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The Determinants of Office Yields in European Cities

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ABSTRACT

This paper examines the drivers of prime office yields in Europe. Specifically, the paper uses 16 European cities across 8 European countries including United Kingdom, France, Germany, Italy, Spain, Belgium, Netherlands, and Ireland from Q1 2007 to Q2 2024. The premier cities include Berlin, Paris, Central London, Frankfurt, and Munich while the primary cities are Hamburg, Dusseldorf, Madrid, Milan, Amsterdam and Dublin. Lastly, the secondary cities comprised of Barcelona, Rome, Brussels, Cologne, and Lyon. For the estimation technique, we use quantile regression and OLS while accounting for country, city and time fixed effects. From the baseline results, we find that take-up, prime rent, vacancy rate and foreign investment have a negative and statistically significant effect on office prime yields. In the case of the results obtained from the quantile regression, vacancy rate is seen as the most significant determinant of office yields. Prime rent emerged as a significant determinant of office yields. The result of this work is particularly useful for investors, policy makers and analysts as it provides an in-depth understanding of how office yield varies over time in different European Cities as well as the factors which influence office yields.

KEYWORDS

Yields; office market; Europe; panel analysis

1. Introduction

The commercial real estate market in recent years have emerged as a key player in the development of global economy. Major global economic crisis in history can be linked to events that emanated from the real estate market. For example, Herring and Wachter (2003) find a correlation between bank crisis and real estate booms. The paper confirms the existence of a feedback loop between debt financing and real estate market which in turn leads to the creation of systematic risk. Similarly, Kragh-Sørensen and Solheim (2014) emphasized that banks have experienced huge losses due to substantial connections to commercial real estate market during crisis periods. On the effect of the sector on economic performance, Ireland in 2013 recorded total commercial real estate investment spend of €1.78 billion over 96 individual transactions with more than half of the stated capital coming from overseas investors (CBRE, 2014). Specifically, a strand of

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literature document the significance of the real estate market to the health of the global economy and economic performance (Baum, 2009; Karakozova, 2005; Boshoff, 2014). Following the significant role of the commercial real estate market to economic growth, a strand of research has emerged in the literature that focuses mainly on the determinants of commercial real estate returns. This paper extends the literature on the drivers of commercial real estate returns by examining the determinants of office yields across European cities during crisis periods such as the COVID-19 pandemic and Russia Ukraine war.

On what is known so far about the determinants of commercial real estate returns, the recent years have witnessed a surge in the popularity of studies investigating the drivers of commercial real estate returns. It is noteworthy to mention that fluctuations in macro-economic indicators and cyclical behaviours caused my several factors and the different types of commercial real estate types have emerged as factors that drive commercial real estate returns (Akinsomi et al., 2018). Previous studies have examined the determinants of real estate returns in several ways. From a model specification perspective, De Wit and van Dijk (2003), Hollies (2007), Kurzrock et al. (2009) and Henneberry and Mouzakis (2014) examined the determinants of real estate returns using real estate yields and total returns as the dependent variable. In a related study, Brounen and Jennen (2009), Dunse and Jones (1998), Chicago- Mills (1992), Slade (2000), Öven and Pekdemir (2006), Ozus (2009) used rent as the dependent variable. Other studies examined the determinants of real estate returns from a single city perspective. For example, Dunse and Jones (1998), Mills (1992), Slade (2000), Öven and Pekdemir (2006), Ozus (2009) examined Glasgow, Chicago, Phoenix and Istanbul respectively. In addition, for country level studies, Dunse et al. (2007) and Henneberry and Mouzakis (2014), Akinsomi et al. (2018), and Kurzrock et al. (2009) focused on the United Kingdom, South Africa and Germany respectively. A section of the literature extended the literature by focusing on sample size as a determinant of office returns. For example, Brounen and Jennen (2009) investigated the European Cities witth De Wit and van Dijk (2003) and Hollies (2007) examining the real estate returns from a global perspective. Clearly, an extensive body of literature exists on the drivers of office yields from different standpoints. However, this paper argues that examining the drivers of commercial real estate returns during turbulent and tranquil periods is a significant question that requires further examination. Specifically, this paper investigates the determinants of office yields across European cities during crisis periods.

The motivation of this research rests on several factors. First, the commercial real estate market is unique and as a result understanding of the factors that determine office yields before and after a crisis period is important for investors, policymaker, practitioners, and the research community. Most of the earlier studies on drivers of real estate returns do not consider the state of the markets (Boshoff, 2014, Akinsomi et al., 2018 etc). This paper argues that the outbreak of COVID-19 which greatly impacted the global economy offers a unique opportunity to examine the factors that drive office yield before and after the pandemic. This is because most major economies have begun to recover from the effects of the COVID-19 outbreak three years after the pandemic. Several countries in the Euro-area began to see positive GDP growth after the start of 2022. This paper also argues that the pre-Covid drivers of office yields are likely to

explain post Covid office yields. The shift to work from home, the rise of hybrid working arrangements, and the general slow return to office following Covid-19 outbreak may have fundamentally shifted the drivers of returns in the real estate sector. The paper provides further insights as to whether the market has fundamentally changed post-Covid or explain how understanding the drivers of office yield pre-Covid is informative in a post-Covid world. Interestingly, just as when the COVID-19 pandemic seemed to be stabilized, the world witnessed another hit because of Russia's invasion of Ukraine in February 2022. Riksbank (2022) show that the invasion of Ukraine by Russia impacted the global economy evidenced by record high energy prices, tightened monetary policies and inflation hikes, Since the attack, the global geopolitical security in Europe has declined significantly. The war has not only caused great human suffering and led to millions of people fleeing but also economies weakening. Inspired by the significant effects of the COVID-19 and Russia Ukaine war on several sectors of the economy including the real estate sector, this paper examines the country level and other factors that drive commercial real estate returns in Europe.

Second, the variation in the commercial real estate total returns across different economies suggests the determinants of performance in the real estate sector may vary from country to country or the same variables affect real estate total returns globally while each country responds to each of the determinants to a different degree. Several studies including Kohlert (2010) examine the drivers of real estate total returns in developed countries (e.g., USA, UK etc). At the regional level, only few studies including De Wit and van Dijk (2003) provide evidence on the drivers of direct real estate total returns in Asia and Europe. This study contributes to the literature on regional level studies by examining the drivers of office yield across European cities for several reasons; i) Office investments is a highly sought-after real estate investment in Europe. According to BNP Paribas Real Estate (2020), as at 2019, Office investments in Europe in 2019 was valued at 132 Billion Euros[1] and represented 47% of total volume of property investments- hence this sector is a significant real estate sector in Europe, ii) The European office market is heterogeneous in nature, according to the BNP Paribas Real Estate (2020) report, for instance out of 39 European cities investigated, as at 2019 the highest yields in a European city is Moscow with 9 to 10% office yield and Munich the lowest with 2.60% office yield.

