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Spatial Dynamics of the Financial Kuznets Curve in the European Union

Yavuz ÖZEK *(https://orcid.org/0000-0003-4517-4875), Fırat University, Türkiye; yozek@firat.edu.tr*
İzzet TAŞAR *(https://orcid.org/0000-0001-9187-6910), Fırat University, Türkiye; itasar@firat.edu.tr*
Tayfur BAYAT *(https://orcid.org/0000-0002-4427-0999), İnönü University, Türkiye; tayfur.bayat@inonu.edu.tr*

Avrupa Birliği'nde Finansal Kuznets Eğrisinin Mekânsal Dinamikleri

Abstract

In this study, the validity of the Financial Kuznets Curve (FKC) in the EU-27 economies for the period 2009-2022 is examined using geographically weighted regression (GWR). According to the results of Global Moran's I and LISA, there is strong, positive, and significant spatial dependence both in the variables and in the residuals of the ordinary least squares (OLS) model. When comparing the performance of various coefficient-of-determination metrics based on the lambda coefficient, the validity of the FKC is primarily determined by the country's location. From the perspective of the global OLS model, the FKC hypothesis is not valid. According to the GWR results, the FKC is valid in Ireland, Portugal, Spain, France, Romania, Hungary, Bulgaria, and Croatia. While inflation reduces income inequality in Portugal and Belgium, it increases income inequality in France, Germany, Malta, Italy, Czechia, Slovakia, Greece, Bulgaria, Romania, Croatia, Lithuania, Latvia, and Estonia. Trade openness reduces income inequality in Poland, Hungary, Slovakia, Latvia, and Croatia; however, it has an increasing effect in Finland and Luxembourg. As a result, because the FKC hypothesis exhibits strong spatial dependence across EU-27 countries, it is valid only in certain countries. Therefore, instead of uniform solutions in the design of economic policy, policy packages should be developed that are tailored to the institutional structure of financial markets, price dynamics, and foreign trade structures of the countries.

Keywords : Financial Kuznets Curve, Geographically Weighted Regression, European Union.

JEL Classification Codes : C51, G51, O52.

Öz

Bu çalışmada, 2009-2022 döneminde AB-27 ekonomilerinde Finansal Kuznets Eğrisinin (FKC) geçerliliği coğrafi ağırlıklı (GWR) regresyon ile incelenmektedir. Global Moran's I ve LISA sonuçlarına göre hem değişkenlerinde hem de en küçük kareler (OLS) modeli artıklarında güçlü, pozitif ve anlamlı mekânsal bağımlılık bulunmaktadır. Lambda katsayısına göre değişen belirlilik katsayılarının performanslarının karşılaştırılmasında FKC'nin geçerliliği esas olarak ülkenin bulunduğu konumla ilişkilidir. Global OLS modeli açısından FKC hipotezi geçerli değildir. GWR sonuçlarına göre, İrlanda, Portekiz, İspanya, Fransa, Romanya, Macaristan, Bulgaristan ve Hırvatistan ekonomilerinde FKC geçerlidir. Enflasyon, Portekiz ve Belçika'da gelir eşitsizliğini azaltırken, Fransa, Almanya, Malta, İtalya, Çekya, Slovakya, Yunanistan, Bulgaristan, Romanya, Hırvatistan, Litvanya, Letonya ve Estonya'da gelir eşitsizliğini artırmaktadır. Ticari açıklık ise Polonya, Macaristan, Slovakya, Letonya ve Hırvatistan'da gelir eşitsizliğini azaltırken, Finlandiya ve Lüksemburg'da ise artırıcı bir etki gösterdiği belirlenmiştir. Sonuç olarak, AB-27 ülkelerinde FKC hipotezi güçlü mekânsal bağımlılık içerdiği için yalnızca belirli ülkelerde geçerlidir. Bu nedenle, iktisat

politikası tasarımında tek tip çözümler yerine, ülkelerin mali piyasalarının kurumsal yapısına, fiyat dinamiklerine ve dış ticaret yapılarına göre spesifikleştirilmiş politika paketleri geliştirilmelidir.

Anahtar Sözcükler : Finansal Kuznets Eğrisi, Coğrafi Ağırlıklı Regresyon, Avrupa Birliği.

