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STRATEGIC FASHION INDUSTRY AND CITY ECONOMY: THE ROLE OF DESIGN ON FINANCIAL DYNAMICS

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Abstract. This study developed three models based on time series analysis to evaluate the effects of the fashion industry on city economies. In the first model, the relationship between fashion industry size and city economic indicators was examined. The second and third models evaluated the effects of fashion events, investments and city infrastructure on economic growth. Data were collected between 2000 and 2023 and analyzed with STATA 17 software. Unit root tests and multiple linear dependency tests were performed for the variables used in the study and then autocorrelation and VIF tests were performed for appropriate model selection. Ridge Regression Model was used due to the multicollinearity problem in the first model. In the second and third models, Prais-Winston AR Model predictions were obtained. The findings reveal that the fashion industry has significant impacts on tourism revenue, gross national product and retail sales.

Keywords: *City economy, fashion industry, time series analysis, ridge regression, Prais-Winsten AR model.*

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1. Introduction

Focusing on the importance of design in developing economic and tourism strategies, this study addresses important concepts and theoretical contexts in the literature. To create a theoretical basis for how design can be used as a strategic tool, inspiration was taken from the article 'Managing as Designing Needs a Theory of Design' by Luo and Chang (2023). This resource combines the concept of design with business strategy, providing a valuable insight into the importance of design in management and strategy.

The fashion industry is a dynamic sector that plays an important role in city economies and greatly affects the social, cultural and economic fabric of cities over time. The fashion industry is of increasing importance, shaping not only the commercial and economic vitality of cities, but also their cultural diversity and urban aesthetics. Clothing styles and trends are a mirror that reflects the identities and preferences of different communities, making the sense of fashion a constant form of expression

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(Fontana & Miranda, 2016). This industry is not limited to clothing and accessories, but has a deep impact on the economic and cultural structure of cities in different dimensions such as design, retail, events and investments.

City economies are growing and transforming by interacting with various elements of the fashion industry. The effects of fashion events, investments and city infrastructure on economic growth leave a clear mark on the economic indicators of cities. Howkins (2013) stated in his study that England's fashion industry employs more people and provides more income than the car or steel industry (Esen & Atay, 2017). According to a 2020 study by the New York State Economic Development Corporation (Empire State Development), the fashion industry in New York City has a large economic impact. The city's fashion industry in 2019 generated an economic impact of $98 billion (New York State Economic Development Corporation, 2020). This impact relates not only to the production of fashion companies, but also to fashion events, retail sales, investments and economic contributions of fashion schools. Fashion is an extremely complex, $2.5 trillion global industry. In the United States alone, consumers spent almost $380 billion on clothing and shoes in 2017 (Maloney, 2019).

Table 1 below summarizes the global economic impacts of the fashion industry

Table 1. Global economic impacts of the fashion industry

City	Annual Economic Impact
New York City	$887 million Annual Revenue, 240,000 tons Annual CO_2 Emissions, 6% of the city's workforce
Paris	$11 billion in wages, $2 billion in tax revenue, 600,000 jobs
Milan	£160 million
UK	£32 billion a year for the UK economy

Source: globaledge.msu.edu/

Fast fashion aims to swiftly produce and market clothing trends at low costs. However, its manufacturing process often relies on inexpensive materials, labor and real estate in developing countries. This setup leads to the establishment of sweatshops, violating various labor laws regarding minimum wage, child labor, safety regulations and more, as highlighted by the United States General Accounting Office (GAO) (Williams, 2022).

The fashion industry is a sector where labor is used intensively and the growth of the sector has reached gigantic levels, which has also led to the sector being one of the sectors that harm nature the most (Kapsız, 2021). These effects have become an important subject of analysis over time to understand and evaluate the role of the fashion industry on city economies. This study aims to examine these effects of the fashion industry on city economies in more detail. Fashion industry is accepted as one of the most polluting industry and has a major consumption of the water (Jacometti, 2019). Particularly, clothing segment of this industry is recognized as one of the biggest polluter industries after the oil industry and it is expected that this industry will grow and get approximately %26 pf Carbon Budget by 2050 (Herold & Prokop, 2023).

Due to the environmental impacts of fashion, the concept of circular fashion is gradually gaining awareness. Circular fashion is an important step towards sustainability at the industrial and consumer level. Circular fashion refers to an approach that aims to minimize waste generation throughout the life cycle of products and reuse resources as much as possible (Bošňáková & Horváthová, 2022). This approach aims to reduce the environmental impact by using fewer resources during the production phase, reduce the amount of waste by encouraging the choice of durable and quality products and improve waste management by recycling the products at the end of their life.