To address the primary objective of the paper, this study uses quarterly data on prime office yields obtained from BNP Paribas Real Estate (BNPPRE) running from Q1 2007 to Q2 2024 in Europe. Specifically, we focus on 16 cities in Europe across 8 countries including Belgium, England, France, Germany, Ireland, Netherlands and Spain. In the case of the cities considered, we focus on premier cities (Berlin, Central London, Central Paris, Frankfurt and Munich), primary cities (Amsterdam, Dublin, Düsseldorf, Humburg, Madrid and Milan) and secondary cities (Barcelona, Brussels, Cologne, Lyon and Rome). This research focused on these cities in Europe given that the commercial real estate market across these cities attracts a lot of investments and contributes significantly to the global real estate market. This paper uses prime office yields as the dependent variable following Białkowski et al. (2019) and Henneberry and Mouzakis (2014). This research uses office yields which is a measure of performance and show the ratio of rent income to the purchase price of a property. On the determinants, we use macro-economic indicators and property information often used in the literature including vacancy rate, net

absorption, foreign investment, transaction volume, take, employment, GDP etc. On the estimation techniques, we use OLS regressions and quantile regression for the empirical analysis and document several interesting findings.

This study makes several contributions to the existing literature. First, it offers a comprehensive analysis on the determinants of prime office yields in Europe with focus on premier, primary and secondary cities. Earlier studies mainly focus on single cities and countries (Akinsomi et al., 2018 etc). However, this paper uses a novel dataset that considers all city tiers in Europe which is a significant contribution to the literature. To the best of our knowledge, this study is one of the foremost studies that examine the drivers of prime office yields while unravelling the effect of good and bad market conditions within several European cities. Second, in recent years, research interest has increased in various aspects of the real estate market during tranquil and turbulent markets states. However, in the case of drivers of office yields, there exist no such study. Thus, this paper also contributes to the strand of studies that offers synopsis of drivers of office yields and the nature of the relationship during crisis periods such as the COVID-19 pandemic and Russia Ukraine war outbreak. Third, an understanding of the determinants of prime office yields is important to investors in the real estate markets. Investors ought to be aware of the location effects when investing in commercial real estate. For example, what cities in Europe generate higher property yield? The real estate investment decision-making is therefore more complex and complicated in comparison to a single homogenous property market. This study examines premier, primary and secondary city tiers in Europe. Four, this study extends the literature from the methodological standpoint. Thus, using both OLS regressions and quantile regression approaches, we delve deeper into determinants of office yields across different segment of the distribution.

The remainder of the paper is as follows: the next chapter reviews extant literature on the determinants of office yields, the data and methodology is provided in Sections 3 and 4 respectively, Section 5 contains the results while the final section concludes.

2. Literature Review

Literature on the determinants of yields is based on data from a single country which includes different cities, as well as across different cities in different countries. Due to the data employed in these papers, different methodologies are employed including time series analysis, cross-sectional analysis and panel data analysis. Therefore, the literature review framework in this study examines past work on office yields from a location and methodology perspective.

2.1. Determinants of Office Yields (Location)

From a single country perspective, there are a number of studies on the determination of yields in the United Kingdom. Dunse et al. (2007) examine provincial centres in the United Kingdom (UK) and particularly office yields, the authors investigate a 20 year period. The paper attempts to understand the risk premiums across different cities in the UK and variations across time. Henneberry and Mouzakis (2014) examine how property investments pricing in non-core UK regions is affected by investors based in London adopting a pure familiarity heuristic model. The authors conclude that yields in London

tend to be projected onto other regions in the United Kingdom. Dunse et al. (2007) examines the trends in office yields in 8 major provincial office centres in the UK over a period of 20 years. They findings suggest that there are some local or fixed effects on yields in different cities in the United Kingdom. Bruneau and Cherfouh (2018) examines the determinants of UK office market yields, the results in this study find that in addition to traditional drivers money supply including risk-free interest rate and expected rental growth is a key factor of property yields.

Sivitanidou and Sivitanides (1999) focus on the office capitalization rate in 17 cities across 12 states in the United States of America (USA), the findings of this study suggest that the office capitalization rate incorporates both a local-fixed component and a time variant component which exhibits difference in persistence across markets. Furthermore in terms of determinants of capitalization rates, the study reveals that local office market dynamics such as location heterogeneity, diversity of local office employment base, tenant mix, space absorption, vacancy rates, employment-growth stability and past rates of rental-income growth.

A number of studies have examined yield determination in European cities, McGough and Berry (2022) examine 10 European cities in 5 European countries which include Belgium, France, Germany, Italy and UK. The paper addressed if there exists a difference between the impacts of risk on the pricing of real estate in international and regional cities in Europe. Van der Vlist et al. (2021) address the effects of agglomeration economies observed through capitalization rates in the Dutch real estate office markets, findings show that agglomeration economies result in lower capitalization rates.

From an international perspective, Hollies (2007) examines factors that explain office yields over a 5 year period from an international perspective (28 countries and 51 cities), results indicate that market with short term interest rates tend to have higher yields, liquid markets, transparent markets and markets with longer leases have lower yields. Kim et al. (2019) examines six major Asian cities including Tokyo, Shanghai, Hong Kong, Seoul, Taipei and Singapore, results show that an increase in excess liquidity tends to decelerate office yields as a result of the positive effect on commercial real estate value. Devaney et al. (2019) explore variation in commercial real estate transaction activity and asset pricing in international office markets in 33 cities across 16 countries from 2007 to 2015, their results show that the drivers of market capitalization rates are government bond yields, yield spread and real estate rents. Jones et al. (2015) analyse the gap between government bonds and real estate yields over time for the UK, Australia and the USA, the study shows that the relationship between bond and property yield go through a turbulent time around the period of the global financial crisis and conclude that the sudden change in the yield gaps may have had an impact to stimulate a greater appreciation of structural change in the property market.

2.2. Office Yields (Methodology)

The methodology employed in the understanding of office yields in past literature are in 2 folds, first methodologies employed to determine office yields in the long run and secondly methodologies employed to forecast office yields.

In the case of studies that focused on countries outside Europe, Sivitanides et al. (2001) examine the determinants of office yields using four different property types in

USA that included office properties. They deployed a model that included real rent index, percentage change in rent, the risk-free rate and changes in the Consumer Price Index (CPI). The authors conclude that market specific yields are influenced by rental growth and common national influences like the interest rate and the Consumer Price Index. Kim et al. (2019) examine the role excess liquidity plays in explaining office yields in 6 Asian cities, the paper first derive office yield by employing a discounted cash model to discount net cash flows, thereafter they employ a panel analysis of fixed and random effects on a number of variables that explain office yields.

In the case of Europe, Dunse et al. (2007) consider exogenous and endogenous influences on the determination of urban office yields in UK, the study employs a time series panel multiple regression analysis with independent variables of rental growth, gilt yield, regional institutional investment and performance of the stock market. Bruneau and Cherfouh (2018) introduce asymmetry in their modelling of the behaviour of UK market office yields by allowing for transition between alternative liquidity regimes. Similarly, Krystalogianni and Tsolacos (2004) use a Markov switching model to capture regime switches in the yield structures of office properties in the UK. Szweizer (2019) use methods borrowed from physics to model London commercial property yields. Watkins et al. (2012) bring another dimension to studies on the determinants of office yields in the UK by reviewing the methodologies used and the performance of the respective econometric models. The authors mainly identify three basic models used in literature to identify the predictors of office yields: namely, vector autocorrelation models, autoregressive integrated moving average (ARIMA) models as well as the regression of office yields on lagged rents and lagged yields. However, Watkins et al. (2012) note that no specific model performs best over the time period tested. Since no superior method was found, we therefore propose to contribute in this area by using quantile regression, a method that has not been used in examining the determinants of office yields to the best of our knowledge. Focusing on 12 major European cities, Mouzakis and Richards (2007) using an error correction model show that local market services output is a key determinant of prime office yields in Europe.