1. Introduction

The complex relationship between financial development (hereafter FD) and income inequality (hereafter II) has recently become a focal point in both theoretical and empirical economic literature. Following the 2008 global economic crisis, the impact of financial markets on macroeconomic variables has gained even more significance. This crisis has demonstrated the crucial role of financial system stability and efficiency in social welfare (Laeven & Valencia, 2018). With financial innovations, the increasing variety of financial instruments has driven financial deepening. Consequently, capital accumulation has been encouraged, and the efficient allocation of resources has positively impacted output growth (Levine, 2005). On the other hand, in the absence of regulations and with the emergence of decentralised financial instruments, financial instability has a negative effect on II (Rajan, 2010). Therefore, the direction and magnitude of the relationship between FD and II are of great importance for policymakers. The main objective of this study is to examine the relationship between FD and II in the EU-27 economies. For this purpose, the validity of the Financial Kuznets Curve (hereafter FKC) hypothesis will be analysed in economies that are part of economic integration. The FKC hypothesis suggests that FD initially has a negative impact on II, but above a certain FD threshold, it begins to have a positive effect on II (Greenwood & Jovanovic, 1990). The FKC hypothesis argues that in the early stages of FD, individuals with low per capita income have limited access to financial services, while those with high per capita income can benefit from these services. Over time, as financial markets develop, more economic actors gain access to financial services, thereby reducing II (Beck et al., 2007). There are two main reasons for selecting European economies in this study. First, the EU is a heterogeneous union comprising economies at different levels of per capita income and development. Given the disparities in FD and II between Eastern and Western European economies, analysing this relationship at a regional level can yield important policy implications (Mendicino et al., 2020). These differences provide a rich framework for understanding how the relationship between FD and II varies across different economic contexts. Second, the EU has implemented significant policies and regulations for financial markets and has subsidised financial integration. This provides a suitable environment for analysing the impact of FD on II. This study aims to fill several critical gaps in the economic literature. First, previous studies examining the FKC hypothesis primarily use time series or panel data analyses. However, the relationship between FD and II may vary by location. Geographically weighted regression (hereafter GWR) can reveal how the relationship between FD and II varies across different regions of Europe. Second, FD is measured by the ratio of private-sector credit to gross domestic product, which helps assess how well financial markets integrate with real economic activity and the extent to which the real sector can access financial resources. Finally, by controlling for inflation and trade openness as

additional explanatory variables, the impact of FD on II becomes more clearly identifiable. The primary reason for choosing GWR in empirical analysis is its ability to account for spatial heterogeneity. Traditional regression methods estimate a single parameter for the entire panel, whereas GWR estimates different parameters for each region, revealing the geographical variations in the relationship between FD and II (Brunsdon et al., 1996). This enables policymakers to develop distinct policy packages tailored to each country.

In the following section, a summary of the relevant literature will be provided. Subsequently, the dataset used and the econometric methodology will be introduced. Finally, the key findings of the study will be summarised, and policy recommendations will be presented.

2. Theoretical Framework and Literature Review

The FKC hypothesis is a product of economic theory's efforts to conceptualise the relationship between FD and II. At its core, the FKC is based on Kuznets' original predictions regarding the relationship between II and economic growth. The FKC suggests that the effects of FD on growth can indirectly influence II and that this effect may change over time. In the early stages of FD, due to adverse selection, moral hazard, asymmetric information, and market failures, individuals with low per capita income have limited access to financial services. In this case, individuals with high per capita income and large corporations benefit more from the financial system. Stiglitz and Weiss's (1981) "Credit Rationing" model explains this issue. The model suggests that commercial banks may restrict credit supply rather than raise interest rates, thereby making it more difficult for small businesses and low-income individuals to access financing. Additionally, according to Tobin's q theory, as FD increases, firms' market values (q ratios) rise, but only a certain segment benefits from this increase. As financial instruments develop and financial markets deepen, access to financial services becomes easier and reaches a broader audience. This, in turn, enhances the efficiency of capital markets and allows for a more efficient allocation of resources. With the increase in financial inclusion, low-income individuals and small businesses also gain easier access to financing. In this way, investments in human capital increase, entrepreneurship is encouraged, and II decreases. According to Greenwood and Jovanovic (1990), FD reduces information asymmetry and enables more individuals to benefit from investment opportunities. The FKC hypothesis is an extension of income distribution theory. While the classical Kuznets curve suggests that II initially increases and then decreases during the growth process, the FKC relates this phenomenon to FD. Classical economic theory asserts that markets will always clear and that FD will reduce II in the long run. However, the FKC hypothesis posits that this process is nonlinear and that FD may initially increase II (Porath & Gilboa, 1994; Azam & Raza, 2018). Keynesian economic theory, on the other hand, posits that FD cannot be fully beneficial without government intervention. Keynesian economics suggests that, due to speculation, FD may exclude low-income individuals from financial markets. In line with the logic of the FKC hypothesis, as FD increases and public regulations improve access to financial services for low-income individuals, II decreases (Duclos, 2000; Shahbaz et al., 2015). Neoclassical economics

argues that in the long run, the increase in FD can reduce II through investment, productivity, and output growth. However, the FKC hypothesis suggests that this occurs in the second phase. The fact that individuals in low-per-capita-income economies have limited access to credit challenges neoclassical economic predictions (Nirei & Aoki, 2016; Younsi & Bechtini, 2020). Institutional economics, meanwhile, links the impact of FD on II to institutional structures, the rule of law, and democracy. According to institutional economic theory, a strong institutional framework accelerates the transition to the second phase of the FKC. Conversely, in economies with weak institutional structures, FD may work in favour of asset owners, thereby increasing II (Huynh & Tran, 2023).

