in the aftermath of World War I and the Depression of 1929-30, and only recovered in the 1980s (Obstfeld and Taylor 2004: 55).

In 1908, Constitutional Monarchy II was declared with the initiative of the İttihat ve Terakki Commitee. In the first years of this process, the society controlled the government from outside instead of directly forming a government. In 1913, with the Bab-ı Ali raid, it took over the government completely. In the last quarter of the 19th century, the highest share of the Ottoman debt to other countries belonged to France and England respectively. Foreign borrowing continued throughout the İttihat-Terakki period as a result of the lack of sufficient

domestic capital accumulation. The foreign borrowing continued during the rule of the Committee of Union and Progress, and the borrowing of 7,040,000 Ottoman liras with the famous German state bank Deutche Bank in 1911 and the borrowing of 1,485,000 Ottoman liras from W.G. Armstrong Whitworths for the modernization of shipyards in 1913 can be given as examples. During the period of the İttihat-Terakki period, while France maintained its predominant share in borrowing and even increased its share to some extent, the share of England decreased significantly and was replaced by Germany.

Table.2: Distribution of the Ottoman Debt Structure

Country	1881	1914
France	40%	49%
England	29%	7%
Germany	5%	20%
Holland	8%	3%
Italy	3%	1%
Austro-Hungary	1%	1%
Belgium	0%	11%
Turkey (internal debt)	8%	8%
Not accounted for	6%	0%

Source: Ergil (1979:215)

The economic policies of the committee during its nearly decade-long activity can be considered as two distinct periods. Boratav (2003) draws a similarity between the economic legacy inherited by the İttihat and Terakki Committee in 1908 and the Kemalists in 1922. According to the author, the main characteristic of the main inheritance is "a semi-colonized social structure". The author lists the characteristics of this economic social structure as follows: An exporter of raw materials in the world economy, an importer of industrial products, a high level of foreign debt, and an attempt to move towards capitalism on a national scale, but an incomplete bourgeois revolution.

In the period from 1908 to 1913, the İttihat-Terakki adopted liberal economic policies with the influence of Cavit Bey, who was the finance minister of the period and served as minister for six years during the ten-year period in which the İttihat-Terakki was active, and put forward an export understanding based on agriculture. During this period, Sakızlı Ohannes Pasha also had views on reducing the weight of the state in the economy and activating the free market.

In 1909, workers' union rights were taken away with the Law on Holiday Law, which can be characterized as a capitalist regulation. [1] Prior to this regulation, and immediately after the declaration of the Second Constitutional Monarchy, strikes by workers in the railroad and tobacco sectors in Anatolia and Rumelia began. This law remained in force until 1936.

In 1913, with another law enacted, private ownership of land was secured by law. With this law, foreign capitalists bought land, especially in Western Anatolia. However, as of 1914, when World War I started, the group that gave importance to protectionism in foreign trade and industrialization increased its weight within the Committee of Union and Progress and the idea of a 'national economy' that would reduce the influence of minorities in the country became dominant. In 1914, the Law on Teşvik-i Sanayi (Encouragement of Industry) was published in this context and this law provided certain privileges to domestic capital.

The conditions of World War I played an important role in the transition from liberal policies to a protectionist and national economic policy approach. During the war years, capitulations were unilaterally abolished, customs duties were doubled and a value-based advalorem tax system was introduced instead of a uniform customs duty applicable to all goods. The biggest proponents of the 'National Economy' doctrine were Ziya Gökalp and Yusuf Akçura. Also influential in this process were the ideas of the German school of historians, which became an influential school of thought in the global political economy. The German school of historians tends to interpret documents directly, analyze events and processes objectively, and consider historical events in their social, economic and cultural contexts. This school generally favors a critical approach to historiography and reflects an effort to gain a deep understanding of historical events through a comprehensive study of them. Although an attempt was made to create an entrepreneurial domestic bourgeois class during this period, it is not possible to speak of a bourgeois revolution in the country. Nevertheless, Varlı (2012) states that the policies that began to be implemented in this period formed the basis of the principle of 'statism' in the Republican era (Varlı, 2012: 171).