The extant literature reviewed in this section has shown that various variables have been used in models designed to identify the determinants of office yields. It is also clear from the literature that different methods have been used in efforts to reveal significant predictors of office yields. The lack of unanimity on the best models to use to this end, shows that more methods should be tested to find the best methods to model the determinants of office yields. It is for this purpose that we use quantile regression as well as introduce other variables that have never been tested as property-specific determinants of office yields. Furthermore, past literature on yields tend to focus more on single-cities as well as single countries. There is a lack of literature examining multi cities as well as multiple countries particularly in Europe. This study on the determinants of yield in multi-European cities seeks to address this deficiency.

3. Data

3.1. European Office Market Data

This paper uses real estate, and macro-economic variables obtained from BNP Paribas Real Estate (BNPPRE) from Q1 2007 to Q2 2024. The real estate variables used include

take-up expressed in square meters, net absorption, vacancy, transaction volume, total foreign investment and prime rent. The macro-economic variables obtained from Moody's include total employment, gross value added (GVA), 10-year government bond and Inflation (CPI). Our data collected consists of 16 major cities in Europe on a quarterly basis from 2007 to 2024. The study focused on premier, primary and secondary cities across 8 European countries based on the significant role these cities play in the real estate market in terms of foreign investment. In all 16 cities were selected and classified into cities based on volume of transactions average over 5 years. First tier cities considered as premium cities include London, Paris, Berlin, Frankfurt and Munich averaging 14.51 billion Euros in transaction volumes. Second tier cities, which are primary cities, include Hamburg, Dusseldorf, Madrid, Milan, Amsterdam and Dublin averaged 3.76 billion Euros in transaction volumes. Third Tier cities also considered as secondary cities include Lyon, Cologne, Barcelona, Rome and Brussels averaged 1.87 billion euros in transaction volumes over 5 years.

Table 1 shows the office market statistics of all 16 cities in 8 European countries. The premium office markets from the cities included in our study are London, Paris, Berlin, Frankfurt and Munich. As of 2020, the average office space in the Premier office markets are the largest in comparison to all other tiers at 26,587 million square meters. The primary office markets also classified as Primary cities comprises of Hamburg, Dusseldorf, Madrid, Milan, Amsterdam and Dublin with average office space of 10,381 million square meters. Secondary Cities in our study are secondary cities such as Lyon, Cologne, Barcelona, Rome and Brussels. These cities have considerably lower sizes in the average office market space at 8,834 million square meters. From the office market statistics in Table 1, we find that Premier cities that are considered as significant markets have considerably larger office marker space than Primary and Secondary office markets. Premier cities tend to have a higher agglomeration of people in a smaller land area with an

Table 1. Office market statistics.

Country	Population	Land Area	City	Nuts 3 Name	Population	Land Area	Office Space	Tier
United Kingdom	65,844	243,610	London	Inner London	8,866	312	20,885	1
France	66,524	549,087	Paris	Paris	9,846	105	54,862	1
			Lyon	Rhone	1,077	3,259	7,011	3
Germany	82,792	357,580	Berlin	Berlin	3,644	891	20,021	1
			Frankfurt	Frankfurt Am	753	248	15,467	1
			Munich	Main Munchen, Kreisfreie Stadt	1,471	311	21,699	1
			Hamburg	Hamburg	1,841	755	14,141	2
			Dusseldorf	Dusseldorf	619	5,291	9,626	2
			Cologne	Koln	1,085	7,365	8,080	3
Spain	46.658	505,935	Madrid	Communidad de Madrid	3,266	8,031	15,077	2
			Barcelona	Barcelona	1,637	7,729	6,021	3
Italy	59,816	301,340	Milan Rome	Milano	1,396	1,576	11,974	2
				Roma	2,820	5,363	9,768	3
Netherlands	16,979	41,540	Amsterdam	Groot-Amsterdam	960	897	7,199	2
Ireland	4,570	70,280	Dublin	Dublin	1,325	926	4,271	2
Belgium	11,445	30,688	Brussels	Region de Bruxxles	1,215	162	13,289	3

Note: Table 1 shows the population, land area for the countries and the cities employed in our study. We measure population as the number of inhabitants in the specific country or city as at 2020 in '000s. Land area is measured in square kilometers. Office space is measure in square meters and '000s. Cities are ranked based on tiers- tiers are created based on the average 5-year volume of transactions within cities.

Source: BNP Paribas, EuroStat and World Bank.

average of 373 square kilometer compared to the average land areas of primary and secondary cities of 2,913 square kilometer and 4,776 square kilometers respectively. Primary and Secondary cities are considerably larger land areas as data on these cities are often provided at city level while Premier cities are provided at inner city level.

Figure 1 shows the office yields of premier cities including Berlin, Paris, Central London, Frankfurt, and Munich from 2007 to 2024. The average office markets in premier cities saw an increase in yields during the great financial crises from 2007 to 2009. The increase in yields during the great financial crises of 2007 to 2009 is attributed to the fall in availability of real estate debt and liquidity. This was then followed by an equally sharp reduction in office yields from 2015 to 2022 after the European debt crisis. During this period the UK voted to exit (Brexit) the European Union. The uncertainty created by this around its post – Brexit relationship with the wider European countries, saw investors adopt a wait and see attitude to the UK market. The results were a stall in yield movement in UK and widening of the gap with yields in continental Europe between 2016 and 2020. However, the pattern changed in 2022, and it rose steadily between the years, 2022 to 2024.

Table 2 shows the summary statistics of office yields for the premier cities in Europe, Berlin had mean and standard deviation to be 0.040 and 0.010 respectively with a minimum value of 0.024 and a maximum value of 0.055. The minimum and maximum values

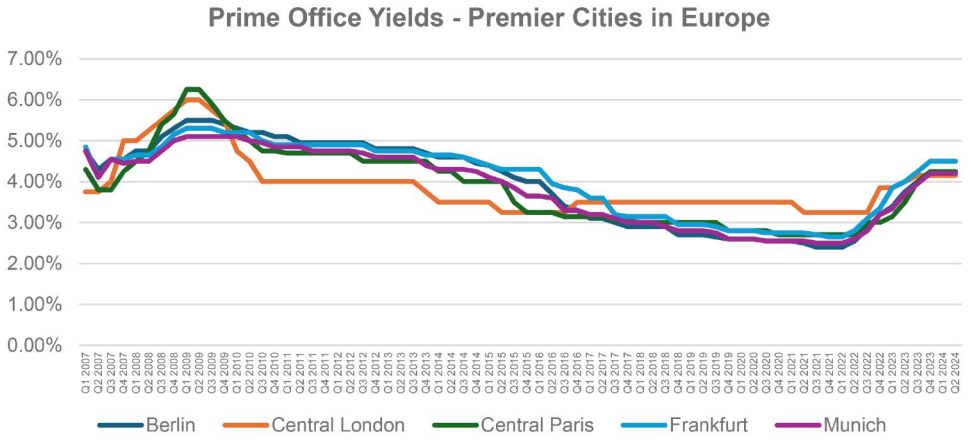

Figure 1. Shows the office yields of premier Cities. The figure shows the annual yields of the office markets in these cities. Premier cities represent premium markets and the largest volumes of transactions in Office property. The data is from Q1 2007 to Q2 2024. Source: BNP Paribas.