In recent years, the FKC hypothesis has been examined alongside the concept of financialization (Khatatbeh & Moosa, 2023; Mirdala, 2011). Financialization refers to financial markets playing a more dominant role in economic growth, rather than the real sector. If FD is directed towards productive investments, II is positively affected. However, if FD shifts towards speculative investments and capital-intensive sectors, II is negatively impacted. The economic literature on FKC suggests significant differences across countries. Baiardi and Morana (2016) for the Eurozone, Özdemir (2019) for low-income economies, Dumrul et al. (2021) for Türkiye, Mikek (2023) for Latin America, Azam and Raza (2018) for ASEAN-5 countries, and Younsi and Bechtini (2020) for BRICS countries argue that FD initially increases II but decreases it after a certain threshold. Mikek (2023) attributes high income inequality in Latin America to unequal land distribution, structural issues in the education system, and political instability. Akan et al. (2017) and Tekin and Cengiz (2017), in their studies on EU countries, suggest that financial market integration can stimulate growth by increasing short-term capital movements. However, whether this output growth reduces II depends on institutional structures and regulations. If financial regulations are insufficient, financial integration can lead to short-term speculative capital flows and financial crises, thereby increasing II. Nikoloski (2013) argues that financial liberalisation can lead to speculative attacks on national currencies by increasing short-term capital flows, potentially causing financial and balance-of-payments crises, which, in turn, can exacerbate income inequality. According to Khatatbeh et al. (2022), the small size of the financial sector restricts access to financial services, thereby increasing income inequality. Kotarski (2015) suggests that state-controlled financial markets in China may lead to inequalities in the distribution of financial resources and financial crises, ultimately worsening II. Nadabo et al. (2024) for the Nigerian economy and Shahbaz et al. (2015) for the Iranian economy argue that income disparities in the distribution of oil revenues and inadequate financial sector regulations can increase income inequality.

Studies examining the FKC hypothesis suggest that the impact of FD on II is non-linear. Accordingly, in an economy undergoing a growth process, II deteriorates in the initial phase but improves once FD surpasses a certain threshold. Tekin and Cengiz (2017) also confirm the U-shaped relationship between FD and II in selected EU countries. Both studies emphasise that in the early stages of financial deepening, high-income groups have easier access to financial instruments, leading to an increase in II. Huynh and Tran (2023) argue that if FD is not supported by democracy, it may have an increasing effect on II. Sayar et al.

(2020) highlight that in developing countries, the effects of FD in reducing II are more rapid and pronounced in economies with strong governance, higher education levels, and robust human capital. Öndes and Kızılgöl (2024) suggest that financial liberalisation can enhance market efficiency, foster financial innovation, and accelerate growth. However, they argue that the impact of this process on II depends on a country's institutional and financial system structure as well as financial regulations. Bektur (2023) proposes that the income inequality caused by FD can be mitigated by reducing the informal economy and implementing public tax policies. However, in economies with high public debt stocks, FD increases the tax burden, negatively affecting income distribution (Mendoza et al., 2009). Baiardi and Morana (2016) argue that monetary policy, whose primary objective is price stability, can influence income distribution. Ridzuan et al. (2021) for Malaysia, Indonesia, Thailand, and the Philippines, Younsi and Bechtini (2020) for BRICS economies, and Azam and Raza (2018) for ASEAN-5 economies suggest that the desire for rapid economic growth may increase income inequality, but policies aimed at social welfare can improve income distribution. Moosa (2018), Özdemir (2019), and Khatatbeh and Moosa (2023) emphasise that FD does not have the same effect across countries, noting that this process has more pronounced effects on inequality in low-income economies. According to Moosa (2016), the impact of FD on II depends on a country's institutional structure and policy choices.

Overall, the impact of FD on II is non-linear and varies with multiple parameters. The inclusiveness of the financial system, the strength and development level of institutional structures, the degree of democratic progress, and economic development strategies are the key factors determining this effect. The FKC hypothesis appears valid in some countries, while in others the financial system does not function as a mechanism to reduce inequality. Particularly in low-income economies, FD can effectively reduce II only if policymakers implement market regulations and social policies. Economic theory suggests that a strong democratic structure and human capital can enhance the transparency and accountability of the financial sector, reducing speculative capital flows and rent-seeking activities, thereby improving income distribution.

