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**Financial Institutions, Exchange Rate Regimes, and Bilateral Remittances
in Europe**

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This master's thesis is my independent work. All the data, authors, and literature have been referenced in this thesis.

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ABSTRACT

This study examines the impact of financial institutions' similarity across 27 European countries on bilateral remittances using structural gravity model from 2010 to 2020. The data are yearly panel data composed of world bank financial data, the matrix of bilateral remittances, and gravity bilateral data. The empirical analysis uses Poisson Pseudo-Maximum Likelihood (PPML) estimates, pair fixed effects, and country-time effects, which control for endogeneity. The empirical analysis shows an insignificant impact of financial institutions' similarities across European countries on bilateral remittances. However, the study shows that dummy variables like exchange rate systems in sending countries, sending countries in Euro Area, and European Union receiving countries and paired members have a significant impact on bilateral remittance. Factors like border, GDP, and distance also have a significant impact as expected. Robustness checks to control for possible Covid-19 effects are considered.

Keywords: Bilateral remittance, Financial institution, Europe, Structural Gravity, Europe, Exchange rate.

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1. INTRODUCTION

Personal transfer and private funds from migrants to home countries are important sources of income in transition and developing economies. The growth of cross-border money transfer has greatly increased beyond other financial flows like foreign direct investment (FDI), private capital flow, official aid, and development assistance from international organizations resulting from increasing migration, opportunities, and globalization across borders. The total amount of remittances in transition economies constitutes 2% of their GDP (World Bank data 2023).

Remittance is affected by the flow of migration patterns, growing demand for highly skilled labor from top-sending countries, and the commitment of migrants to their home country (Levitt & Jaworsky, 2007) in sending capital and fund to receiving countries. The degree of globalization, growing demand for foreign workforce, and migration policies have undoubtedly increased migration activities Alfieri & Sinitsyna (2022). To compensate for receiving countries' skills and talents, remittance flow and size must be unhindered to facilitate economic growth and financial development. However, Cox and Oreggia (2009) show how household labor force can be passive to economic production if they rely on remittance.

According to IFAD (2015), there are 19 remittance-receiving countries in Europe, with Ukraine and Romania leading these countries, while 10 European Union countries member receives 20.5 billion USD annually, and 9 non-European member receives 16 billion USD annually. Top sending countries include Germany, Italy, France, Spain, Belgium, and Russia. Remittance to GDP ratio exceeds 10 percent for countries like Moldova and Kosovo. These countries are predominantly agricultural-based economies and depend most on migrant funds. On a micro level, remittance has helped in solving basic household needs and an avenue for start-up capital for private businesses for households (Dustmann & Kirchkamp, 2002), while on a macro level, it

helps in the redistribution of resources and capital that fuel growth. It is also wrong to assume remittance flow to poor or developing countries alone, Belgium, Spain, and France are among the ten largest remittance recipients in 2004 (Singer, 2010).

Several studies have greatly shown that remittance and financial development stimulate growth. Lueth & Ruiz-Arranz(2006) shows how remittance help to overcome liquidity constraint by providing financial alternative for investment, which stimulate economic growth. Thus, the trend and contribution of remittances have called for different financial development, reform, and openness policy across countries that could aid more flow. Financial institutions are medium through which economic agents accumulate wealth, send or receive funds, fund investment opportunities and mitigate risks. They are expressed in form of financial products and services, market and investment risk within the framework of a monetary system. This system can be measure in terms of access, efficiency, stability, depth etc. (Cihak et al., 2012). These measurements are used to determine financial development which is expressed in the quality of financial service offered.

However, little effort has been exerted on financial similarities across European regions and how it impacts remittance apart from Alfieri & Sinitsyna (2022) study on Nordic and Baltic regions. This research work will explore a large scope by exploring differences in financial institution similarity in different European countries between sending countries and receiving countries, identify monetary dummy variables, and how it tends to impact total remittances flows. Financial aspects like depth, access, efficiency, and stability are used to test similarities.

Like the financial institution, another important aspect is the exchange rate, a vital macroeconomy policy that affects everything related to goods and services as well as investment and trade. It involves trade-offs when making economic choices (Broz 2002; Walter 2008). It is

either a Fixed or flexible exchange rate is employed. When a fixed rate is employed on a country's currency with regard to other countries, the need to adjust to recent domestic happenings is hampered while stability is enhanced, the use of a flexible exchange rate allows for adjustment to endogenous shocks. Singer(2010) shows how increasing remittance inflow is highly correlated with fixed exchange rates. The study shows that smaller economies are more likely to benefit from fixed exchange rates

Also, not all migration aid remittances. (Piracha & Saraogi, 2011) shows how duration (temporary or permanent) migration have a significant effect in determining remittance and amount to be send using household respondent to identify determinant factor in Moldova. Bencivenga & Smith (1991) demonstrate how economies with competitive financial intermediaries affect resource allocation from agents and houses who might be faced with future liquidity and its implication on real rate of growth compared with economies with no competitive intermediaries. The analysis complements the literature on endogenous growth by Lucas (1998), Romer (1989), which demonstrates how saving activities influence growth rates.

Using panel data on remittance and financial system variables over the period of 2010-2020 from World Bank Global Financial Development database, I explore variables related to accessibility, efficiency, depth, and stability to ascertain its effect on bilateral remittance between sending and receiving countries in Europe, Identify countries monetary exchange systems and how it affect remittance. This is achieved by estimating the difference in financial similarities based on respective countries' data using Euclidian distance, identifying the exchange rate regime of the analyzed countries, and conduct empirical analysis using structural gravity model to ascertain the effect. A robust check is employed by estimating interval pair fixed effect, comparing panel data before covid (2017) and during covid (2020), which was interpolated due to lack of bilateral remittance data.