Table 2. Statistics of office yield changes in premier cities.

	Berlin	Central London	Central Paris	Frankfurt	Munich
Mean	0.040	0.039	0.039	0.041	0.039
Median	0.043	0.036	0.040	0.044	0.041
Standard Deviation	0.010	0.007	0.010	0.009	0.009
Minimum	0.024	0.033	0.027	0.027	0.025
Maximum	0.055	0.060	0.063	0.053	0.051
Obs.	70	70	70	70	70

Note: Table 2 shows the summary statistics of office yields in the largest office markets in our sample (Premier Cities). Min represents minimum and is the lowest yield in our sample period, the max represents maximum and is the highest yield in our sample period. Average represents the mean of the yield in our sample period and SD represent standard deviation of yields during the sample period.

of Central London were 0.033 and 0.060 respectively, with a sample mean of 0.039 and a standard deviation of 0.007. Central Paris had a mean and a standard deviation of 0.039 and 0.010 respectively with a minimum and a maximum value of 0.027 and 0.063. Frankfurt over the period had minimum and a maximum value of 0.027 and 0.053 with a sample mean and standard deviation of 0.041 and 0.009 respectively. Munich recorded a mean and standard deviation of 0.039 and 0.009 respectively. It also recorded a minimum of 0.025 and a maximum value of 0.051.

Figure 2 shows the office yields of primary cities, which includes Hamburg, Dusseldorf, Madrid, Milan, Amsterdam and Dublin from 2007 to 2019. The average office markets in primary cities saw an increase in yields from 2007 to 2009, with Dublin rising way above the rest of the cities from 2007 to 2010, which is similar to the increase in yields in premier cities, and there it experienced a decline from 2010 to 2020, after which it started rising again.

From Table 3, Amsterdam had mean and standard deviation of 0.045 and 0.009 respectively with a minimum value of 0.029 and a maximum value to be 0.058. The minimum and maximum values of Dublin were 0.035 and 0.080 respectively, with a sample mean of 0.052 and a standard deviation of 0.014. Düsseldorf had a mean and a standard deviation to be 0.042 and 0.009 respectively with a minimum and a maximum value of

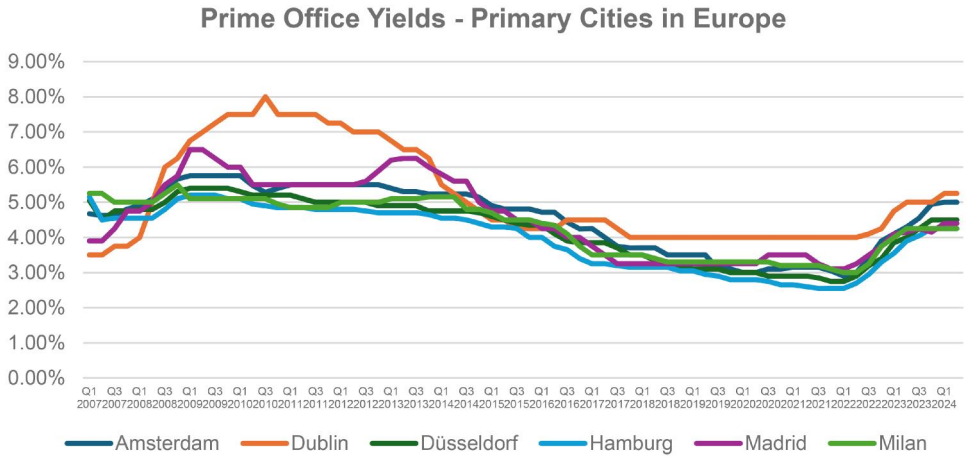

Figure 2. Shows the office yields of Primary Cities. The figure shows the annual yields of the office markets in these cities. Primary cities represent primary markets and large volumes of transactions in Office property. The data is from Q1 2007 to Q2 2024. Source: BNP Paribas.

Table 3. Statistics of office yield changes in primary cities.

	Amsterdam	Dublin	Düsseldorf	Humburg	Madrid	Milan
Mean	0.045	0.052	0.042	0.040	0.045	0.043
Median	0.048	0.045	0.045	0.043	0.043	0.045
Standard Deviation	0.009	0.014	0.009	0.009	0.011	0.008
Minimum	0.029	0.035	0.028	0.026	0.031	0.030
Maximum	0.058	0.080	0.054	0.052	0.065	0.055
Obs.	70	70	70	70	70	70

Note: Table 3 shows the summary statistics of office yields in the secondary office markets in our sample (Primary Cities). Min represents minimum and is the lowest yield in our sample period, the max represents maximum and is the highest yield in our sample period. Average represents the mean of the yield in our sample period and SD represent standard deviation of yields during the sample period.

0.028 and 0.054. Humburg over the period had minimum and a maximum value of 0.026 and 0.052 with a sample mean and standard deviation of 0.040 and 0.009 respectively. Madrid recorded a mean and standard deviation of 0.045 and 0.011 respectively. It also recorded a minimum of 0.031 and a maximum value of 0.065. Milan had a mean and a standard deviation of 0.043 and 0.008 respectively with a minimum and a maximum value of 0.030 and 0.055.

Figure 3 shows the office yields of secondary cities, which include Barcelona, Rome, Brussels, Cologne, and Lyon from 2007 to 2019. The average office markets in secondary cities saw an increase in yields from 2008 to 2009 and thereafter fell in 2010, remained flat from 20111 to 2012 and declined steadily from 2012 to 2021.

From Table 4, Barcelona had mean and standard deviation to be 0.047 and 0.011respectively with a minimum value of 0.031 and a maximum value to be 0.065. The minimum and maximum values of Brussels were 0.033 and 0.068 respectively, with a sample mean of 0.052 and a standard deviation of 0.011. Cologne had a mean and a standard deviation to be 0.042 and 0.010 respectively with a minimum and a maximum

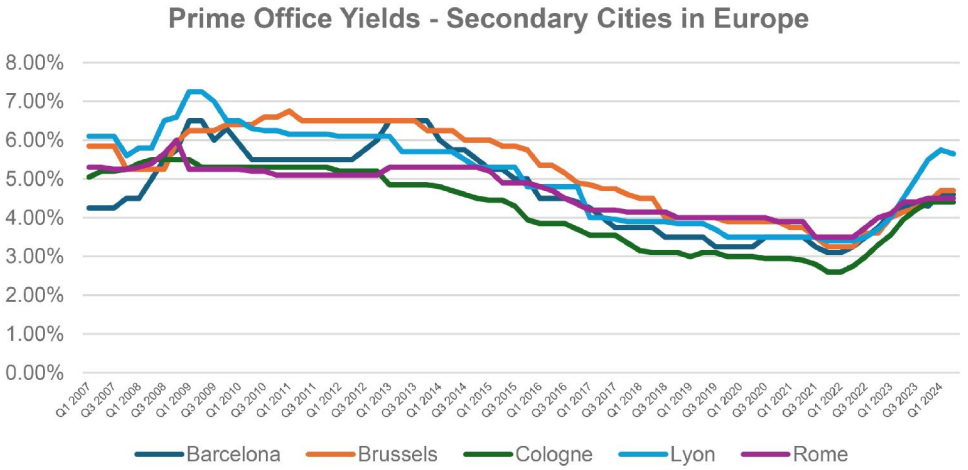

Figure 3. Shows the office yields of Secondary Cities. The figure shows the annual yields of the office markets in these cities. Secondary cities represent secondary markets and the lowest volumes of transactions in Office property. The data is from Q1 2007 to Q2 2024. Source: BNP Paribas.