3. Methodology and Empirical Results

In this study, the validity of the FKC in the EU-27 economies is examined using the GWR method. The model includes gross domestic product in U.S. dollars (lnGDP), the Gini coefficient, and the inflation rate (INF) derived from the consumer price index, following the studies of Hoi and Hoi (2012) and Azam and Raza (2018). Additionally, trade volume as a percentage of gross domestic product (TRD) is incorporated, drawing on studies by Lim and McNelis (2016) and Siddique (2021). Although various alternatives exist for measuring FD, this study utilises the ratio of private sector credit to gross domestic product. The Gini coefficient is sourced from the SWIID database, while other variables are obtained from the World Bank database. The empirical analysis consists of three stages. First, the robustness of the results from the GWR model versus the Global Ordinary Least Squares (GOLS) model will be discussed. Then, it will be tested whether the model and variables align with spatial variations. Finally, the parameters derived from the GWR model will be presented. FKC,

given the geographical location of country iii, is formulated as follows (Fotheringham et al., 2002):

$$lnGINI_{it} = \beta_0(u_i, v_i) + \beta_1(u_i, v_i)lnGDP_{i0} + \beta_2(u_i, v_i)FD_{i0} + \beta_3(u_i, v_i)FD_{it}^2 + \beta_4(u_i, v_i)INF_{i0} + \beta_5(u_i, v_i)TRD_{i0} + \varepsilon_i \quad (1)$$

In this equation, i represents the country, t represents time, β_0 is the constant term, and ε_{it} denotes the independently and identically distributed error term. In this statement, i country, t time, β_0 denotes the constant term, and ε_{it} represents the error term that follows an independent and identically distributed distribution. β_1 shows the effect of lnGDP, β_2 of FD, $\beta_3$of FD², β_4 of INF, and $\beta_5$of TRD on. According to economic theory, if $\beta_0 < 0$, an increase in output reduces II, while if $\beta_0 > 0$, an increase in output increases II. Similarly, if $\beta_4 < 0$, INF improves II, whereas if $\beta_4 > 0$, INF worsens II (Azam & Raza, 2018). If $\beta_5 < 0$, TRD improves II, while if $\beta_5 > 0$, TRD worsens II (Kim & Lin, 2011). The validity of the FKC is determined based on the signs of the coefficients β_2 and β_3. If $\beta_2 > 0$ and $\beta_3 < 0$, the FKC is valid. Conversely, if $\beta_2 < 0$ and $\beta_3 > 0$, FD initially reduces II but later increases it (Baiardi & Morana, 2016; Jauch & Watzka, 2016). In equation (1), the problem of nuisance parameters arises due to the low number of degrees of freedom. By assuming that the weight assigned to observations is inversely related to both the distance to area I and the distance to the regression, weighted local estimates are employed (Görür & Yüzbaşı, 2024). The $\hat{\beta}$ estimator;

$$\widehat{\beta}\,(u_i, v_i) = (X'W(u_i, v_i)X)^{-1}X'W(u_i, v_i)y \quad (2)$$

In this regression, where the independent variables are reversed $\widehat{\beta}\,(u_i, v_i)$ expression β_{kxn} is the matrix showing the parameters of the dimensional independent variables. Parameter estimation for each local unit;

$$\widehat{\beta_n} = (X'W_nX)^{-1}X'W_nY \quad (3)$$

is calculated as (Bourdin, 2019; Yüzbaşı & Görür, 2021). For each location, the W(i) matrix is diagonal, with entries equal to the distances. In the weight matrix, the bi-square function is used as a kernel function.

$$w_{ij}(i) = \left(1 - \left(\frac{d_{ij}}{b}\right)^2\right)^2 \text{ if } d_{ij} < b \quad (4)$$

(Oshan and Fotheringham, 2018). In this way, higher weights can be assigned to nearby observations and lower weights to distant observations. Thus, with GWR, the data-borrowing technique can be applied, allowing local coefficients to be estimated by borrowing information from neighbouring observations (Yu et al., 2020). The bandwidth determines how many neighbours are used in the local regression (Li et al., 2020). In this study, the most critical method, the AICc criterion, is used.

$$AICc = 2nln\left(\frac{RSS}{n}\right) + nln(2\pi) + \frac{n(n+tr(S))}{n-2-tr(S)} \quad (5)$$

These formulas are minimised with respect to AICc (Yu et al., 2020). GWR parameters show how relationships vary across geographic regions. Therefore, spatial autocorrelation in GWR parameters is natural and should not be considered a problem (Paez et al., 2011), since local processes are already spatially continuous (Oshan et al., 2019).