This study is organized as follows: next section covers reviews of research study on determinants of remittance and how financial development affect it. Section 3 shows how structural gravity model can be employed to solve bilateral remittances issues in an international environment, while section 4 contains data analysis of 27 European countries, Section 5 contains a robustness check, and how this paper has contributed to the research topic is explicitly discussed in section 6.

CERCS code for this thesis is S181.

2. LITERATURE REVIEW

Worker remittance trends, scale, and projection have equally attracted scholars, policymakers, and global attention. Rapoport (2005) states that the motivation behind remittances is a mix of various factors. There is an interplay of complex factors ranging from socioeconomics to macro factors as the major determinant and increasing growth in the remittance trend. From the macroeconomic point of view, Jijin et al. (2021) show how developing countries are prone to external economic shocks as it shows how remittance is impacted by exchange rate, oil price, and domestic GDP contribution in India- the world's highest remittance rate (World Bank Remittance 2020) using ARDL approach. This corroborates (Mouhoudet al., 2008) as he shows how income level in home countries, exchange rate, and GDP makes workers to send funds to their home countries for family and investment motives while the altruistic motive is impacted by the interest rate using Mediterranean countries as a case study.

In transitioning economies (Aydas et al., 2005) demonstrate how macroeconomic variables in both sending and receiving countries affect remittance in the case of Turkey by considering two different periods. Factors like black market, inflation, and interest rate policies is seen to affect remittance rate negatively. This supports the countercyclical approach, Silva&Ivan (2006) expressed how remittance increases positively as the exchange rate depreciates in receiving countries leading to an increase in demand for money and negatively with an uncertain exchange rate

Another strand of literature focuses on the socioeconomic context for sending and receiving countries. Lueth & Ruiz-Arranz (2007) used a gravity model framework with a panel dataset showing bilateral remittance flow from 11 countries in Asia and Europe from 1980-2004. The

research captures the economic situation of migrant workers host and their respective home countries by looking at variables like common borders, distance, historical bilateral trade, and natural disasters (like what happened recently in Turkey) as a determinant of remittance. The gravity model enables the study to compare varieties of variables across many regions without relying on the oil prices, interest rates, and other proxies, unlike other studies (Martin 1990, Glytsos 1997, McCormick and Wahba 2000, Connell/Conway 2000, Taylor et al., 1996, Boone, 1995, Martin, 1990) that focus on the impact of remittance on current account and macroeconomic variables. It found that a procyclical trend with remittance and not a good instrument for limiting vulnerability shocks as remittance loose momentum when export and GDP are low. Hence it should not be a panacea to growth but can improve financing, consumption, and investment opportunities if the home countries' financial systems are developed. The theoretical foundation of the model employed, with its predictiveness and proper representation of multiple factors in a realistic general equilibrium environment, can be traced back to Anderson(1979) and seen as

$$M_{ijk} = a_k Y_t^{\beta k} Y_j^{y_k} Y_j^{y_k} N_j^{\epsilon k} N_j^{ik} d_{ij}^{\mu k} U_{ijk}$$

Where M_{ijk} is the dollar flow of good or factor K from country or region i to country j , Y_i and Y_j are incomes in i and j , N_i and N_j are population in j and i while d_{ij} is the distance between countries(regions) j and i . The U_{ijk} is the log distributed error term with $E = (ln U_{ijk}) = 0$

In addition, Anderson and Wincoon (2003) further upgraded the above model on the presence of biasness created by tariff, transport cost proxied by distance, assumption of differentiated goods, and homothetic preferences across countries for proper representation in a general equilibrium environment which is the building block of the model.

Approximated by a CES utility function we have.

$$\left(\sum_i \beta_i^{(1-\sigma)/\sigma} c_{ij}^{(\sigma-1)/\sigma}\right)^{\sigma/(\sigma-1)} \dots\dots\dots(1)$$

Subject to the budget constraint

$$\sum_i^n (p_{ij} c_{ij} = y_j) \dots\dots\dots(2)$$

σ is the degree of responsiveness of substitution between all goods, β_i is a positive parameter, y_j is the nominal income of region j residents, and p_{ij} is the price of region i goods for region j consumers. Let p denotes the exporter's supply price, net of trade costs, and let t_{ij} be the trade cost factor between i and j. Then $p_{ij} = p_{it_{ij}}$

The gravity equation equals

$$x_{ij} = \frac{y_i y_j}{y^w} \left(\frac{t_{ij}}{P_i P_j}\right)^{1-\sigma} \dots\dots\dots(3)$$

Furthermore, the need to address multilateral resistance as region trade with other partners reduced omitted variables and the need to solve general equilibrium model before and after the removal of trade barriers gave birth to Structural gravity in Anderson (2013). Multilateral trade resistance tends to rise more for smaller countries, leading to observing trade cost in Anderson's final revived development. Larch and Yotov (2016) explore how this multilateralism can be incorporated in a general equilibrium environment. Incorporating this in the above gravity equation, we have;

$$x_{ij} = \frac{Y_i E_{j,t}}{Y_t} \left(\frac{t_{ij,t}}{P_{j,t} \Pi_{i,t}}\right)^{1-\sigma} \dots\dots\dots (4)$$

$$\Pi_{i,t}^{1-\sigma} = \sum_j \left(\frac{t_{ij,t}}{P_{j,t}}\right)^{i-\sigma} \frac{E_{j,t}}{Y_t}, \dots\dots\dots(5)$$

$$P_{j,t}^{1-\sigma} = \sum_i \left(\frac{t_{ij,t}}{\Pi_{i,t}}\right)^{i-\sigma} \frac{Y_{i,t}}{Y_t} \dots\dots\dots(6)$$

Equation $X_{ij, t}$ means exporter i trade to destination j at a specified time; while $E_{j, t}$ is the total

expenditure by importer j . $Y_{i,t}$ is the total amount of export production while Y_t is the world output; $t_{ij,t}$ represent restriction in bilateral trade between partners and $\sigma > 1$ is the elasticity of substitution among goods from different countries. While $P_{j,t}$ and $\Pi_{i,t}$ are structural terms based on multilateral resistance.