For the financing of World War I, the Ottoman government resorted to domestic borrowing for the first time in 1918 by adopting an intensive campaign method instead of foreign debt and issued government bonds worth 19 million

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1 Although the history of the first strikes dates back to the ancient Egyptian civilization, the first recorded strikes in Europe started after the Industrial Revolution. The first strike was initiated by workers who could not get paid for their work in France in 1593, and union organization and strikes were banned in France by the Chapelier Law in 1791 (Doğan, 2018; 266-267).

liras. Boratav (2003: 35) considers this initiative as the first nucleus of the transition to a national economy and, citing Vedat Eldem, states that 26% of the financing of the resources used by the Ottoman Empire in World War I was received from Germany and Austria, whereas the foreign support in the financing of the War of Independence was 10% (Soviet aid and donations). The method used by the Committee of İttihat ve Terakki in financing its war is similar to the method used by Britain in the Seven Years' War, the first global war in the world. The British were able to use borrowing instruments effectively in this war, while their rival France chose to finance the war through taxes.

In 1911, the Istanbul Bank was established, as was the National Bank of Economics in 1914, and these banks were followed by a number of small banks established in the provinces. In 1917, as a result of the nationalization movements in the economy, the idea of establishing a national bank that could rival the Ottoman Bank, which was composed of foreign capitalists who did not provide sufficient resource support during the Balkan wars, came to the forefront and the Itibar-i Milli Bank was established in the same year (Toprak, 2012).

3. Monetary and Fiscal Policies in Atatürk's Period

It is not possible to speak of a sharp distinction between the economic policies of the Atatürk period and the economic policies of the last period of the Ottoman Empire. As in the 1908-1918 period, the Ataturk period was dominated by national economic policies that were more liberal at first, but did not completely exclude foreign capital as a result of the developing conditions.

Trade openness is the ratio of the sum of a country's imports and exports to national income. Today, the threshold for a country to be considered open to foreign trade is 60 percent, but in the first quarter of the 20th century, this ratio was considered to be around 20 percent. For this reason, both the Ottoman Empire and Turkey had the characteristics of being an open economy under both the Committee of İttihat ve Terakki and Atatürk before the Great Depression in 1929-30.

A comparison of the ten-year period under the Committee of İttihat ve Terakki (1908-1918) and Atatürk's 1923-1929 period shows that the foreign trade openness was close to each other in both periods. In fact, while the ratio of imports and exports to national income was 25% in 1913, this ratio was realized at similar levels (26%) in the 1923-1929 period.[2] However, with the economic depression crisis in the world, countries gave importance to protectionism in

2 The data for 1913 were taken from the studies of Eldem (1970) and Pamuk (1994), and the data for 1923 and later were taken from TUİK Statistical Indicators 1923-2013, p.437.

foreign trade in the global sense, and this situation was observed in Turkey and the foreign trade deficit decreased to 15% in the period 1930-1939. Especially in 1930, the annual contraction in imports reached 44%, while the contraction in exports was still moderate at 4.6%.

Graph.1: Foreign Trade Openness in Historical Period
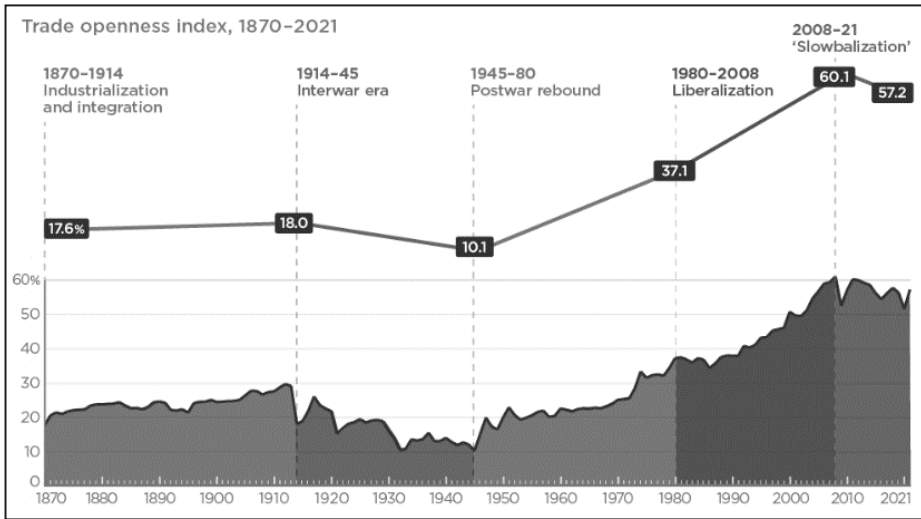
Source: Irwin (2023)

According to TUIK data, the annual growth in national income during the 1924-1929 period was 10.3%, with the largest contribution to this growth coming from agriculture with 13% growth. Agriculture was followed by services with 8.2% and industry with 7.5% growth. In the period between 1929 and 1932, when the world experienced the Great Depression, the contraction in national income was only 0.3% on an annual basis, and in the period between 1933 and 1939, the increase in national income reached 8.3% on an annual basis (TÜİK, Statistical Indicators; 635).