Table: 1
Global Moran's I Results: Variables and Model Residuals

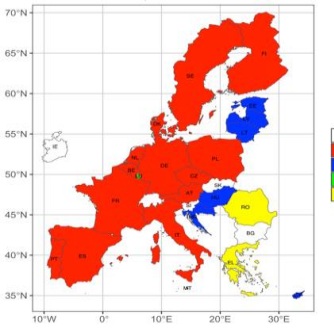
Variable / Model Residuals	Moran I	Variance	Z-stat	p value	Results
OLS Res.	0.4387	0.000133	38.201	0.00[a]	Strong spatial dependence, OLS inappropriate
GWR Res.	-0.0197	0.000132	-1.480	0.93	No spatial dependence, GWR appropriate
lnGDP	0.6653	0.000133	57.793	0.00[a]	Very strong spatial clustering
FD	0.5623	0.000133	48.905	0.00[a]	Strong spatial clustering
FD^2	0.5676	0.000133	49.381	0.00[a]	Strong spatial clustering
INF	0.0284	0.000129	2.725	0.00[a]	Weak but significant spatial effect
TRD	0.3507	0.000132	30.764	0.00[a]	Moderate spatial clustering

Notes: Residuals, Expected Value is -0.00265, p<0.01 a.

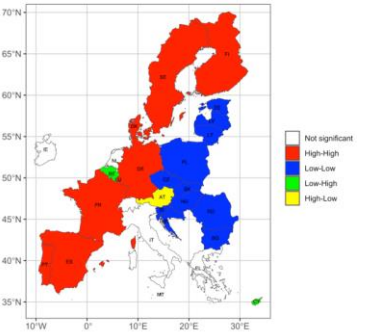
Table 1 presents the results of the Global Moran's I test applied to determine the level of spatial dependence in the variables and model residuals. Moran's I value for the OLS model residuals indicates a high level of positive spatial autocorrelation. Accordingly, the OLS model cannot capture spatial heterogeneity. On the other hand, Moran's I value for the GWR model residuals is statistically insignificant. Accordingly, the GWR model successfully eliminates spatial dependence and demonstrates that it internalises spatial heterogeneity. Moran's I findings for the independent variables also show similar results. The independent variables exhibit strong and statistically significant spatial clustering. Although Moran's I value for INF is relatively low, it still displays a statistically significant spatial pattern.

Graphic: 1
LISA Cluster Map

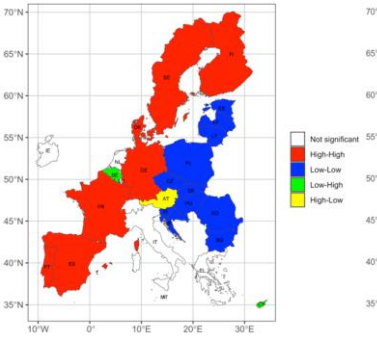
lnGDP



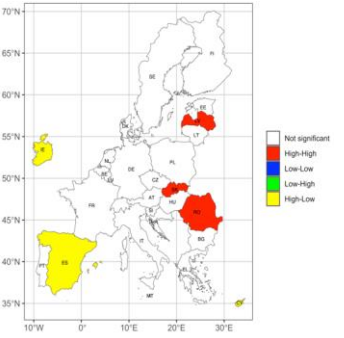
FD



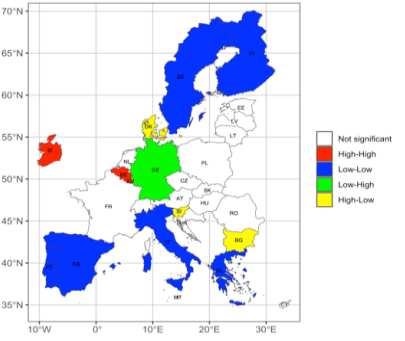
FD^2



INF



TRD



According to the LISA (Local Indicators of Spatial Association) results presented in Graph 1, the variables have a strong spatial dependence structure. The presence of distinct High-High (HH) and Low-Low (LL) clusters for lnGDP, FD, FD², and TRD is consistent with the high and significant positive values obtained from the Global Moran's I test. There is spatial clustering on a variable basis. This indicates that the spatial independence assumption underlying the traditional OLS model is violated. On the other hand, the statistically insignificant Moran's I value for the local residuals of the GWR model shows that GWR successfully eliminates spatial dependence. The spatial clusters observed in the LISA maps indicate that the parameters of the independent variables vary spatially.