Table 4. Statistics of office yield changes in secondary cities.

	Barcelona	Brussels	Cologne	Lyon	Rome
Mean	0.047	0.052	0.042	0.051	0.047
Median	0.045	0.053	0.044	0.053	0.049
Standard Deviation	0.011	0.011	0.010	0.012	0.006
Minimum	0.031	0.033	0.026	0.034	0.035
Maximum	0.065	0.068	0.055	0.073	0.060
Obs.	70	70	70	70	70

Note: Table 4 shows the summary statistics of office yields in the smallest office markets in our sample (Secondary Cities). Min represents minimum and is the lowest yield in our sample period, the max represents maximum and is the highest yield in our sample period. Average represents the mean of the yield in our sample period and SD represent standard deviation of yields during the sample period.

value of 0.026 and 0.055. Lyon over the period had minimum and a maximum value of 0.034 and 0.073 with a sample mean and standard deviation of 0.051 and 0.012 respectively. Rome recorded a mean and standard deviation of 0.047 and 0.006 respectively. It also recorded its minimum of 0.035 in and a maximum value of 0.060.

4. Methodology

4.1. Data Specification

Over 30 years, past literature on the determinants of office yields has provided empirical evidence on the real estate variables and macro-economic variables that significantly explain real estate yields and returns. However, a number of these papers have examined the determinants of office yields in single cities and multi-cities within a single country, with a few studies that address this from an Asian perspective and global perspective. Our model therefore is adopted primarily from past literature that examines determinants of office yields in multi-cities within Europe and globally. Our model is a disaggregated model, and local variables include local office market dynamics as well as national economic data are employed. The various studies conducted on the determinants of office yields have almost unanimous on the direction of the coefficients of the determinants. For example, in a panel study consisting of 52 nations sampled between 2000 and 2006, D'Argensio and Laurin (2009) report a strong positive relationship between office yield and government bond rates. McAllister and Nanda (2016) capitalize on a panel dataset consisting of 28 European cities between 1999 and 2013 and report an expected positive coefficient for real risk-free rate which is statistically significant.

In this study, we use the yield on a 10-year government debt as proxy for the risk-free rate of return. McAllister and Nanda (2016) also report a negative relationship between office yields and foreign investment. We also test the effect of foreign investment on office yields by creating a dummy variable that is a given a "1" if foreign investment in the city is greater than 70% of the total investment or "0" otherwise. For robustness, we also test the effect of foreign investment when foreign investment is greater than 30% and 50% with results reported in Table A1 in the appendix. For other variables affecting office yields found in existing literature, Watkins et al. (2012) report a negative coefficient for rental value growth as well as liquidity while Sivitanides et al. (2001) report a negative relationship between lagged CPI and office yields. Oikarinen and Falkenbach (2017) report a statistically significant positive relationship between office yields and vacancy rates while Sivitanidou and Sivitanides (1999) reported that the growth in employment levels signify stability leading to a negative relationship between employment levels and office yields. Devaney et al. (2019) examine the impact of transaction activities on capitalization rates and find no impact in explaining office yields. Table 5 below outlines all the variables used in this paper.

4.2. Model Specification

Following Sivitanides et al. (2001), this paper uses the empirical model outlined below to explore the drivers of office yields in Europe during crisis periods.

Table 5. Variable description.

Variable Name	Description	Data source
Panel I: Dependent variable		
Prime Office Yields	Estimated as net income over purchase price plus other costs of acquisition.	BNP Paribas Real Estate (BNPPRE)
Panel II: Independent variables		
Take-ups	The gross square meters (sqm) of space demanded by occupiers. Note that the variable excludes lease renewals	
Net Absorption	The change in sqm of total occupied space in hundreds of thousands	
Transaction Volume	the total value in tens of billions Euros (€) of commercial real estate transactions	
Prime Rent	the hypothetical prime rent measured as €/sqm	
Vacancy Rate	the ratio of space to let relative to total stock in the market	
Foreign Investment	dummy variable that is 1 if foreign investment is greater than 70% of total investment in the city.	
10Y Gov. Bond	the yield on 10-year government debt	Moody
CPI	Consumer Price Index per country	
Gross Value Added	the value of output in € produced within a city	
Total Employment	the number of individuals employed in thousands	

$$D.Office_{it} = \beta_1 D.\ln(Takeup)_{it} + \beta_2 Netabsorb_{it} + \beta_3 Transvol_{it} + \beta_4 D.\ln(Prime)_{it} + \beta_5 D.Vacancy_{it} + \beta_6 Foreign_{it} + \beta_7 D.\ln(TotalEmp)_{it} + \beta_8 GovBond_{it} + \beta_7 D.GVA_{it} + \beta_8 CPI_{it} + \alpha_i + \delta_t + \mu_{it}$$

Equation 1

where α and δ are the country/city and quarter unobserved heterogeneity, respectively. The dependent variable, *Office*, is prime office yields defined as a percentage and is defined as net income over purchase price plus other costs of acquisition. The other variables taken from BNPPRE and used as determinants are: 1) *Take-up* is the gross square meters (sqm) of space demanded by occupiers[2], 2) *Netabsorb* is the change in sqm of total occupied space in hundreds of thousands, 3) *Transvol* is the total value in tens of billions Euros (€) of commercial real estate transactions, 4) *Prime* is the hypothetical prime rent measured as €/sqm, 5) *Vacancy* is the ratio of space to let relative to total stock in the market, and 6) *Foreign* is dummy variable that is 1 if foreign investment is greater than 70% of total investment in the city. The data from Moody's are: 1) *TotalEmp* is the number of individuals employed in thousands, 2) *GovBond* is the yield on 10-year government debt, and 3) *GVA* is the value of output in € produced within a city. The *D* in front of a variable indicates that the variable is differenced.[3]

5. Empirical Discussion

In this section, we discuss the main findings of the study. However, we first focus on the descriptive statistics of the variables used for the empirical analysis.The descriptive statistics are presented in Table 6. The data in Table 5 represents an aggregate of all 16 cities during the period investigated. During the period investigated from 2007 to Q2 2024, the mean of the Differenced ln(Take-up) is negative at -0.001. However, the rest of the other independent variables had a positive mean except for Differenced Office Yield and Differenced Vacancy Rates which recorded a mean of 0.00. Also, the mean of the differenced office yield is negative at −0.020,

Table 6. Descriptive statistics.

Variable	Obs.	Mean	Std. Dev.	min	max
Differenced Office Yield*	1,104	−0.020	0.002	−0.038	0.010
Differenced ln(Take-up)*	1,104	−0.001	0.460	−2.724	1.803
Net absorption	1,120	1.086	2.496	−32.266	41.427
Transaction Volume	1,120	0.127	0.205	0.000	1.871
Differenced ln(Prime Rent)*	1,104	0.005	0.032	−0.223	0.214
Differenced Vacancy Rate*	1,104	0.000	0.005	−0.026	0.049
Foreign Investment	980	0.443	0.272	0.000	1.000
Differenced ln(Total Employment)*	1,120	2.181	1.762	−0.570	11.530
10 Year Gov. Bond	1,104	0.003	0.005	−0.030	0.024
Differenced (Gross Value Added)*	1,104	0.003	0.012	−0.060	0.048
Log of CPI	1,120	4.593	0.094	4.399	4.899

Note: The * indicates that a lm-Pesaran-Shin unit-root test showed the original variable was not stationary. We differenced the variable and the new differenced variable is stationary.