Atatürk emphasized the importance of financing economic growth with domestic resources and emphasized that the economic road map of the new Republic of Turkey should be implemented in the form of an investment planning that should be supported by the state. During the Atatürk period, a rational, developmentalist policy strategy in the light of science rather than an ideological understanding of economic-fiscal policy came to the fore. If we look at the economic policies of this period, it is possible to talk about two different

periods. In the first period covering the years 1923-1929, the Republic of Turkey adopted a predominantly liberal economic approach with the influence of the prevailing wind blowing in the world, but at the same time, a unique national economic vision was also put forward.

As a result of the Economic Depression experienced in the world in 1929, economic policies were changed in accordance with the general world order. In this second period, which can be defined as 1929-1938, a mixed (moderate statist) policy strategy was followed, giving more emphasis to state interventions. During this period, the state did not enter into a competitive relationship with the private sector, and the extent of this relationship was based on complementing each other. As a matter of fact, in this period, the growth rate in the industrialization process in the public and private sectors did not differ significantly from each other in terms of production value. However, Boratav (2003:83) states that, apart from the production value, the share of private industrial profits in national income increased from 3.4% to 6.2% in the 1932-1939 period, and that the share of the private industrial bourgeoisie in national income increased in this period. II. The period is also the period when the Republic of Turkey started to pay the debt left from the Ottoman Empire in Lausanne. As it is known, the Republic of Turkey agreed to pay its share of the Ottoman debt (65% of the total debt - 108 million TL). [3]

Although it is possible to divide the economic policies of the Ataturk period into two periods, there are also economic policy practices implemented in a similar way in both periods. Low inflation was one of the main priorities during the 1923-1938 period, and although there were depreciations in the TL before the establishment of the CBRT, attention was paid to make the TL a valuable and stable currency throughout the period. Negative inflation rates were observed in the country in the 1924-1930 period, and inflation remained at 4.9% in the 1930-1940 period. Although the Central Bank of the Republic of Turkey[4] (CBRT) did not have an institutionally independent monetary policy until its establishment in 1930, it followed a disciplined monetary policy regarding the emission volume, and this prudent monetary policy was continued after the CBRT. With the influence of the liberal policies of the period, the Treasury's

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3 The first installment payment in 1929 was equal to 10% of the export revenues and 8% of the general budget revenues on the relevant date (Yay, 1998: 300).

4 Before the CBRT, the Ottoman Bank had the authority to print money and this bank was established in 1863 (Abdülmecid period). The bank was first established entirely with British capital, and then French capital also joined the bank. This bank wanted to become a partner in the newly established CBRT with a 51% share..

share in the CBRT was limited to only 15% and the independence of the bank was considered important. Atatürk and İnönü acted cautiously in printing money (emission) until 1938. Especially between 1934 and 1938, while the annual average increase in money supply was 9.5%, this increase rate was close to the increase in the country's national income (8%) in this period (Yay, 1998: 312).

During this period, efforts were made to increase the reserves of the CBRT, and the gold reserves of approximately 6 tons in 1931 were increased to 26 tons in 1938. Again, while the British Pound was 76 kuruş in 1923, it decreased to 61 kuruş in 1938. Similarly, the Dollar, which was 80 kuruş in the first years of the new Republic, did not increase much until 1938 and was traded at 1 TL (Hürriyet, 2003). As stated in the previous lines, during this period, special importance was given to keeping the domestic currency valuable and strong.

Although there were two different periods in economic policies, no change was made in the fiscal policy approach in both periods and the balanced budget approach was adopted.[5] Also during this period, it was accepted that it was unacceptable to use financial revenues obtained as a result of domestic and foreign borrowing to close the budget deficit. There was no budget deficit in the 1923-1929 period, except for 1925. In this period, almost 80% of the taxes consisted of taxes on agriculture and livestock, and in 1925, the 'Tithe Tax', which was collected from agriculture and constituted almost 1/4 of the budget revenues, was abolished and the tax on livestock, which was previously collected from only a few animals, began to be collected from all animals. . With the introduction of the 'Earnings Tax' in 1926, it is seen that the tax burden was taken from the peasants and shifted towards the urban population. [6] While the share of income tax in budget revenues was 19% in the 1932-1935 period, World War II. During World War II, this rate would rise to 33%. In the meantime, the tax rate on the urban population has increased. In order to alleviate this burden, the 'Soil Products Office' tax would be put into effect in 1943, after Atatürk's death, and some of this burden would be transferred again to the villagers. Ertan (2018: 249) states that this tax "was a political breaking point in the relationship established between the single-party rule and the peasant class."