This study examined the effects of the fashion industry on city economies by developing three different models based on time series analysis. The first model evaluated the relationship between fashion industry size and city economic indicators and the other two models evaluated the effects of fashion events, investments and city infrastructure on economic growth. The study was conducted by performing analyzes with STATA 17 software on the data collected between 2000-2023.

The variables used in the study were determined as fashion events and trends, investments in the fashion sector, gross national product, tourism income, fashion retail sales, city infrastructure development and the size of the fashion industry. The growth rates of these variables were used in the study to avoid unit root tests and incorrect coefficients and the multicollinearity problem in the model was solved with the Ridge Regression Model.

The focus of the study was to evaluate the effects of the fashion industry on city economies and the hypotheses were tested by developing three separate models. The findings show that the fashion industry has significant impacts on economic indicators such as a city's tourism revenue, gross domestic product and retail sales.

The results of the study provide a detailed analysis of the various dimensions of the fashion industry on city economies. It emphasizes that the fashion industry is an important factor affecting the economic vitality and growth of cities and that the fashion industry is not limited to just clothing and accessories.

Contribution to Literature

This study provides a framework for assessing the impacts of the fashion industry on city economies. Existing studies in the literature have generally only addressed the commercial effects of the fashion industry, but this study analyzes in depth the contributions of fashion events, investments and infrastructure to city economies. Previous studies have generally emphasized that the fashion industry is solely a revenue-generating sector, but this study demonstrates the contributions of fashion events and investments to the economic growth of cities. In this context, this study emphasizes that the fashion industry is not only a revenue-oriented sector, but also has turned into a critical element shaping the cultural and economic structures of cities.

2. Dataset and Methodology

2.1. Dataset and Sample Structure

The data of the research was collected between 2000 and 2023. STATA 17 software was used in this research. Information about the variables of the study is shown in Table 2.

Table 2. Variables used in the study

Abbreviation	Variables	
METI	Fashion events and trains	(Number of fashion weeks, Number of fashion events and Average index of the number of fashion brands in the city)
MY	Investments in the fashion industry	Budget allocated to the fashion sector Growth rate
GSMH	Gross national product	Gross national product Growth rate
TG	Tourism income	Tourism revenue Growth rate
PS	Fashion Retail	Retail sales Growth rate
SFY	City infrastructure development	Financial investments in the city Growth rate
PT	Size of the fashion industry	Total transaction volume of the fashion industry Growth rate

Table 2 shows which variables were selected to answer the determined hypotheses. The data of these variables were collected in Billion TL basis and these data were converted into growth rates to avoid unit roots and incorrect coefficients in the model.

2.2. Methodology

The focus of the study is to evaluate the impacts of the fashion industry on city economies. The research uses a two-stage methodology to identify strategies to develop the city's economy and tourism. In the first stage, important concepts and theoretical contexts were determined by literature review and analysis. In the second stage, the data collection process was explained in detail and the methods used for analysis were explained.

Three separate models were developed and the hypotheses of these models were determined: The relationship of fashion industry size and diversity with city tourism and economic indicators (Model 1), the effect of fashion events on trade volume in certain retail areas (Model 2), the effect of investments in the fashion sector on city infrastructure (Model 3).

The aim of the research is to answer the hypotheses set below:

Model 1 H1: The size and diversity of the fashion industry may be directly related to a city's tourism income and gross national product.

Model 2 H1: Fashion events and trends can increase trade volume in certain retail districts, which can contribute to the city's economic growth.

Model 3 H3: Investments in the fashion sector can provide financial resources for the development of city infrastructure**.**

Since the data are time series, time series models will be used. The model of the study was chosen after checking the time series assumptions. The stationarity of the data was checked with unit root tests and suitable variables for the model were determined. Multiple collinearity test was used to determine the relationship between independent variables. Autocorrelation tests were performed to determine the autocorrelation problem in series models when it entered the model. The Ridge Regression Model was used for Model 1, which had multicollinearity issues and the Prais-Winston AR Model was used for the other models.

3. Test Results - Findings

Table 3 shows the descriptive statistics of the variables.