Table 7 shows an overview of the correlation variables between the dependent variable differenced office yield and other independent variables. Results from the table show a high significant correlation between office yields and most of the independent variables selected at the 1% level. There is a positive significant correlation between differenced office yield and Differenced Vacancy Rate, Differenced ln(Total Employment) and Log of CPI as well as the differenced vacancy rate. Moreover, it also shows a negative significant correlation between the dependent variable differenced office yield and Differenced ln(Take-up), Transaction Volume, Differenced ln(Prime Rent), Foreign Investment, 10 Year Gov. Bond and Differenced (Gross Value Added).

5.1. Determinants of Office Yields in Europe

In this section, we examine the empirical outcomes of the panel data regression analysis outlined in equation (1). Table 8 presents the results for various model specifications, incorporating both city, country and year fixed effects. Robust standard errors are clustered at the firm level to account for potential heteroscedasticity.

Table 8 shows the results for equation (1) with only city fixed effects in columns 1, we find that Take-up, prime rent, foreign investment, Gross Value Added are negatively associated with office prime yields, as their coefficients are statistically significant at the 1% level. The results are also economically meaningful. For example, a 1-unit increase in foreign investment is associated with a 0.042-unit reduction in office prime yields. However, vacancy rate, CPI and 10-year government bonds emerged to have a positive impact on prime office yields evidenced by the significant coefficients. Focusing on column 2 where we account for time and city fixed effects, we find that employment decreases office yields by 6.189 for a 1-unit change. We also find that foreign investment when greater than 70%, reduce differenced office yields by 0.043 for a 1%-unit change. Focusing on column 3 which includes country fixed effects and time fixed effects, we find that prime rent has a significant and negative relationship with office yields across all cities investigated, this result is similar to Watkins et al. (2012). Foreign investments (McAllister and Nanda (2016) and total employment (Sivitanidou & Sivitanides, 1999) have a negative and significant relationship to office yields across Europe which are consistent with past literature on office yields. From column 4- column 6, we obtain results similar to what we obtained in column 1-column 3. From Table 8, the results obtained so far suggest

Table 7. Pairwise correlation.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) Differenced Office Yield	1										
(2) Differenced ln(Take-up)*	−0.09***	1									
(3) Net absorption	−0.03	−0.04	1								
(4) Transaction Volume	−0.08***	0.05	0.23***	1							
(5) Differenced ln(Prime Rent)*	−0.11***	0.06*	0.05	0.11***	1						
(6) Differenced Vacancy Rate*	0.18***	−0.08**	−0.22***	−0.04	−0.25***	1					
(7) Foreign Investment	−0.11***	0.04	−0.08***	0.16***	0.05*	−0.08**	1				
(8) Differenced ln(Total Employment)*	0.24***	0	−0.11***	−0.15***	−0.12***	0.13***	−0.11***	1			
(9) 10 Year Gov. Bond	−0.14***	0.06**	0.11***	0.18***	0.32***	−0.29***	0.13***	−0.27***	1		
(10) Differenced (Gross Value Added)*	−0.17***	0.11***	−0.06**	0.05*	0.16***	−0.11***	0.13***	−0.14***	0.58***	1	
(11) Log of CPI	0.19***	−0.01	−0.03	0.07**	0.14***	0.06*	0.07**	−0.27***	0.19***	0.11***	1

Note: ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$.

Table 8. Regression results on factors that drive office yields in Europe using full sample data from Q1 2007 to Q2 2024.

Dependent Variable = Prime Office Yields	1	2	3	4	5	6
Differenced log(Take-up)	−0.023**	−0.010	−0.010	−0.024**	−0.013	−0.013
	(0.011)	(0.010)	(0.010)	(0.011)	(0.010)	(0.010)
Net absorption Hundred ths	0.001	−0.002	−0.001	0.000	−0.002	−0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Transaction Volume Ten ths	−0.070	0.014	0.040	−0.036	0.009	0.038
	(0.045)	(0.042)	(0.036)	(0.043)	(0.042)	(0.035)
Differenced log(Prime Rent)	−0.372**	−0.253	−0.257*	−0.226	−0.259*	−0.263*
	(0.173)	(0.157)	(0.156)	(0.169)	(0.155)	(0.155)
Differenced Vacancy Rate	3.362***	1.340	1.345	2.266**	1.764*	1.778*
	(1.149)	(1.073)	(1.068)	(1.116)	(1.060)	(1.055)
Foreign Investment greater than 70%	−0.042***	−0.043***	−0.037***	−0.026*	−0.032**	−0.027**
	(0.014)	(0.013)	(0.012)	(0.014)	(0.013)	(0.012)
Differenced Ln(Total Emp.)	−0.610	−6.189***	−6.231***	−0.202	−5.767***	−5.815***
	(1.277)	(1.262)	(1.254)	(1.217)	(1.244)	(1.235)
10 Year Gov. Bond	0.033***	−0.014*	−0.014*	0.030***	−0.010	−0.010
	(0.003)	(0.008)	(0.008)	(0.003)	(0.008)	(0.008)
Differenced (Gross Value Added)	−2.010***	−0.628	−0.567	−1.609***	−0.548	−0.491
	(0.546)	(0.709)	(0.700)	(0.524)	(0.694)	(0.684)
Log of CPI	0.668***	0.213	0.222	0.501***	0.280	0.283
	(0.062)	(0.246)	(0.245)	(0.063)	(0.247)	(0.246)
L.Differenced Office Yield				0.201***	0.024	0.024
				(0.030)	(0.031)	(0.031)
Constant	−3.114***	−0.917	−0.964	−2.348***	−1.237	−1.257
	(0.288)	(1.129)	(1.125)	(0.292)	(1.131)	(1.128)
Observations	1,104	1,104	1,104	1,088	1,088	1,088
R-squared	0.209	0.453	0.452	0.254	0.459	0.458
City FE	YES	YES	NO	YES	YES	NO
Time FE	NO	YES	YES	NO	YES	YES
Country FE	NO	NO	YES	NO	NO	YES

Note: Standard errors in parentheses.
*$p < .10$, **$p < .05$, ***$p < .010$.

that take-up, prime rent, vacancy rate and foreign investment have a negative and statistically significant effect on office prime yields.

For robustness, the baseline model is replicated using quantile regression with results reported in Table 9. We use quantile regression to examine the determinants of office prime yields. According to Ferrando et al. (2017), quantile regression analyses the effect of explanatory variables on tail ends and not only on the centre of the distribution. From the lower quantile (0.05), we find that foreign investment impact office yields negatively with the effect emerging to be significant. Across all quantiles, we find vacancy rate is a significant determinant of office yields in Europe. Also, in the upper quantile (0.95), prime rent emerged to have a negative effect on prime office yields. In all, from the quantile regression, vacancy rate is seen as the most significant determinant of office yields across all quantiles except the lower quantile (0.05). The results obtained are in consonance with the findings Watkins et al. (2012).