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5 Atatürk implemented an extremely meticulous policy in public expenditures; For example, he disagreed with the last caliph, Abdülmecid Efendi, about increasing the budget of the caliph-ate, and although he was more tolerant towards Abdülmecid Efendi than Sultan Vahdettin, he expressed a negative opinion, finding such budget spending requests unnecessary. In fact, this request of Abdülmecid Efendi was later cited as a reason for the abolition of the Caliphate.
6 In 1929, the share of indirect taxes reached up to 75%.

With the abolition of tithe tax, the scope of land and animal taxes in the agricultural sector was expanded and their share in budget revenues was increased; The ratio of both taxes in budget revenues increased from 3% to 8% (Tezel, 2002: 438). But this was not enough, so the difference was tried to be closed through indirect taxes. To emphasize again, while this tax policy partially reduced the tax burden on the peasantry, it caused an increase in the tax burden on the urban population.

Taxes are a necessary element in a civilized society, however, the degree of taxation varies according to the conditions of the period and the dominant ideology. During Atatürk's period, the tax burden (the ratio of tax revenues to national income) was around 10% on average, and the fiscal policy implemented in the country allowed capital accumulation to occur. As of the end of 2020, this rate is 26.8% in Turkey. In the relevant period, the tax burden in other countries was, for example, 3% in Japan, 4% in the USA, 8% in Sweden, 13% in Spain and Italy, 14% in France, 20% in the UK in 1928 (IMF , TY). These tax burden rates show that practical applications may differ from dominant ideologies. In other words, there are significant differences in terms of tax burden even between the two largest representatives of liberal economic policies (the USA and the UK).

In the 1923-1938 period, there was a budget deficit only in 1925, 1931 and 1933, and the highest deficit was in 1924. In other words, during this fifteen-year period, special importance was given to fiscal discipline, and no budget deficit was experienced except for the three years in question.

**Graph.2: Ratio of Budget Deficit and Surplus to GDP**
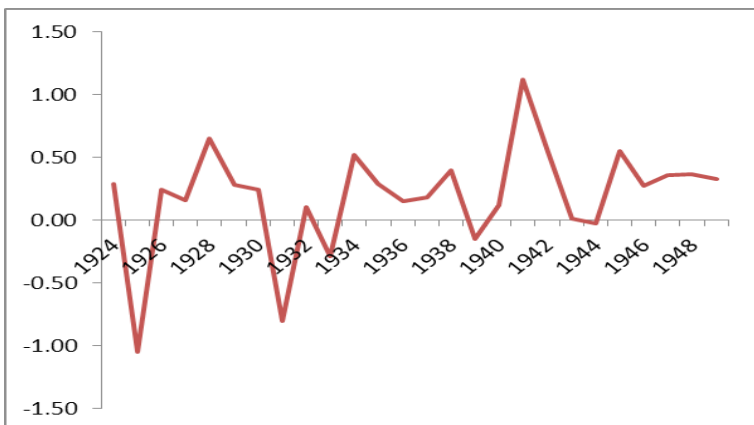
Source: Ministry of Treasury and Finance, Budget Expense-Income Realizations (1924-2019)

For the period 1924-1949, the ratio of tax revenues to consolidated budget expenses has varied significantly over the years. While this rate was at an average level of 70.3% in the period until Atatürk's death, it decreased to 62.6% in the period covering the period 1939-1949.

Graph.3: Share of Tax Revenues in Consolidated Budget Revenues
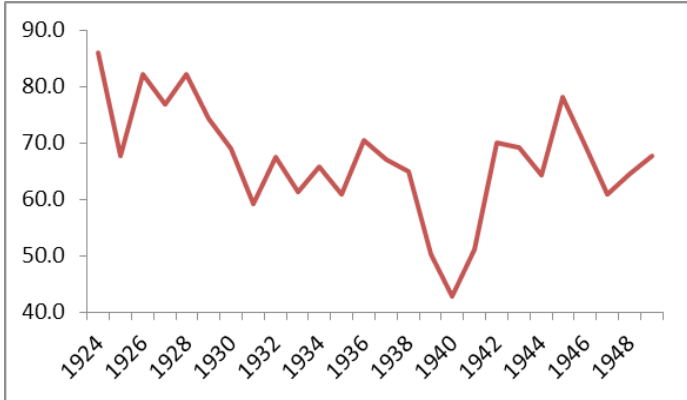
Source: Ministry of Treasury and Finance, Budget
Expense-Income Realizations (1924-2019)