The economic well-being of host country and migrant country of origin migrant represent macroeconomic determinants that affect remittances across the globe. Silva &Huaug (2006) present the level of financial development, deposit interest rate, exchange rate, and income gap between the rich and poor significantly impact determining remittance. However, empirical studies from Tabit and Moussir (2016) from a panel data of 22 developing countries show that macroeconomics tools like official exchange rate, interest rate, and the migrant stock in the country of origin do not have a strong effect on remittances but show how migrants host, and countries of origin GDP, inflation, and financial development with institutional quality have a stronger impact on remittance. The role of financial institutions and its significant role in bilateral trade and monetary integration process is further buttressed by how financial institutions' differences determine if monetary integration will increase trade Alferi (2021) . The study found a negative outcome for both variables that affects monetary integration. Also, using cumulative deposits and credit issuance as financial development indicators, Aggarwal et al. (2006; 2011) finds a positive correlation between remittance flows and cumulative deposits.

On a micro level, Anneke (2014) uses a multinomial logit mode to ascertain migrants' choices of remittance channels. Countries' heterogeneity, costs, conveniences, and personal characteristic are statistically significant in the choice of channels in a study survey on 1680 migrants living in the Netherlands. It also discovers that people who use internet services frequently are likely to use banking services rather than informal routes to send funds to their respective countries.

There is a paradigm shift from economic and political factors to institutional channels and factor as major determinants of remittance. According to Brown (2011), remittances are influenced by multiple factors which vary temporally and geographically. Studies have shown that what affects remittance in receiving countries differs across regions, but it is seen that financial system and its development cut across regions and is a vital tool in determining remittance. The financial system is characterized by several components like the infrastructure (such as the legal, payment, settlement, and accounting systems), markets (stock, equity&bond, foreign exchange, and derivatives), and institutions (banks, insurance companies, pension funds, and institutional investors). Cihak et al. (2012), the extent of financial system is categorically based on its access (degree to which people can use financial services), depth, efficiency, and stability. Across cross country, this measure of financial system defers and are similar to each other, affecting remittance. Furthermore, Kosse & Vermeulen (2014) present evidence role in Netherlands that emphasizes that migrants are more likely to use banking services in sending money to their home countries compared to other informal means. Cost, availability of remittance options (innovative solution), and convenience are significant determinants in making choices. Mundaca (2009) agrees that the degree of financial market development indicator and intermediary was discovered to be statistically significant to remittance using GMM estimate. It is concluded that growth in depth and access to financial services will lead to better use of remittance across regions, stimulating growth.

3. METHODOLOGY

DATA SOURCE

To investigate the impact of financial similarities across Europe on remittance using structural gravity model, data will be sourced from the World Bank development dataset to capture values related to financial institutions' access, depth, and stability across Europe. Remittance matrix and migration data are sourced from the World Bank bilateral remittance matrix, while Gravity Bilateral Data of 27 European countries is sourced from CEPII: Centre d'Etudes Prospectives et d'Informations Internationales database. Considering all the data available from different sources, the time frame of the thesis analysis spans from 2010 to 2020.

THEORETICAL MODEL

Gravity model mimics Newton's law of gravity which expresses how two identities attract each other based on proportional force related to the product of their mass and negatively related to the square of distance between both identities. According to Baier & Standaert (2020), the gravity model has become a decisive computing tool in international economics. It demonstrates how bilateral exchange between two countries is proportional to their economic size and inversely related to trade barriers like language, distance, currency, etc.

LIMITATIONS OF THE TRADITIONAL MODEL AND USE OF THE STRUCTURAL GRAVITY MODEL

This model is, however, not perfect, according to Larch and Yarch (2016), it has its challenges and criticism. Some variables, like multilateralism cannot be fully observed by policymakers, employing time-fixed effects to capture the dynamics will help to solve this, and a reduced log-linear form will be explored in this study.

$$\ln X_{ij,t} = \ln E_{j,t} + \ln Y_t - \ln Y_{i,t} + (i - \sigma) \ln t_{ij,t} - (1 - \sigma) \ln P_{j,t} - (1 - \sigma) \ln \Pi_{i,t} + \epsilon_{ij,t}$$

Also the presence of no trade cost flow between importer and exporter representing Zero is often dropped by estimation sample technique when the reduce form is employ. From Tinbergen (1962), the OLS approach drops these large samples of zero value. Also, to reduce biasedness in gravity estimate when the reduced log form is used as trade data is plunged to heteroskedastic, the PPLM estimator will be employed as suggested by Larch and Yotov (2016).

In addition, to solve endogeneity issues that might arise from financial similarity variables having an unobservable connection with the error term in the gravity regressions, I will employ paired fixed effect, as Larch and Yotov (2016) recommended.