Table: 2
Adjusted R^2 Results of GWR/GTWR Models by Lambda Values

λ	$\bar{R}^2$
0.0	0.0294
0.1	0.0311
0.02	0.0320
0.3	0.0328
0.4	0.0337
0.5	0.03474
0.6	0.3589
0.7	0.03741
0.8	0.03969
0.9	0.04471
1	0.7080

λ =0 corresponds to the GTR (Geographically Temporally Random) model, 0< λ<1 indicates the GTWR (Geographically and Temporally Weighted Regression) and λ =1 corresponds to the GWR model (Yüzbaşı & Görür, 2026). According to Table 1, spatial distribution and heterogeneity are more important than temporal heterogeneity. Therefore, the validity of the FKC is shaped by a country's spatial location rather than by time.

Table: 3
The Descriptive Statistics of the GWR and GOLS

	Min	25%	Median	75%	Max	GOLS
Intercept	-6.2741	-1.7218	0.5617	3.4803	10.2829	2.066 (0.00)[a]
lnGDP	-0.1042	-0.0618	0.0096	0.0689	0.3070	-0.01332 (0.00)[a]
FD	-9.2793	-1.5837	0.1401	3.3948	6.2589	-0.4155 (0.01)[b]
FD^2	-1.8382	-1.0414	-0.0468	0.4253	2.3024	0.1085 (0.02)[b]
INF	-0.0083	-0.0036	-0.0020	0.00008	0.0045	-0.001307 (0.15)
TRD	-0.0016	-0.0004	0.0002	0.00039	0.0013	-0.000228 (0.00)[a]
AIC	-2222.197					-1178.332
AICc	-2034.536					-1178.03
BIC	-2087.275					-1487.244
RSS	0.0470					0.9443
Adj. R^2	0.935					0.075

Notes: AIC Akaike Information, BIC Bayesian Information, AICc Corrected Akaike Information, RSS Residual Sum of Squares, Euclidean distance metric is used. Kernel function: bisquare, p<0.1 c, p<0.05 b

Table 3 presents the parameter estimates and descriptive statistics for the GWR and GOLS models. Since the primary objective of the GWR model is to capture spatial heterogeneity, focusing solely on the GOLS results would be misleading. The GWR model is preferred over the GOLS model based on AIC, BIC, and RSS, as it yields lower values for all three. Additionally, the coefficient of determination is higher in the GWR model. In

the GOLS model, the constant term, lnGDP, and TRD are statistically significant at the 1% significance level, while FD and FD^2 are statistically significant at the 5% significance level. When comparing the GOLS and GWR parameters, the intercept in the GOLS model is close to the upper band in the GWR model. A positive intercept value indicates that income inequality is high across all countries, suggesting chronic income inequality. In the GOLS model, the parameters for lnGDP, FD and INF are closer to the lower band in the GWR model, whereas the FD parameters in the GOLS model are closer to the middle and upper bands in the GWR model. Economic theory suggests that output growth should reduce income inequality. However, in both the GOLS and the lower band of the GWR model, the effect of lnGDP is negative. According to Milanović (2016), while output growth reduces income inequality, inequality trends vary depending on a country's level of development. This phenomenon is believed to have emerged in the transition economies that joined the EU during its third and fourth enlargement waves. On the other hand, Piketty (2013) argues that the rate of return on capital exceeds the growth rate of output, while Stiglitz (2012) suggests that output growth is not equally distributed among economic agents. When the FKC hypothesis is evaluated within the GOLS model, it is found to be invalid. Because the FD coefficient is negative and the FD^2 coefficient is positive in sign. This result suggests that FD initially reduces but later increases. Jaumotte et al. (2013) attribute this to high-income individuals benefiting more from the financial system and short-term capital movements, while Atkinson (2015) links it to the negative shocks caused by financial crises. The effect of INF aligns with economic theory's expectations. Disruptions in price expectations negatively affect the welfare of individuals with fixed incomes. However, the source of inflation alters its impact. In economies experiencing demand-driven inflation, the contractionary monetary policies implemented by central banks to maintain price stability further increase income inequality. In the case of supply-side inflation, the pressure on firms' profits affects social welfare depending on demand elasticities.

Table: 4
Leung's F-Test

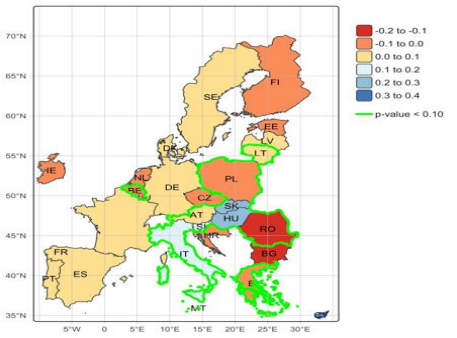
	F Value	SS OLS residuals	SS GWR residuals	SS GWR improvement
F(1) Test	0.069 (0.00)[a]	0.0599	0.0405	-
F(2) Test	4.352 (0.00)[a]	0.0599	-	0.0193
F(3) Test	F Value	probablity		
Intercept	1.2986	0.12		
lnGDP	2.5494	0.00[a]		
FD	1.2220	0.00[a]		
FD^2	1.3543	0.08[c]		
INF	1.7030	0.00[a]		
TRD	1.2958	0.00[a]		
F(4) Test	0.0498	0.00[a]		