Since Ataturk believed that tax increases should be proportional to the income level of the people, he abolished some taxes, especially on production, during this period. However, Ataturk, who was aware that indirect taxes created a partial injustice in taxes, made efforts to reduce the weight of this type of tax, which had a high share, in the following years. As a matter of fact, by 1938, it was seen that the share of indirect taxes decreased to 60%. In response to criticism that this 60% rate is still high, it should be emphasized that this situation is a natural consequence of the weak capital accumulation and industry in a country that was reborn after the war. Also in this period, there was a controlled monetary management, and especially after 1930, it was aimed to ensure external stability in a way that would not cause a deficit in the balance of payments, and a fixed exchange rate system was implemented. The first budget of the new Turkey in the modern sense was the 1924 budget, which was a budget based on estimating income and expenses before the fiscal year began (Vural, 2010: 82).

With the abolition of Tithe tax in 1925, the share of taxes in budget revenues decreased significantly. The abolition of this tax, which had existed for over six hundred years, was one of the biggest reforms in the financial system. It also appears that there is a serious consensus on the abolition of this

tax. The opposition party of the period, the 'Progressive Republican Party – Terakkiperver Cumhuriyet Fırkası', also voted positively for the abolition of the tithe tax. [7] The resulting revenue gap was tried to be partially filled with 'Fiscal Monopoly Taxes'[8]. 'Earnings Tax', which is also a type of individual tax and includes a progressive tax tariff to be collected according to the financial situation of individuals, was introduced in 1926 as an alternative to the loss in Tithe tax. [9]

As a result of some problems in this tax, a new regulation was made and, as briefly mentioned in the previous lines, the new 'Earnings Tax' was put into effect in 1934. Another tax that replaces tithe is 'Fixed Tax' and this type of tax can be considered as an additional tax collected from the tax. If the taxpayer's income from the buildings, inns and houses he owns, or the taxpayer's income subject to 'Earnings Tax', another new type of tax, exceeded a certain limit, he also had to pay 'Fixed Tax'. As a result of not obtaining sufficient income from these taxes imposed in lieu of tithes, the weight of indirect taxes began to increase gradually. As a result, the 'Consumption Tax', which can be called a consumption tax today, was put into effect.

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7 Although the Tithe tax was abolished during the Atatürk period, the new Republic of Turkey did not completely abandon agricultural income. As a matter of fact, the 'Soil Products Office-TMO Tax' was put into practice between 1943 and 1946. This tax was applied in kind and a 10% tax was collected from the product. However, the expected income from here was realized at half of what was predicted. TMO was established as a public institution in June 1938, a few months before Atatürk's death, to support wheat purchases, and over time, many other agricultural products were included in the scope of activity of the institution.

8 "Financial monopolies are a consumption tax within the scope of indirect taxes. Here, the state can generate income by public monopolizing the production and sale of some goods with low demand elasticity and determining their prices to provide very high profits. Financial monopoly practices include tobacco, alcoholic beverages, gunpowder, salt, matches, coffee, tea, sugar, etc. It was in the form of a monopoly. "In the face of environmental problems that are becoming increasingly important today, financial monopolies can find a different and wider application opportunity." (Ekodialog, TY)

9 In this tax, the tax base was determined according to the declaration procedure.

increase gradually. As a result, the 'Consumption Tax', which can be called a consumption tax today, was put into effect.

'Inheritance and Transfer Tax' was put into practice in 1926, and some changes were made to this tax in 1931 due to the adoption of the Civil Code in this period. In addition, the 'Building and Land Tax' was introduced in 1931, and in 1935, this tax was combined with the 'Musakkafat Tax' and the taxation authority was left to local governments. This step is the first step taken in the history of the Republic towards the principle of Decentralization.

The new taxes introduced in the 1930-1939 period were the Economic Crisis Tax, the Balance Tax and the Air Force Aid Tax. The common feature of all three taxes is that the working class is a taxpayer and is collected temporarily. In the period covering the years 1931-1939, the Economic Crisis Tax constituted approximately 7.5% of total tax revenues and remained in force until 1950. 'Road Tax'[10], which was put into effect before 1930, is another tax that was in force during the Atatürk period, and this tax continued until 1954.