Therefore, the model will include respective countries' time effects, pair-effect between sending and receiving countries involved, impact of the standard variables represented in the structural gravity model, and log values of financial similarities

MODEL SPECIFICATION

The estimated models can be related to those which have been suggested by Yotov et al. (2016), Alfieri (2021) as well as Alfieri & Sinitsyna (2022) and can be summarized as follows:

$$BR_{i,j,t} = \exp[\mu_{i,j} + \pi_{it} + \chi_{j,t} + \eta_1 SV_{i,j,t} + \eta_2 FS_{i,j,t}] \times e_{i,j,t} \dots\dots\dots(8)$$

$BR_{i,j,t}$ represents the bilateral remittances from country i to country j at time t , $SV_{i,j,t}$ is a vector which represents the standard variables in the structural gravity model (involving the GDP of the country of origin, the GDP of the country of destination, population, monetary variables, borders in common, and distance), and FS relates to the natural logs of measurements involving financial similarities. Furthermore, $\mu_{i,j}$ covers the pair-fixed effects amongst countries i and j , the pair-fixed effects capture any time-invariant unobserved factors that affect bilateral remittance between each pair of countries, such as distance, cultural similarities, or political differences. π_{it} stands for the country-time effects for country i at time t , while $\chi_{j,t}$ are relates to the country-time effects for country j at time t , and $e_{i,j,t}$ is the error period. It can be seen that depending on the specification, some variables are dropped by PPML estimations.

The monetary and EU membership variables that will be considered include:

- the standard currency union dummy to indicate the euro-area membership of pair countries;
- the dummies for euro-area membership in terms of countries of origin and destination;
- the dummies for a fixed exchange rate for countries of origin and destination and the pair dummy if both have fixed exchange rate regimes;
- The membership of EU in terms of countries of origin or destination, and if both they are part of the EU.

These monetary variables are sourced from the European Central Bank and IMF annual report on Exchange Arrangement

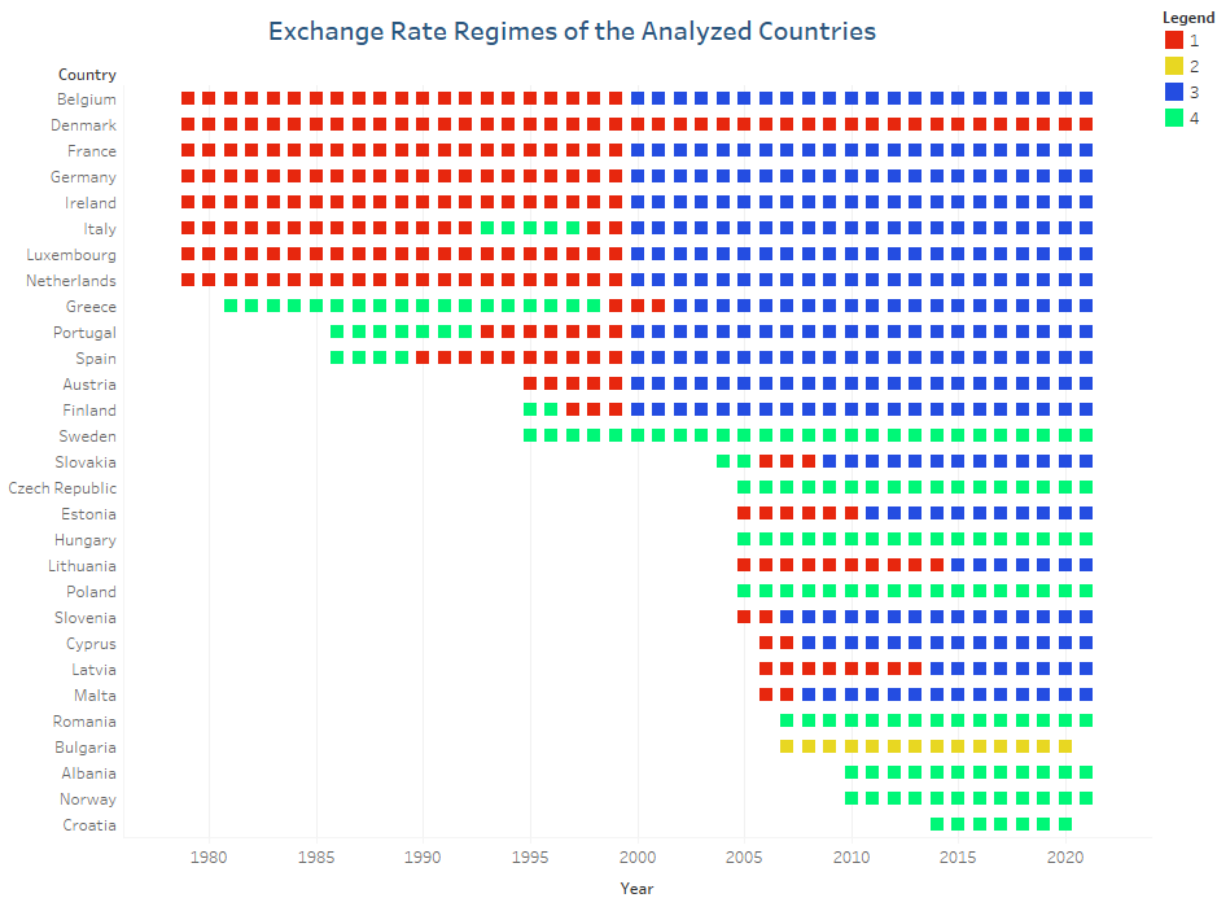


Fig 1: Exchange rate regimes of the analyzed countries

Source: ECB (2021)

- Color 1**= Analysed countries with its currency pegged to the European Currency Unit/euro via ERM/ERM II
- Color 2**=Analysed countries outside the ERM/ERM II with a fixed exchange rate regime
- Color 3** = Analysed countries with the euro as its currency
- Color 4** = Analysed countries or countries outside the ERM/ERM II with a flexible exchange rate regime (free floating or managed float)

In addition, I investigate the financial similarity using the methodology called Euclidean distance specified by Alfieri (2021). Financial institutions similarity is calculated using panel data from World Bank Global Financial Development database (2020)

$$SF = \sqrt{\sum_{i=1}^n (q_{i,t} - p_{i,t})^2} \dots\dots\dots(9)$$

Where SF means Similarities in Financial institutions, $q_{i,t}$ and $p_{i,t}$ are the values of indicator taken into account from the World bank global financial development database. According to Cihak et al. (2012), these indicators are based on access, depth, stability, and efficiency. The larger the Euclidean distance, the more difference in financial institution system and vice-versa.