5.2. Sub-Sample Analysis

To further shed insights on the drivers of office yields, we provide sub-sample analysis in this section to test for variation in our baseline results. Table 9 shows the results of the sub-sample analysis for all city tiers including premier, primary and secondary cities while accounting for time and city fixed effects. From Table 9, at a significant level of 5%, a unit increase in the independent variable Foreign Investment greater than 70% and Differenced log(Prime Rent) causes a decrease in Prime office yield in Premier cities, and at a 1% significant level, a unit increase in Differenced Ln(Total Emp.), causes a decline in the Prime office yield for Primary and Secondary cities, however, at the same significant level, a unit increase in Log of CPI cause an increase in the Prime office yield for Primary cities. Prime rent emerged to be significant determinants of office yields across premier cities. The results in Table 8, which show the heterogeneity of premier, primary and secondary cities, are different from the study by Brounen and Jennen (2009) who investigate the rentals of premium and secondary cities in Europe and find no clear evidence that local model specifications explain the rent dynamics of secondary cities. In our study, we show clear evidence that local office variables including transaction volume, prime rent and total employment explain office yields across the city tiers.

Next, we conduct sub-sample analysis focusing on before and after the outbreak of COVID-19 with results reported in Table 10. This result is critical given that the outbreak impacted global markets including the real estate market (Akinsomi et al., 2024). From column 1 of Table 11, we note that before the outbreak of COVID-19, take-up, net absorption, foreign investment and total employment had a significant negative impact on office yields. However, after the covid, we find from column 2 that vacancy rate and prime rent significantly impacted office yields. Specifically, prime rent had a negative impact with vacancy rate recording a positive impact.

In the case of the determinants of office yields in Europe before and during the outbreak of Russia Ukraine war, we find from Table 12 that transaction volume is a significant determinant of office yields in Europe after the invasion of Ukraine by Russia. Before the invasion, foreign investment was seen as a significant determinant of office yields.

Table 9. Robustness – Quantile Regression results on factors that drive office yields in Europe using full sample data from Q1 2007 to Q2 2024.

Dependent Variable = Prime Office Yields	(1) Q.05	(2) Q.10	(3) Q.25	(4) Q.50	(5) Q.75	(6) Q.90	(7) Q.95
Differenced log(Take-up)	−0.035	−0.023	−0.006	0.000	−0.013*	−0.015	−0.015
	(0.032)	(0.026)	(0.009)	(0.004)	(0.008)	(0.014)	(0.016)
Net absorption Hundred ths	0.006	0.004	0.002	0.000	0.001	0.003	0.002
	(0.007)	(0.009)	(0.004)	(0.001)	(0.001)	(0.002)	(0.003)
Transaction Volume Ten ths	0.055	−0.018	−0.014	0.000	−0.034***	−0.057	−0.040
	(0.041)	(0.039)	(0.061)	(0.014)	(0.011)	(0.045)	(0.058)
Differenced log(Prime Rent)	−0.374	−0.429	−0.296	0.000	−0.214	−0.311	−0.686**
	(0.387)	(0.289)	(0.316)	(0.165)	(0.223)	(0.224)	(0.307)
Differenced Vacancy Rate	3.732	4.652*	4.013***	0.000	1.788**	4.455***	5.445***
	(3.831)	(2.384)	(1.136)	(0.739)	(0.823)	(1.031)	(1.955)
Foreign Investment greater than 70%	−0.125**	−0.063	−0.019	0.000	−0.021***	−0.011	0.004
	(0.050)	(0.039)	(0.012)	(0.006)	(0.008)	(0.012)	(0.026)
Differenced Ln(Total Emp.)	−0.714	−1.988	0.449	0.000	0.085	−1.343	−3.646
	(6.368)	(2.915)	(1.303)	(0.809)	(0.931)	(1.395)	(2.641)
10 Year Gov. Bond	−0.002	0.007	0.013***	0.000	0.040***	0.073***	0.092***
	(0.013)	(0.009)	(0.002)	(0.003)	(0.003)	(0.004)	(0.006)
Differenced (Gross Value Added)	−0.811	−2.060	−1.521***	0.000	−0.718*	−1.343**	−1.404*
	(2.252)	(1.294)	(0.417)	(0.290)	(0.376)	(0.677)	(0.798)
Log of CPI	1.061***	0.675***	0.272***	0.000	0.722***	0.730***	0.670***
	(0.127)	(0.101)	(0.072)	(0.067)	(0.055)	(0.077)	(0.096)
Constant	−5.118***	−3.268***	−1.332***	0.000	−3.322***	−3.328***	−3.020***
	(0.592)	(0.460)	(0.329)	(0.313)	(0.253)	(0.356)	(0.447)
Observations	1,104	1,104	1,104	1,104	1,104	1,104	1,104
City FE	YES	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES

Note: Standard errors in parentheses.
*$p < .10$, **$p < .05$, ***$p < .01$.

Table 10. Sub- sample regression results on determinants of Prime Office Yields before and during COVID-19.

Dependent Variable = Prime Office Yields	(1) Before COVID	(2) After COVID
Differenced log(Take-up)	−0.013***	0.001
	(0.013)	(0.014)
Net absorption Hundred ths	−0.002**	−0.002
	(0.002)	(0.004)
Transaction Volume Ten ths	0.009	−0.100
	(0.053)	(0.079)
Differenced log(Prime Rent)	−0.199	−0.194**
	(0.186)	(0.313)
Differenced Vacancy Rate	0.191	2.269**
	(1.439)	(1.437)
Foreign Investment greater than 70%	−0.059***	0.010
	(0.016)	(0.020)
Differenced Ln(Total Emp.)	−7.762***	−1.219
	(1.664)	(1.866)
10 Year Gov. Bond	−0.016*	−0.035
	(0.009)	(0.039)
Differenced (Gross Value Added)	−0.667	−0.431
	(0.970)	(0.894)
Log of CPI	0.590	0.124
	(0.392)	(0.661)
Constant	−2.639	−0.440
	(1.784)	(3.099)
Observations	816	288
R-squared	0.375	0.644
City FE	YES	YES
Time FE	YES	YES

Note: Standard errors in parentheses.
*$p < .10$, **$p < .05$, ***$p < .01$.

Table 11. Full sample regression results on determinants of Prime Office Yields across city tiers in Europe.

Dependent Variable = Prime Office Yields	(1) Premier	(2) Primary	(3) Secondary
Differenced log(Take-up)	−0.035	0.006	−0.029
	(0.025)	(0.016)	(0.020)
Net absorption Hundred ths	−0.002	−0.004	−0.003
	(0.002)	(0.009)	(0.012)
Transaction Volume Ten ths	0.040	−0.461**	−0.117
	(0.047)	(0.222)	(0.377)
Differenced log(Prime Rent)	−0.782**	−0.439	0.408
	(0.302)	(0.301)	(0.278)
Differenced Vacancy Rate	0.042	−1.021	3.198
	(2.587)	(1.600)	(2.339)
Foreign Investment greater than 70%	−0.090**	−0.028	−0.020
	(0.037)	(0.018)	(0.026)
Differenced Ln(Total Emp.)	−0.932	−7.003***	−8.336***
	(2.856)	(1.739)	(3.132)
10 Year Gov. Bond	−0.003	−0.034***	0.023
	(0.037)	(0.010)	(0.021)
Differenced (Gross Value Added)	−0.396	−0.342	1.562
	(1.325)	(0.974)	(2.107)
Log of CPI	−0.303	1.159***	−0.499
	(0.398)	(0.421)	(0.651)
Constant	1.436	−5.185***	2.256
	(1.794)	(1.930)	(2.993)
Observations	345	414	345
R-squared	0.651	0.561	0.460
City FE	YES	YES	YES
Time FE	YES	YES	YES

Note: Standard errors in parentheses.
*$p < .10$, **$p < .05$, ***$p < .01$.