While the share of total income taxes in total budget revenues was 37.5% in the 1923-1924 period, this rate decreased with the abolition of tithe tax and reached an average of 10% in the 1925-1931 period. The share of the total tax collected from wealth continued its high course during the said period; The reason for this is that the 'Animal Tax' paid by agricultural producers is within the scope of this group (Saraçoğlu, 2009: 139). The weight of indirect taxes was generally higher in the 1930-1938 period. On the other hand, in accordance with the principle of justice in taxation, the share of direct taxes was tried to be increased throughout this period and this was achieved to a certain extent. As a matter of fact, while the share of direct taxes was only 26% in 1930, this rate increased to 40% by 1938[11]. The low share of direct taxes in the said period can be associated with the fact that capital accumulation was not yet strong enough in a country that emerged from the war and inherited a significant portion of the Ottoman debt.

10 All men over the age of 18 had to work in road construction; if they did not work, they had to pay a tax. This tax has brought a burden to the agricultural sector as it reduces the labor force working on the land or pays taxes if people work on the land.

11 During the economic crisis of the 'Great Depression' the top income tax rate increased from 25% to 63% in the USA in 1932-33 (Patton,2016)

Table.3: Tax Distributions in Turkey in the Period of 1930-1939

Years	Taxes on Income	Taxes on Wealth	Taxes on Expenditures
1930	8,6	17,5	73,9
1931	13	17	70
1932	22,3	14,2	63,5
1933	22,2	14,2	63,6
1934	27,4	16,1	56,5
1935	28,5	15,6	55,9
1936	41,8	11,6	46,6
1937	17,1	10,8	72,1
1938	31,5	8,1	60,4
1939	35,7	8,6	55,7

Source: Budget Revenues Yearbook 1977-1978
(cited in: Saraçoğlu, 2009: 139)

During this period, steps were taken towards the modernization of the Turkish tax system, and private initiatives were tried to be supported by the state without giving up fiscal discipline. However, there are some criticisms that the fiscal monopoly tax application is incompatible with the modern understanding of finance. Although no significant agricultural investments were made in the period after 1930, the free distribution of Treasury lands to the villagers in line with the laws enacted in 1927 and 1929 continued in this period, and while the ratio of cultivated lands to total lands was approximately 5% in 1927, this ratio decreased to two by 1934. has doubled. The share of the agricultural sector in total export revenue in this period was around 75-80% (Şahin, 2002: 69). With the abolition of tithe tax, the share of tax revenues in consolidated budget revenues showed a continuous downward trend until 1938-1940. Towards the end of the Ataturk period, this rate decreased to 40%. Today, the share of tax revenues in total public revenues is approximately 85%.[12]

Turkey's first development plan was put into effect in April 1934 and was prepared at a time when the negative effects of the Great Depression economic crisis (1929-1933) experienced in the world at that time were still continuing. The fact that Soviet Russia was not affected by the economic crisis during

12 Other income items other than tax revenues of the state include duties, fees, goodwill, parafiscal revenues, property, enterprise, privatization revenues, borrowing revenues, seigniorage (money printing) revenues, SOE profits, fines and tax penalties, bonds and aid, etc. Other public revenues consisting of revenues are included.

this period turned attention to state-led development policies. As a matter of fact, annual economic growth in the USSR during the 1928-1940 period was 5.8% on average. Stalin put into effect the first development plan in 1928. The economic crisis experienced during this period did not only affect the USA; It has manifested itself violently all over the world[13]. In summary, in the period between the two World Wars, views increased that capitalism did not function successfully and even had many flaws. As a result of the economic contraction, especially during the Great Depression of 1929-30, unemployment rates increased to 22% in England, 24% in the USA, and 44% in Germany. Hungry and unemployed people are the elements that create dictatorships. As a matter of fact, during this depression period, there were significant deviations in the political balances, causing military dictators to seize power in Central and South America. Similarly, fascism and communism became increasingly popular, fascist and militarist governments became increasingly stronger in Germany (Hitler), Italy (Mussolini) and Japan, and Stalin consolidated his power in the Soviet Union.