Specific variables from the World Financial Database to determine the similarity of financial institutions are observable at Table (B)

TABLE 1: Financial Institution indicators

Access	Depth	Efficiency	Stability
gfddai02: Bank branches per 100,000 adults	gfdddi01: Private credit by deposit money banks to GDP (%)	gfddei01: Bank net interest margin (%)	gfddsi01: Bank Z-score
gfddai25: ATMs per 100,000 adults	gfdddi02: Deposit money banks' assets to GDP (%)	gfddei04: Bank overhead costs to total assets (%)	gfddsi06: Liquid assets to deposits and short term funding (%)

Source: World Bank Financial Development Database

Fig 2 shows a downward trend in financial system similarity between Bulgaria and Germany. This indicates a low similarity in financial systems between the two countries.

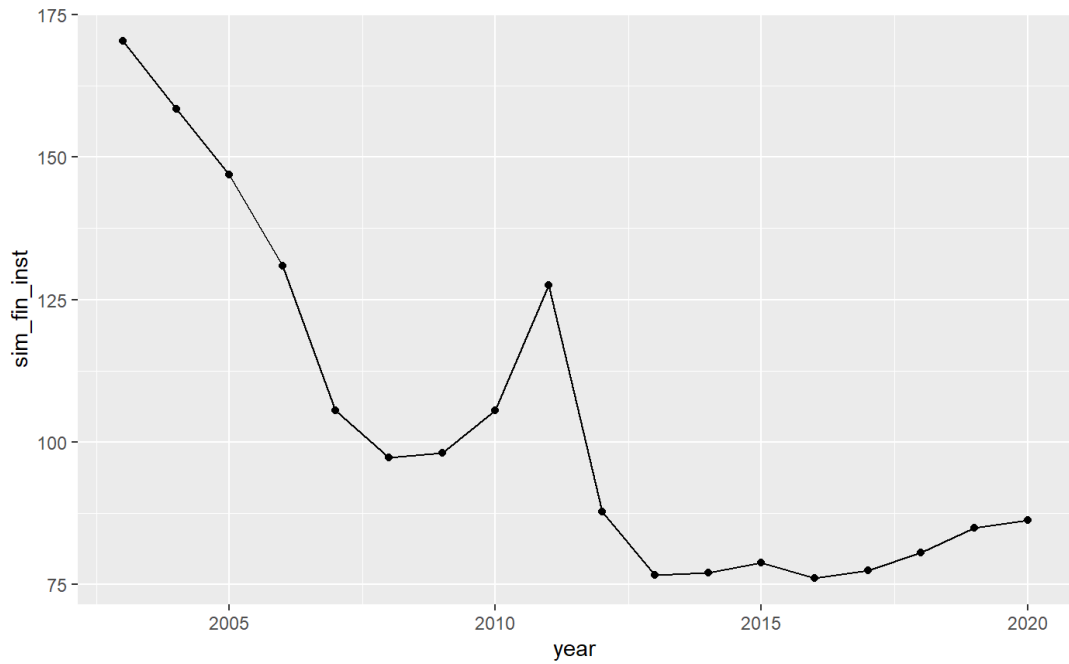


Fig 2: Example of Financial similarity: Bulgaria and Germany

Source: Author's calculations

Fig 3 shows a cyclical trend and downward movement in similarity in financial institution between Estonia and Denmark

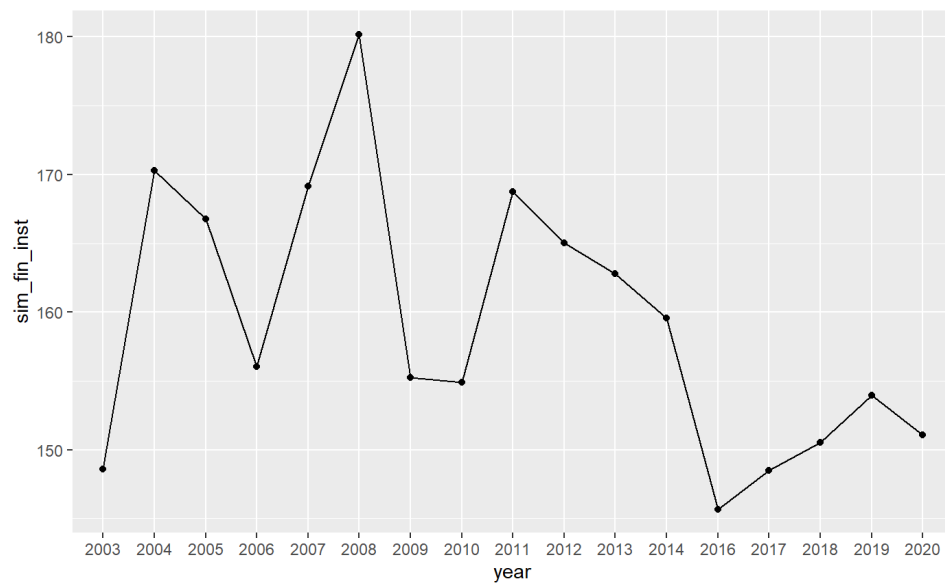


Fig 3: Example of Financial similarity: Estonia and Denmark

Source: Author's calculations

Fig 4 shows a cyclical trend and upward movement in similarity in financial institution between Italy and Lithuania