Table 12. Sub- sample regression results on determinants of Prime Office Yields before RUW (2007 to 2021) and after RUW (2022 to 2024) sample.

Variables	(1) Before RUW	(2) After RUW
Differenced log(Take-up)	−0.012	0.004
	(0.011)	(0.026)
Net absorption Hundred ths	−0.002	0.002
	(0.002)	(0.006)
Transaction Volume Ten ths	0.017	−0.339**
	(0.047)	(0.166)
Differenced log(Prime Rent)	−0.246	−0.194
	(0.172)	(0.446)
Differenced Vacancy Rate	0.872	3.489
	(1.239)	(2.166)
Foreign Investment greater than 70%	−0.053***	0.024
	(0.014)	(0.035)
Differenced Ln(Total Emp.)	−5.827***	−3.024
	(1.369)	(5.582)
10 Year Gov. Bond	−0.014*	−0.106
	(0.008)	(0.069)
Differenced (Gross Value Added)	−0.793	1.364
	(0.758)	(3.053)
Log of CPI	0.305	0.498
	(0.316)	(1.357)
Constant	−1.360	−1.902
	(1.443)	(6.460)
Observations	944	160
R-squared	0.363	0.545
City FE	YES	YES
Time FE	YES	YES

Note: Standard errors in parentheses.
*$p < .10$, **$p < .05$, ***$p < .01$.

Table 13. Sub-sample analysis: Robustness based on cities in G7 vrs. Non-G7 economies in Europe.

Dependent Variable = Prime Office Yields	(1) Cities in Non G7 economies in Europe	(2) Cities in G7 economies in Europe
Differenced log(Take-up)	−0.013	−0.001
	(0.021)	(0.012)
Net absorption Hundred ths	−0.002	0.002
	(0.003)	(0.003)
Transaction Volume Ten ths	0.093	−0.090
	(0.067)	(0.061)
Differenced log(Prime Rent)	−0.335	−0.288
	(0.306)	(0.182)
Differenced Vacancy Rate	0.027	1.707*
	(1.752)	(1.441)
Foreign Investment greater than 70%	−0.023	−0.028**
	(0.022)	(0.018)
Differenced Ln(Total Emp.)	−5.388**	−2.733
	(2.118)	(2.737)
10 Year Gov. Bond	−0.016	0.010
	(0.012)	(0.013)
Differenced (Gross Value Added)	−0.284	−0.740
	(1.215)	(0.891)
Log of CPI	0.514	0.115
	(0.366)	(0.500)
Constant	−2.307	−0.530
	(1.683)	(2.292)
Observations	414	690
R-squared	0.521	0.542
City FE	YES	YES
Time FE	YES	YES

Note: Standard errors in parentheses.
*$p < .10$, **$p < .05$, ***$p < .01$.

For variability in our results, we conducted sub-sample analysis focusing on cities located in G7 countries against cities not located in G7 economies. We argue that the economic fundamentals and strength of a nation will impact all assets class including the real estate sector. From the regression results in Table 13, at a significant level of 5%, a unit increase in the independent variable Differenced Ln (Total Emp.) causes a decrease in office yields across cities in Non G7 economies in Europe. For the G7 economies, we find that vacancy rate and foreign investment are key factors that impact office yields.

6. Conclusion

This study provides insights into the dynamic nature of office yields in Europe by capturing local dynamics of the office market as well as macro-economic variables. This study employs novel data on office markets in Europe provided by BNP Paribas for sixteen European cities in eight countries segmented into five premium cities (premier) including London, Paris, Berlin, Frankfurt and Munich, primary cities comprise of Hamburg, Dusseldorf, Madrid, Milan, Amsterdam and Dublin and secondary cities (secondary cities) which includes Lyon, Cologne, Barcelona, Rome and Brussels. We investigate the period Q1 2007 to Q2 2024 and our results indicate that local office market dynamics such as net absorption, prime rent and foreign investment significantly explain office yields and macro-economic variables such as employment significantly explain office yields.

Further we examine the heterogeneity of European cities by segmenting our data to premier, primary and secondary cities. In our study, we show clear evidence that local office variables including transaction volume, prime rent and total employment explain office yields. For the period before and after COVID-19 pandemic, we observed some differences across the factors that drive office yields. For example, after the covid, we find that vacancy rate and prime rent significantly impacted office yields. For the period before and after the invasion of Ukraine by Russia, foreign investment was seen as a significant determinant of office yields. We obtained varying results across the sub-sample analysis.

The results reported in this study have confirmed the heterogeneity of property yields by cities and specifically across premier, primary and secondary cities in Europe. Our results also confirm common property specific and macro-economic variables that explain office yields across European cities. Thus, from a practical perspective, these results point to the possibility of diversifying real estate portfolio by investing in the same type of property (office) across different tier cities in Europe. Investors and property analysts can employ our results to make investment decisions of office property in Europe. An understanding of the drivers of office yields across different cities in different European countries offers institutional investors a basis for strategic portfolio allocation. Our findings contribute to the office yields discourse as we highlight the heterogeneity of the office markets in Europe.

Notes

1. BNP Paribas (2020) value total commercial real estate investments in Europe at 281 Billion Euros and office property investments represent 47%.
2. Note that the variable excludes lease renewals.
3. Im-Pesaran-Shin unit-root test indicated that, once the variables were differenced, the variables are stationary, we reject the null hypothesis that the panel contains a unit root.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Appendix A

Table A1. Sub-sample analysis: Robustness based on Foreign Investment greater than 30% and 50%.

Dependent Variable = Prime Office Yields	1 (>30%)	2 (>50%)
Differenced log(Take-up)	−0.010	−0.009
	(0.011)	(0.011)
Net absorption Hundred ths	−0.002	−0.002
	(0.002)	(0.002)
Transaction Volume Ten ths	0.011	0.013
	(0.043)	(0.043)
Differenced log(Prime Rent)	−0.246	−0.246
	(0.157)	(0.157)
Differenced Vacancy Rate	1.298	1.344
	(1.078)	(1.076)
Foreign Investment greater than 30%	−0.013	
	(0.011)	
Differenced Ln(Total Emp.)	−6.257***	−6.224***
	(1.268)	(1.266)
10 Year Gov. Bond	−0.014*	−0.014*
	(0.008)	(0.008)
Differenced (Gross Value Added)	−0.652	−0.689
	(0.713)	(0.711)
Log of CPI	0.214	0.207
	(0.248)	(0.247)
Foreign Investment greater than 50%		−0.023**
		(0.011)
Constant	−0.927	−0.891
	(1.138)	(1.134)
Observations	1,104	1,104
R-squared	0.448	0.450
City FE	YES	YES
Time FE	YES	YES

Note: Standard errors in parentheses.
*$p < .10$, **$p < .05$, ***$p < .01$.