Notes: p<0.01 a, p<0.05 b, p<0.1 c

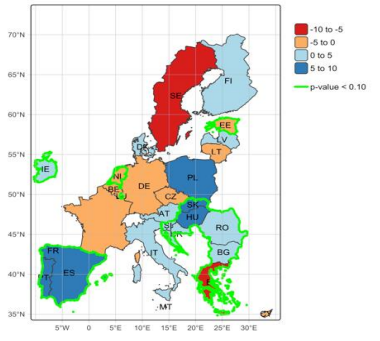
It is necessary to test whether both Model (1) and the explanatory variables on the right-hand side exhibit spatial variation to verify whether the GWR method accurately models spatial heterogeneity. This requires checking whether the error terms in Model (1) are spatially clustered using F-tests. According to the results in Table 2, in the F(1) test, the GWR method provides more robust results than the OLS method at a 5% significance level, while in the F(2) test, it does so at a 1% significance level. According to the F(3) and F(4)

test statistics, spatial variation is present in all independent variables, including the intercept term. Thus, the effect of the independent variable on the dependent variable varies across countries.

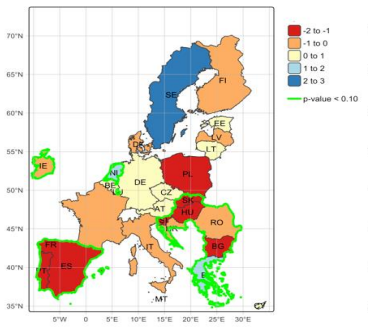
Graphic: 2
GWR Parameters



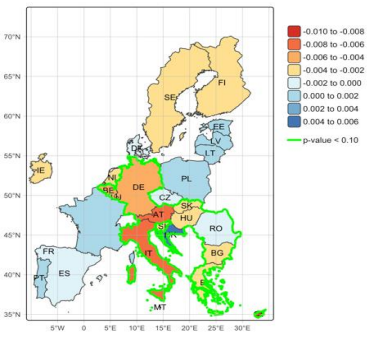
β_1



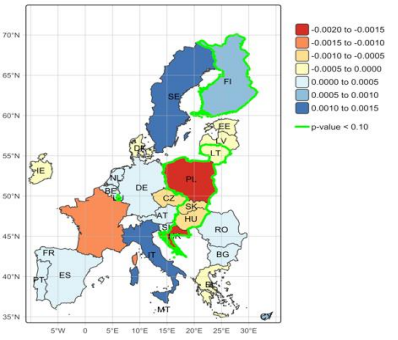
β_2



β_3



β_4



β_5

Graph 2 presents the GWR estimators along with the p-values indicating whether the coefficients are statistically significant at the 10% level. Thus, the areas shaded with green lines indicate the countries where the coefficient is statistically significant. Hungary, as an EU member, has undertaken key reforms to ensure judicial independence, combat corruption and informality, and enhance institutional quality. Czechia, formerly part of Czechoslovakia, transitioned from a centrally planned economy to a market economy more successfully than other transition economies. Economic growth in Czechia has remained above the EU average, and income inequality is relatively lower compared to other transition economies. lnGDP is statistically significant for Romania and Bulgaria, and its effect is negative in both countries. This indicates that economic growth has decreased in these economies. Inclusive growth refers to the equal distribution of the wealth generated by economic growth across all segments of society. Instead of focusing solely on output growth, ensuring income equality, access to education, and healthcare services becomes essential. In economies where lnGDP does not affect (France, Portugal, Spain, Germany, the Netherlands, Scandinavian countries), inclusive growth has not been achieved. In line with the expectations of the FKC hypothesis, it is both positive and negative. However, this effect is observed only in certain European countries. The FD parameters are positive in Ireland, Portugal, Spain, France, Romania, Hungary, Bulgaria, and Croatia. FD2 exhibits a negative slope in Ireland, Portugal, Spain, France, Romania, Hungary, Bulgaria, and Croatia. Accordingly, the FKC hypothesis is valid in these economies. Accordingly, financial development initially increases income inequality but supports income equality beyond a certain threshold. In economies where the FKC hypothesis is invalid, several economic issues may arise. First, individuals may have low levels of financial literacy. Second, the lack of widespread financial products, such as health insurance, prevents low-income individuals from mitigating risks. Third, insufficient access to credit restricts entrepreneurial activities. Fourth, the absence of strong property rights, the rule of law, and a transparent institutional framework may prevent the FKC hypothesis from holding. In these economies, FD can further enhance the already high average level of welfare and promote income equality. In transition economies such as Romania, Bulgaria, Hungary and Croatia, the transition to a market economy has been completed. In these countries, EU membership, competitive