Fig 4: Example of Financial similarity Italy and Lithuania

Source: Author's calculations

4. RESULTS

Table 2 depicts the estimations of the effect of the similarity of financial institutions based on structural gravity model using Poisson Pseudo Maximum Likelihood (PPLM). GDP_d and GDP_o represent GDP of sending and receiving countries in exponential form. $Distw_{arithm}$ is population-weighted distance between most populated cities in kilometers using the CES formulation, with the parameter θ equal to -1, while $contig$ is a dummy representing the presence of a common border between paired countries. EU_o and EU_d are dummies representing EU members for sending and receiving countries, while EU_{pairs} is a dummy indicating whether both paired countries are EU members. $Euro_d$ and $Euro_o$ indicate if the sending and receiving countries are part of the euro area, while $Euro_{paired}$ if both paired countries are members of the euro area or not. $Fixed_{paired}$, $Fixed_o$, and $Fixed_d$ follow the same pattern for a fixed exchange monetary system, and if both paired countries operate such together. Same pattern applies to the floating exchange rate, while SFI represents Similarity in financial institutions.

From the table, SF is positive and insignificant. structural gravity variables like GDP, distance, borders, and $contig$ are significant at 1%. Dummies variables like $Euro_d$ (receiving countries in the Euro area) signal a significant positive impact on remittance, $Euro_o$ (sending countries in the Euro area) is insignificant. EU_o (Sending countries in the EU) is negative compared to EU_d (receiving countries in European Union), which is positive and both significant at 1% and 5%, respectively. This means financial system of receiving countries in the European Union aid remittance compared to those not in the EU region. All exchange rate systems have significant impacts but to different degrees. Floating exchange of sending countries ($Floatingrate_o$) and Fixed exchange system of sending ($Fixedrate_o$) result in 1% significant impact on remittance but in different directions. $Fixedrate_o$ is negative, while $Floating_o$ is positive. For sending countries, $fixedrate_o$ is insignificant, while $floatrate_o$ is significant. $Contig$ (Border) is

positive and significant at 1%, while Distw_arithm (distance) is negative and significant at 1% also.

Table 2: PPML without PairFE and country-time effects with similarity of financial institutions

	PPLM (1)	PPLM (2)	PPLM (3)	PPLM (4)	PPLM (5)	PPLM (6)	PPLM (7)	PPLM (8)
Sim_fin_inst	-.023 (.139)	.108 (.153)	.133 (.158)	.043 (.136)	-0.023 (.139)	.044 (.136)	.045 (.136)	.007 (.142)
Euro_o		.303 (.216)						
Euro_d		.455** (.202)						
PairedEuro			.441** (.204)					
Gdp_o	.759*** (.079)	.718*** (.083)	.714*** (.076)	.734*** (.079)	.759*** (.077)	.734*** (.078)	.740*** (.077)	.782*** (.080)
Gdp_d	.490*** (.072)	.439*** (.066)	.452*** (.066)	.473*** (.070)	.489*** (.070)	.473*** (.070)	.470*** (.069)	.468*** (.067)
Distw_arithm	-.001*** (.0002)	-.001*** (.0002)	-.001*** (.0002)	-.001*** (.0002)	-.001*** (.0002)	-.001*** (.0002)	-.001*** (.0002)	-.001*** (.0002)
contig	1.084*** (.233)	1.027*** (.231)	1.048*** (.229)	1.066*** (.231)	1.084*** (.233)	1.066*** (.231)	1.067*** (.230)	1.088*** (.228)
Fixedrate_o				-0.988** * (.248)				
Fixedrate_d				-.580 (.341)				
PairedFixedrate					-.187 (.446)			
Floatingrate_o						.988*** (.247)		
Floatingrate_d						.580* (.341)		
PairedFlostrate							.740*** (.241)	
EU_o								-.240 (.193)
EU_d								.579** (.256)
PairFEs	NO	NO	NO	NO	NO	NO	NO	NO
Country_time Es	NO	NO	NO	NO	NO	NO	NO	NO
N	7330	7330	7330	7330	7330	7330	7330	7330
R ²	.475	.490	.486	.488	.475	.488	.489	.503

Note: Correlations within the pairs are taken into account, by clustering the standard errors by country pair. *p<0.1;

p<0.05; *p<0.01

Table 3 depicts the estimations of the effect of the similarity of financial institutions based on PPLM structural gravity model with pair fixed effect consideration. This estimation differs from Table 1 as it is robust in considering unobserved factor effects that is particular to each country when they are paired together. Table 2 shows that SFI(similarity in Financial institution) is obviously positive but insignificant and different to Table B regarding *GDP_o* and *GDP_d*. *GDP_o* is negative and insignificant in contribution to remittance, while *GDP_d* is positive and significant at 1%. The inclusion of dummy variables like Euro area and exchange rate system make it significant at 5% and 1%, respectively, *Fixedrate_o* and *Floating_o* is similar to the occurrence in Table B. Both are significant at 0.1% but take different directions. *Fixedrate_o* is negative while *floating_o* is positive while both exchange system in receiving country is insignificant. *EU_d* (receiving countries in the European Union) is significant, while *EU_o* is insignificant.