Although the First Development Plan during the Stalin period ensured the growth of the economy and industry, there was no bright picture for the household. During this period, significant improvements were seen in heavy industry, mining and construction. Thus, the Soviet Union became the world's leading producer of oil, coal, iron ore, and cement, and a major world producer of manganese, gold, natural gas, and other minerals. These gains enabled the USSR to develop the defense industries it needed to fight Hitler's armies during World War II. According to official statistics, national income in Soviet Russia increased by 14% in the period 1928-1941. People's living standards were seriously negatively affected during this first 'Five Year Plan' period. In 1932, workers' real incomes were about one-tenth of their 1926 levels. The Soviet famine of 1932-33 affected tens of millions. For the majority of the Soviet population, these were years of poverty (Figes,1997). Stalin was already aware that this would happen; He thought that individual interests should be sacrificed to the state. As a matter of fact, on the twelfth anniversary of the revolution (1929), Stalin described the Five-Year Development Plan as the beginning of the last great revolutionary struggle against 'capitalist elements'. 'Five-Year Development Plans', which continued as Stalin's legacy, continued in later

13 The economic depression lasted quite a long time, however, this period varied from country to country. For example, while Europe significantly reduced unemployment rates in the period until 1936, there was still an unemployment rate of over 14% in the USA by 1941.

periods and twelve plans in total were prepared; Thus, these development plans became the basic economic model of the Soviets (Figes, 1997).

The First Five-Year Industrial Plan in Turkey, covering the years 1934 - 1938, was based on targets such as producing basic necessities and the necessary raw materials needed by the industry within the country and minimizing the high dependence on foreign sources, and significant improvements were achieved in this regard during the plan period. In this plan, priority was given to sectors such as cement, glass, bottles and textiles, as well as areas such as iron and steel, chemistry, sulfur and sugar production. In order to realize these productions, in addition to being close to the raw materials, utmost attention was paid to establishing a regional balance within the country and investments were distributed to different regions. These investments started to bear fruit after a while. As a matter of fact, while there was no production in the iron-steel, paper and glass sectors in Turkey in 1929, in 1940 the production of these products increased to 32%, 39% and 91%, respectively. Similarly, while domestic cement production in our country was 49% in 1929; By 1940, this rate increased to 97%. Again, a similar development is clearly seen in sugar production, and domestic sugar production, which had a 10% share in 1929, reached up to 99% in 1940 (tarihibilgi.org). The contribution of industrial investments emerges with a certain delay; For this reason, the infrastructure transformation of economic growth in the country was not possible at once. As a matter of fact, while the share of industry was 13.5% in 1933, this rate only increased to 14.1% in the year when the First Five-Year Industrial Plan ended (Saraçoğlu, 2009: 133).

Although the financing required for the plan in question was largely met from the existing appropriations in the budget, a certain amount of domestic borrowing was also carried out. In the pre-plan period, the share of the industrial sector in the Turkish economy was 15%[14]. Considering that this rate was 9% in 1930, it can be seen that attempts were made to increase the share of industry even before this development plan. II, covering the period 1939-1943. In the Five-Year Industrial Plan, unlike this strategy, investments in intermediate and investment goods will come to the fore and the first important steps will be taken towards the development of heavy industry. The plan, the preparations of which started in 1936, was completed after Atatürk's death and World War II. As a result of the start of World War II, it could not be implemented at the desired level.

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14 Today, this rate is at 28%.

In 1923, 50% of the banks were in local hands. The only local bank with its own branch network throughout the country was Ziraat Bank, which was established in 1888. When we look at the developments in the field of banking in this period, İş Bank was established in 1924, followed by the establishment of Sanayi ve Maadin Bankası in 1925, Emlak Bankası in 1926, Sümerbank in 1933, Etibank in 1935, Denizbank and Halkbank in 1938. has done. Yay (1998: 309) states that time and demand deposits in the banking system increased by 110% in the 1933-1938 period. According to the author, the share of national banks in total deposits increased to 81% in the relevant period, and the increase in loans between 1929 and 1938 was 40%.

On the foreign trade side, a foreign trade deficit was observed every year during the 1923-1929 period. In accordance with the Treaty of Lausanne, Turkey could not realize the desired arrangements in its foreign trade policies until 1929. From this date on, a more protectionist foreign trade policy was put into practice with the influence of the general trend in the world, first with the 'Customs Law' that came into force in 1929, and then with the 'Law on Protecting the Value of Turkish Currency' enacted in 1930. [15] Turkey's exports also deteriorated significantly during the 'Great Depression' crisis, which emerged in the USA in 1929 and then spread to many countries. As a matter of fact, the total export figure, which was 88 million dollars in 1928, decreased to 48 million dollars in 1932. During this period, close economic relations were established with Germany and there was a significant increase in the foreign trade volume with this country. As a matter of fact, the share of our exports to this country increased from 15% in 1932 to 44% between 1935 and 1938; Our imports to Germany increased from 25% to 46% (Şahin, 2002: 73-74). "Customs Duty revenues were at the highest level among tax revenues with a rate of 34% in 1930. Although the Customs Duty maintained its importance in the following years, its share in the total tax revenue decreased, falling to 24% in 1938 (Saraçoğlu, 2009: 136). Although there was a foreign trade deficit in the 1923-1929 period, as a result of the measures taken afterwards, a foreign