labour costs, and an increase in foreign direct investment support the positive impact of FD on II. In Germany, Malta, Italy, Czechia, Slovakia, Greece, Bulgaria, Romania and Croatia, inflation (INF) increases income inequality. Classical economic theory suggests that unexpected inflation disrupts income distribution. In cases where nominal contracts (such as rents and wages) are fixed, real incomes decline in the face of inflation (Brancaccio &Saraceno, 2017). Albanesi (2007) argues, within the framework of the Phillips curve, that high inflation worsens income distribution, but low and stable inflation can stimulate the labour market and promote income equality in the long run. According to Altunbaş and Thornton (2022), central banks implementing inflation targeting can contribute to income equality by stabilising price expectations. Finally, Riggi (2010) suggests that wage rigidity in low-inflation economies can increase unemployment, negatively affecting unskilled labour. In Greece and Italy, high public debt stocks, contractionary fiscal policies, the prevalence of the informal economy, and ineffective tax collection have hindered the financing of social expenditures (Donati, 2023). The impact of TRD on II is statistically insignificant in most of the EU countries. In the economies of Poland, Hungary, Slovakia, Latvia, and Croatia, TRD increases while decreasing. On the other hand, in Finland and Luxembourg, an increase in TRD leads to an increase in. Eastern European countries, through economic integration, have benefited from free trade environments as expected.

5. Conclusion

This study analyses the relationship between FD and II in EU economies within the framework of the FKC hypothesis, using GWR. Based on the hypothesis that FD may initially increase II but reverse its impact after reaching a certain level of financial deepening, an empirical analysis is conducted while accounting for spatial heterogeneity across EU economies. The empirical findings indicate that the FKC hypothesis holds for some EU economies but cannot be generalised across all EU economies. The results reveal that the effect of FD on II varies significantly across countries. In economies with strong institutional frameworks and well-developed financial markets, such as Ireland, Portugal, Spain, France, Romania, Hungary, Bulgaria, and Croatia, the impact of FD on II appears to be more balanced. In these economies, access to financial services is widespread, ensuring that even low-income individuals can benefit from the financial system. The presence of state-supported credit mechanisms, financial subsidies for small and medium-sized enterprises (SMEs), and strong regulations has reinforced the negative impact of FD on II. On the other hand, in transition economies such as Latvia and Lithuania, which shifted from centrally planned economies to market economies, the equalising effects of FD have not yet fully materialised. There are several key reasons for this: (i) Low-income individuals face significant barriers to accessing financial services. The lack of trust in the banking system, inadequate financial literacy, and limited credit availability constrain the positive effects of FD on II. (ii) Weak institutional structures and the lack of full enforcement of the rule of law prevent the efficient allocation of financial resources, thereby increasing income inequality. (iii) Financial deepening in these economies relies primarily on short-term capital flows and speculative investments, preventing low-income individuals from benefiting sufficiently from the financial system. Another significant empirical finding of the study is that the

impact of inflation (INF) on II varies across countries. In high-inflation economies, low-income individuals are disproportionately affected. The erosion of purchasing power due to inflation further deepens income inequality, particularly for fixed-income individuals and those dependent on social transfer programs. In economies experiencing high inflation, income inequality is more pronounced, and macroeconomic imbalances and fluctuations increase. Conversely, in economies that maintain price stability, the adverse effects of INF remain limited, leading to a more equitable distribution of economic welfare.

Based on the empirical findings of this study, several policy recommendations can be made to ensure that FD becomes more inclusive: (i) Facilitating access to financial services can help low-income individuals and small businesses benefit more from financial markets. (ii) Regulations that limit short-term capital flows and speculative currency market movements can help build confidence in financial markets for the real sector. (iii) Social transfer expenditures should support FD to ensure that its benefits reach vulnerable groups. (iv) Minimum wage controls should be implemented to protect low-skilled workers, ensuring that the effects of FD positively influence the labour market. (v) The primary objective of monetary policy should be price stability, preventing low-income and fixed-income individuals from suffering due to inflation. Although this study analyses the FKC hypothesis in EU economies using the GWR method, it has certain limitations: (i) Extending the dataset could help produce more robust results. (ii) Measuring FD by the ratio of private sector credit to GDP has certain shortcomings. Using alternative FD indicators could provide a broader perspective on the results. (iii) Incorporating institutional structure indicators as control variables would help better interpret the FD- relationship in greater detail.

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