Table 3: PPML Pair fixed effects estimations with similarity of financial institutions

	PPLM (1)	PPLM (2)	PPLM (3)	PPLM (4)	PPLM (5)	PPLM (6)	PPLM (7)	PPLM (8)
Sim_fin_inst	.049 (.037)	.047 (.038)	.048 (.037)	.048 (.038)	.049 (.037)	.049 (.037)	.049 (.038)	0.49 (.037)
Euro_o								0.322*** (.093)
Euro_d								-.111 (.124)
Gdp_o	.059 (.176)	-.054 (.177)	-.052 (.177)	-0.61 (.176)	-0.058 (.176)	-0.061 (.176)	-0.057 (.176)	-0.61 (.176)
Gdp_d	0.299* (.157)	.294* (.157)	.292* (.158)	.310** (.157)	.297 (.157)	.310** (.157)	.308* (.156)	.310* (.157)
Fixedrate_o				-.322*** (.093)				
Fixedrate_d				-0.111 (.125)				
PairedFixedrate					-0.177 (.115)			
Flostrate_o						.323*** (.094)		
Flostrate_d						-0.111 (.124)		
PairedFlostrate							-0.072 (.125)	
EU_o			.264 (.253)					
EU_d			-0.111* (.058)					
EU_Pairs		-.115** (.049)						
PairFEs	YES	YES	YES	YES	YES	YES	YES	YES
Country-time Es	NO	NO	NO	NO	NO	NO	NO	NO
N	6856	6856	6856	6856	6856	6856	6856	6856
R ²	.977	.977	.977	.977	.977	.977	.977	.977

Note: Correlations within the pairs are taken into account, by clustering the standard errors by country pair. *p<0.1; **p<0.05; ***p<0.01.

Table 4 shows the results with paired fixed effects and country time effects. SFI shows a negative and insignificant effect.

Table 4: PPML Pair fixed effects and country time effect estimations with similarity of financial institutions

	PPLM (1)
Sim_fin_inst	-0.0028 (.022)
PairFEs	YES
Country-time Es	YES
<i>N</i>	6777
<i>R</i> ²	.985

Note: Correlations within the pairs are taken into account, by clustering the standard errors by country pair. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

5. ROBUSTNESS CHECKS

- **COMPARISON BEFORE COVID**

Lack of bilateral remittance data (2019-2020), during covid-19 is resolved with interpolation, two different periods is compared for an in-depth analysis. Panel data between 2010-2017 period and 2010-2020 period are compared together. Table 5 shows that both results are similar in directions and significant effects but different in degree of impact.

Table 5: PPML Pair fixed effects and country time effect estimations with similarity of financial institutions between 2010-2017 and 2010-2020

Variables	2010-2017	2010-2020
Sim_fin_inst	-0.021 (.053)	-0.0028 (.022)
PairFEs	YES	YES
Country-time Es	YES	YES
N	4,848	6777
R2	.984	.985

Note: standard errors are clustered by country pair to account for any intra-cluster correlations. *p<0.1; **p<0.05; ***p<0.01

- **SOLVING PAIR FIXED EFFECT SHORTCOMING: INTERVAL ESTIMATION**

Pair fixed account for time-invariant unobserved factor and also solve reverse causality, a scenario where the dependent variables are determined by another variable in the model resulting in endogeneity. Pair Fixed estimates from pooled panel data of consecutive years are criticized because the adjustment between the dependent and independent variable can not be captured within specific years, it takes time for the effect of policy or initiative to be realized. Four years interval estimation of 2010-2017 pooled data is employed, as Larch and Yotov (2016) suggested. We have (2010-2013) and (2014-2017) intervals.

From Table 6, *SF* is positive and insignificant for 2010-2013 interval. while factors like GPD in receiving countries are significant. Dummy variables like *Euro_o*, (sending countries in Euro area),

EU_d (receiving countries in the European Union) are significant when pair fixed effect is applied only (See Appendix A).

For 2014-2017 interval, *SF* is negative and remains insignificant. Dummy variables like the exchange rate system play a significant role when pair fixed effect is applied only. Fixed-rate and floating rate in receiving countries' result is significant. This could have been the effect of policies in the exchange rate system in receiving countries (See Appendix B).

Table 6: PPML Pair fixed effects and country time effect estimations with yearly intervals

Variables	2010-2013	2014-2017
Sim_fin_inst	0.053 (.082)	-.0002 (.0006)
PairFEs	YES	YES
Country-time Es	YES	YES
<i>N</i>	2468	2344
<i>R</i> ²	.984	.990

Note: standard errors are clustered by country pair to account for any intra-cluster correlations. **p*<0.1; ***p*<0.05; ****p*<0.01

6. CONCLUSION AND DISCUSSION

Although Tabit & Moussir (2016) link financial development as a major panacea for remittance and increasing growth in 22 developing countries and empirical study by Alferi & Sinitsyna (2022) on migrants' remittances in the Nordic-Baltic region using the gravity model to explore how financial markets and institution similarity in the region impact bilateral remittance significantly, the heterogeneous region and large part of this study data comprising member of European union make the result of this study differs. Arranz et al. (2006) used GMM estimate to control for endogeneity, which demonstrates a negative interaction between financial development and remittances in 100 countries. The study shows how remittances contributed to growth in less developed financial systems and how developed financial system is less important to remittance. These results and findings show how regions differ.

In Table 3, we further saw how dummies like *EU_d* (analyzed receiving countries in EU member) show a negative trend for remittance. This supports (Fagiolo & Rughi, 2021) study on how altruism motive of remittance in a larger income at home would decrease remittance flows. That is, when a country of origin tends to have a more flourishing economy, migrants send less money home.