Table 3. Descriptive Statistics

	GSMH	METI	PT	PS	MY	GT	SFY	TG
Mean	0.0477	0.0881	0.0517	0.0534	0.0878	1.41E-20	0.0786	0.0534
Median	0.0434	0.0681	0.0463	0.0476	0.0666	-0.0002	0.062	0.0476
Maximum	0.0833	0.2479	0.0947	0.1	0.25	0.0013	0.2	0.1
Minimum	0.0294	0.0379	0.0307	0.031	0.0384	-0.0003	0.037	0.031
Std. Dev.	0.0157	0.0558	0.0185	0.0198	0.0557	0.0004	0.0441	0.0198
Skewness	0.7762	1.4956	0.8445	0.8746	1.5105	1.5823	1.3319	0.8746
Kurtosis	2.5331	4.4745	2.668	2.7313	4.562	4.5687	3.9541	2.7313
Sum	1.0983	2.0268	1.1896	1.2295	2.021	-2.22E-18	1.8081	1.2295
Observations	23	23	23	23	23	23	23	23

Source: Author’s own calculations

Table 4. ADF Unit Root Test Results

ADF Unit Root Test		
Variables	Test Statistics	Prob.
METI	-14.869	0.0000
MY	-18.517	0.0000
GSMH	-28.312	0.0000
TG	-25.816	0.0000
PS	-25.816	0.0000
SFY	-19.66	0.0000
PT	-26.509	0.0000

Source: Author’s own calculations

To use data in time series models, we must first make sure that the data is stationary. If the data of the variables have unit roots at normal levels and are not stationary, their first differences will be checked and used in the model. In this research, Augmented Dickey Fuller (ADF) (1958) unit root test was used. Table 4 shows the results of ADF unit root tests.

The null hypothesis of the ADF test is that the series has a unit root. Since the series of variables are less than 0.05 in the ADF test, the null hypothesis is rejected. Therefore, the variables of this research will be used in the normal level model.

The variance inflation factor (VIF) is a measure of the amount of multicollinearity in regression analysis. Multicollinearity exists when there is a correlation between more than one independent variable in a multiple regression model. Multicollinearity between independent variables will lead to less reliable statistical inferences. Figure 1 shows the results of the VIF test.

Variable	VIF	1/VIF
GSMH	882.28	0.001133
TG	882.28	0.001133
Mean VIF	882.28	

Figure 1. VIF Test

The null hypothesis of the VIF test is that there is no multicollinearity and if the VIF value is less than 10, it indicates that there is no multicollinearity in the model. In the VIF test of the first model, VIF values are much larger than 10, indicating that there is severe multicollinearity in the model. Since there is too much correlation between the independent variables of the first model, VAR and normal time series models cannot be used, so the Ridge Regression Model will be used for this model. Since the second and third models have only one independent variable, VIF test was not performed.

Two separate tests will be performed on the models to ensure that there is no autocorrelation between the residual terms of the models. One test was the Breusch Godfrey OLS test and the other was the Lagrange VAR LM test. The null hypothesis of these tests is that the model has autocorrelation. Figure 2 The results of the Breusch Godfrey (1978) OLS test are shown.

Breusch-Godfrey LM test for autocorrelation

lags(*p*)	chi2	df	Prob > chi2
2	9.307	2	0.0095

H0: no serial correlation

Breusch-Godfrey LM test for autocorrelation

lags(*p*)	chi2	df	Prob > chi2
2	9.867	2	0.0072

H0: no serial correlation

Breusch-Godfrey LM test for autocorrelation

lags(*p*)	chi2	df	Prob > chi2
2	8.215	2	0.0165

H0: no serial correlation

Figure 2. Breusch Godfrey OLS

In the figures, probability values reject the null hypothesis in all three models. Therefore, it was determined that there was autocorrelation in all three models. Figure 3 shows the results of the VAR Lagrange LM test of all 3 models.

```
. varlmar, mlag(1)
the lags of residuals may not be collinear with the dependent variables, or
    their lags
```

Figure 3. Breusch Godfrey OLS

The results of the VAR Lagrange LM test show that the model residuals are not related to the dependent variable, this result shows that there is autocorrelation and the series is insufficient to reduce this problem with lags. Therefore, it was determined that all three models had autocorrelation.