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15 These regulations were carried out by Şükrü Saraçoğlu, Minister of Finance, who served in the İsmet İnönü government during the 1927-1930 period. He later served as Minister of Foreign Affairs between 1938 and 1942, and as Prime Minister between 1942 and 1946. During these periods, Turkey's II. Along with İsmet İnönü, Şükrü Saraçoğlu had important contributions in preventing the war from entering World War II. During his term as Prime Minister, he introduced the 'Wealth Tax', which was to be collected from the rich one-time, in 1942, but abolished this tax in 1944 as a result of the harsh reactions that followed. The 'Farmers Landing Law', which was put into effect in 1945, was criticized by the leading politicians of the period (Adnan Menderes, Celal Bayar) and a new opposition party (Democratic Party) was established within the CHP in the same year.

trade surplus was obtained between 1930-1939. While the share of imports in national income was 14.5% in the 1923-1929 period, this rate decreased to 6.6% in the 1933-1939 period (Bulutay et al., 1974; cited in Boratav, 2003: 111-112).

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Since 1923, the liberal and open trade policy gave way to a more conservative trade approach due to the 'Great Depression' experienced in the world. For this reason, the strategy of protecting the domestic industry against foreign competition was adopted in Turkey after 1930. As a matter of fact, if 1938 is considered an exception, a foreign trade surplus was achieved every year in the 1930-1939 period. In order to protect itself from the global crisis, Turkey became a more closed economy during this period. In this period when the nationalization movement was felt intensely, the principle of statism became a dominant paradigm. However, Öner (1981:104) defines this statism movement as "not an ideology in the sense of socialism; He defined it as "an statism that is limited to the requirements of the national economy, the need for rapid development and industrialization of the country, and that sees it necessary for private enterprise to continue its existence in full security and stability" (cited in Saraçoğlu, 2009:132).

4. Conclusion

The 19th century is a period when trade began to revive between Western European countries and other developing regions. In this period, especially from the last quarter of the century, developed countries, especially England and France, began to invest and lend money to third world countries. This process symbolizes a period in which economic relations became more effective on a global scale and international trade and investments increased.

The economic practices of the Committee of Union and Progress, which played an active role in the administration in the period between 1908 and 1918, focused on foreign borrowing, modernization, industrialization and stability policies that did not create dependency. However, the international political situation of the period, the war and some internal difficulties brought by the war had a negative impact on the success of these policies. There is no clear differentiation or a paradigm shift between the economic policies of the Committee of Union and Progress and the economic policies of the Ataturk period. In both periods, liberal policies were at the forefront at first, and then became more protectionist, as a result of internal and external factors such as war and global crisis. A national economic perspective has dominated the country's economy. The Committee of İttihat-Terakki, which began to see the risks posed by foreign borrowing on financial and political independence, turned to domestic borrowing by issuing government bonds to finance the war, especially at the beginning of World War I, and thus reducing the weight of foreign borrowing in the country is an example of the transition to a national economic approach.

During Ataturk's reign, especially at the beginning, more liberal policies were a priority, but as conditions changed over time, national economic policies that did not completely exclude foreign capital also gained importance. This policy aimed to strengthen the local economy by adopting a flexible approach, as in the 1908-1918 period. A country's foreign trade openness refers to the sum of imports and exports in proportion to its national income. Today, the generally agreed upon threshold for a country to be considered open is 60%. In the first quarter of the 20th century, this rate was generally 20 %, depending on the conditions at that time. Therefore, during the period of Committee of İttihat-Terakki and during the Atatürk period before the Great Economic Depression of 1929-30, the Ottoman Empire and the Republic of Turkey were an open economy for that period, with a rate of up to 25-26%. In 1820, the related rate in the Ottoman Empire's was only at the level of 4%.

Unlike the last period of the Ottoman Empire, Atatürk accelerated the slow infrastructural transformations in this period. By creating modern civil codes and legal structures, it has enabled to increase foreign investment and create a suitable environment for entrepreneurship. In response to the agricultural policies prioritized by the Committee of Union and Progress, Ataturk supported industrialization by encouraging the diversification of the economy. It encouraged the development of sectors such as textiles, steel and mining, thereby aiming to reduce the country's dependence on agricultural products.

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