Ridge Regression Model (Model 1)

Ridge regression is a method for estimating the coefficients of multiple regression models in scenarios where independent variables are highly correlated (Tikhonov, 1943). This method, also known as Tikhonov regularization, named after Andrey Tikhonov, is a method for regularizing poorly formed problems. It is particularly useful for mitigating the problem of multicollinearity in linear regression that commonly occurs in models with large numbers of parameters. Since the first model of this study has multicollinearity, it will be used to estimate the first model from the Ridge model. Figure 4 shows the results of the Ridge regression model.

```
==============================================================================
* (OLS) Ridge Regression - Ordinary Ridge Regression
==============================================================================
  PT = TG + GSMH
------------------------------------------------------------------------------
  Ridge k Value     =   0.65000     |   Ordinary Ridge Regression
------------------------------------------------------------------------------
  Sample Size       =          23
  Wald Test         =  16897.1077   |   P-Value > Chi2(2)       =      0.0000
  F-Test            =   8448.5538   |   P-Value > F(2 , 21)     =      0.0000
 (Buse 1973) R2     =      0.9894   |   Raw Moments R2          =      0.9988
 (Buse 1973) R2 Adj =      0.9889   |   Raw Moments R2 Adj      =      0.9988
  Root MSE (Sigma)  =      0.0020   |   Log Likelihood Function =    111.8578
------------------------------------------------------------------------------
- R2h= 0.9999   R2h Adj= 0.9999  F-Test = 1.9e+05 P-Value > F(2 , 21)  0.0000
- R2v= 0.8881   R2v Adj= 0.8828  F-Test =   83.36 P-Value > F(2 , 21)  0.0000
------------------------------------------------------------------------------
          PT | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
          TG |   .4197142   .1903558     2.20   0.039     .0238477    .8155808
        GSMH |   .5810024   .2157461     2.69   0.014     .1323338    1.029671
------------------------------------------------------------------------------
```

Figure 4. Ordinary Ridge Regression for Model 1

Multicollinearity and autocorrelation problems in Ridge regression estimates were eliminated and the estimated coefficients were found to be correct. According to the results, the probability values of the TG and GNP variables show that the effects on the dependent variable are significant. This result means that if there is a positive movement in TG and GNP values, the PT variable will be affected positively.

Prais-Winsten AR Model (Models 2 and 3)

Prais-winston (1958) uses the generalized least squares method to estimate parameters in a linear regression model in which errors are serially correlated. Specifically, errors are assumed to follow a first-order autoregressive process. Additionally, heteroscedasticity problems were eliminated in the estimated Prais-Winston model. The Prais-Winston AR Model is shown in figure 5 for the second model.

```
Prais-Winsten AR(1) regression with SSE search estimates

Linear regression                               Number of obs     =         22
                                                F(1, 20)          =     101.34
                                                Prob > F          =     0.0000
                                                R-squared         =     0.8970
                                                Root MSE          =     .00403

------------------------------------------------------------------------------
             |             Semirobust
        meti | Coefficient  std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
          PS |   4.871827   .4839509    10.07   0.000     3.862323    5.881331
       _cons |  -1.132214   .2314959    -4.89   0.000    -1.615106   -.6493219
-------------+----------------------------------------------------------------
         rho |   1.005931
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    = 0.321120
Durbin-Watson statistic (transformed) = 1.792717
```

Figure 5. Ordinary Ridge Regression for Model 2

According to the Prais-Winston results estimated for the second model, the model is significant and the PS variable positively affects the METI variable significantly.

```
Prais-Winsten AR(1) regression with SSE search estimates

Linear regression                               Number of obs     =         22
                                                F(1, 20)          =    1050.74
                                                Prob > F          =     0.0000
                                                R-squared         =     0.9952
                                                Root MSE          =     .00099

------------------------------------------------------------------------------
             |             Semirobust
          MY | Coefficient  std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
         SFY |   1.441019   .0444552    32.42   0.000     1.348287    1.533751
       _cons |  -.0589987   .0109248    -5.40   0.000    -.0817875   -.0362099
-------------+----------------------------------------------------------------
         rho |   1.031977
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    = 0.393914
Durbin-Watson statistic (transformed) = 0.527263
```

Figure 6. Ordinary Ridge Regression for Model 3

According to the Prais-Winston results estimated for the third model, the model is significant and the SFY variable positively affects the MY variable significantly.

4. Discussion

In this section, other studies in the literature in a similar field will be discussed comparatively.

Studies on the fashion industry in the literature generally focus on the impact of the fashion industry on urban economies, the structural and social dynamics of the fashion industry and policy and implementation opportunities.

While this study evaluates the effects of the fashion industry on urban economies using time series analysis, Larner et al. (2007) examine the rise of the designer fashion industry in New Zealand in the context of globalization and show how this industry has an economic and symbolic impact in cities such as Auckland. However, the studies of Larner et al. (2007), Godart (2014) and Kim and Wu (2021) offer a broader geographical and symbolic perspective on the effects of the fashion industry on globalization and urban economies. In particular, Godart (2014) discusses in his article the power structure of the fashion industry and how global fashion capitals are determined, while Kim and Wu (2021) examine how the circular economy can be implemented in the fashion industry and what challenges this implementation faces in global fashion centers such as New York City. These articles evaluate the economic and symbolic impacts of the fashion industry in the context of globalization, highlighting differences arising from different geographical perspectives and the power structure of the industry.

Different approaches have been adopted to understand the structural and social dynamics of the fashion industry. In this research, while measuring the effects of the fashion industry on urban economies through time series analysis and econometric models, Larner et al. (2007), Godart (2014) and Kim and Wu (2021) examine the structural and social aspects of the fashion industry from different perspectives. focuses on dynamics. While the article by Larner et al. (2007) examines how the fashion industry is affected by symbolic capital and global fashion capitals, the article by Godart (2014) discusses the power structure of the fashion industry and discusses how this industry is shaped and how it may evolve in the future. The article by Kim and Wu (2021) offers a new perspective such as social and environmental sustainability while evaluating how the circular economy can be implemented in the fashion industry and the effects of this application on different stakeholders within the industry.

While our article uses statistical models and time series analysis to quantify the fashion industry's impacts on urban economies, the other three articles address policy and implementation possibilities and discuss how this industry can be oriented towards broad issues such as sustainability and global competitiveness. While the article by Larner et al. (2007) highlights the economic and symbolic potential of the designer fashion industry in New Zealand, the article by Godart (2014) questions the power structure of the fashion industry and the role of global fashion capitals and proposes alternative structures. The article by Kim and Wu (2021) evaluates how the circular economy can be implemented in the fashion industry and the effects of this application on the industry and offers concrete recommendations for policy makers and stakeholders.

As can be seen from these comparisons, different approaches have been adopted to understand the effects of the fashion industry on urban economies and discussions on the structural, symbolic and social dynamics of this industry are quite diverse. Future research may need to focus on developing a more comprehensive understanding of the fashion industry by combining these different approaches.

5. Conclusion

The fashion industry is attracting more and more attention today as a dynamic factor that creates significant and diverse effects on city economies. This study examined in detail the role of the fashion industry on city economies using time series analysis. Fashion has gone beyond just clothing and accessories and has become an element that shapes the cultural and economic fabric of cities. Different aspects of the fashion industry, such as design, retail, events and investments, have become critical elements affecting the economic vitality and growth of cities.

This study aimed to examine the effects of the fashion industry on city economies based on time series analysis. Three separate models were developed and the effects of various dimensions of the fashion industry on city economic indicators were evaluated. The findings revealed that the fashion industry has significant impacts on economic indicators such as a city's tourism revenue, gross national product and retail sales.

In Model 1, it was observed that the size and diversity of the fashion industry is directly related to city tourism and economic indicators. In Model 2, it is found that fashion events increase trade volume in certain retail areas and contribute to the economic growth of the city. In Model 3, it was found that investments in the fashion sector provide financial resources for the development of city infrastructure.

The findings of the study provide a detailed analysis of the various dimensions of the fashion industry on city economies. The direct relationship between the size and diversity of the fashion industry and cities' tourism revenue, gross national product and retail sales highlights the role of the fashion industry as an important part of the economy. It has also been observed that fashion events and trends increase trade volume in certain retail areas and contribute to the economic growth of the city. However, investments in the fashion sector have been found to provide financial resources to the development of city infrastructure and play an important role in improving the infrastructure of cities.

Implications

The findings of this study have several implications for urban planners, economists, and fashion industry stakeholders. First, urban planners and local governments can use this study to understand how fashion events and investments can increase commercial space and tourism revenues in their cities. Economists can gain new perspective on economic growth strategies by evaluating the role of the fashion industry in city economies. Fashion industry stakeholders can better understand the potential contribution of fashion events and investments to city economies and create their strategies accordingly.

Future Directions

This study identifies some directions for future research. In particular, expanded data sets can be used to examine in more detail the effects of the fashion industry on city economies. Additionally, the scope of this study can be expanded and studies comparing the effects of the fashion industry in different city types (metropolitan, urban, rural etc.) can be conducted. Additionally, future research could focus more on understanding the impacts of fashion on sustainability.

Limitations

This study has some limitations. First of all, the time range of the data set used is limited and the generalizability of the results obtained can be increased by using data sets containing a longer time period. Additionally, the modeling used in this study has some assumptions and the compatibility of these assumptions with real-world conditions should be evaluated in more detail. However, more data and detailed analysis are needed to fully explain the fashion industry's effects on city economies.

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