Results from this empirical study show how similarity in financial institutions is insignificant to bilateral remittances in Europe and how exchange rate impact remittance significantly. This study will add to the body of literature, and answers questions related to approach of financial institutions of paired countries in Europe regarding if onboarding more users and access to financial products, increasing banking efficiency, and financial strength to mitigate shocks, etc. does have an impact on remittance.

However, this research finding does not capture information on financial market variables like investment securities, stocks, treasury, and bonds, mobile money transfers. Moreover, it cannot

be excluded that different indicators of the financial institutions' aspects could not sort out different results. Hence, further analysis should take into account the limitations of the data. Respective countries like Belarus and Romania are not captured in this research finding due to the unavailability of data. Finally, trade literature explains the limit of using dummy variables for monetary integration and exchange rate regimes. Further analyses should replace them with pair time-variant effects in order to be able to implement the same control checks as in the estimations with financial similarity of institutions (Baldwin & Taglioni,2006).

This paper employs an international framework model for policymakers in a multinational environment by providing helpful insight on the importance of macroeconomic variables like GDP, border, distance and exchange rate system, etc., in solving the increasing demand for skilled workers and improving remittance issues.

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APPENDIX

APPENDIX A: PPML (2010-2013) Interval Pair fixed effects estimations

	PPLM (1)	PPLM (2)	PPLM (3)	PPLM (4)	PPLM (5)	PPLM (6)	PPLM (7)
Sim_fin_inst	.115 (.089)	.107 (.089)	.107 (.089)	.115 (.089)	.115 (.089)	.115 (.089)	0.115 (.089)
Euro_o							.324*** (.247)
Euro_d							.057 (.097)
PairedEuro							
Gdp_o	-.052 (.317)	-.016 (.318)	-.005 (.319)	-.054 (.317)	-.052 (.317)	-0.54 (.317)	-.054 (.317)
Gdp_d	1.415*** (.377)	1.388*** (.378)	1.378*** (.378)	1.41*** (.379)	1.41** * (.377)	1.41*** (.379)	1.411*** (.379)
Fixedrate_o				-.324 (.247)			
Fixedrate_d				-.057 (.097)			
PairedFixedrate					.060 (.062)		
Flostrate_o						.324 (.248)	
Flostrate_d						.057 (.097)	
EU_o			.227 (.265)				
EU_d			-.345*** (.074)				
EU_Pairs		-.328*** (.075)					
PairFEs	YES	YES	YES	YES	YES	YES	YES
Country-time Es	NO	NO	NO	NO	NO	NO	NO
N	2573	2573	2573	2573	2573	2573	2573
R ²	.973	.976	.973	.973	.975	.973	.973

APPENDIX B: PPML (2014-2017) interval Pair fixed effects estimations

	PPLM (1)	PPLM (2)	PPLM (3)	PPLM (4)	PPLM (5)
Sim_fin_inst	-.040 (.039)	-.037 (.037)	-.40 (.039)	-.037 (.037)	-.037 (.037)
Euro_o					.173 (.120)
Euro_d					.570*** (.014)
Gdp_o	.211 (.167)	-.203 (.152)	-.209 (.166)	-.203 (.151)	-.203 (.152)
Gdp_d	.258 (.169)	.234 (.158)	.259 (.169)	.234 (.159)	.234 (.158)
Fixedrate_o		-.173 (.120)			
Fixedrate_d		-.570** * (.014)			
PairedFixedrate			.557** * (.038)		
Floatrate_o				.173 (.120)	
Floatrate_d				-.570*** (.014)	
PairFEs	YES	YES	YES	YES	YES
Country-time Es	NO	NO	NO	NO	NO
N	2344	2344	2344	2344	2344
R ²	.988	.988	.988	.988	.988

APPENDIX C: Analysed European Countries

Albania	Denmark	Italy	Portugal
Austria	Estonia	Latvia	Hungary
Belgium	Finland	Lithuania	Luxemborg
Bulgaria	France	Moldovia	Spain
Czech	Greece	Netherland	Sweden
Croatia	Germany	Norway	Switzerland
Cyrups	Ireland	Poland	

FINANTSASUTUSED, VALUUTAKURSI REŽIIMID JA KAHEPOOLNE RAHVUSVAHELINE RAHAÜLEKANNE EUROOPAS

Käesolev uuring analüüsib finantsasutuste sarnasuse mõju 27 Euroopa riigi vahelistele rahaülekannetele struktuurse gravitatsioonimudeli abil aastatel 2010–2020. Andmed koosnevad aastaste paneelandmete kogumist, mis sisaldavad maailmapanga finantsandmeid, bilateraalseid rahaülekannete maatriksit ja gravitatsiooniga seotud bilateraalseid andmeid. Empiirilises analüüsis kasutatakse Poissoni pseudomaksimaalse tõenäosuse meetodil (PPML) hinnanguid, paari fikseeritud mõjude mõõtmeid ja riigi-aja mõjusid, mis võtavad arvesse endogeensust. Empiiriline analüüs näitab, et finantsasutuste sarnasus Euroopa riikide vahel ei avalda märkimisväärset mõju rahaülekannetele. Siiski näitab uuring, et dummimuutujad nagu saatvate riikide valuutakursi süsteemid, saatvad riigid Euroala piirkonnas ja Euroopa Liidu vastuvõtvad riigid ning paarilised liikmed avaldavad bilateraalsetele rahaülekannetele olulist mõju. Piir, SKP ja kaugus avaldavad samuti oodatavat märkimisväärset mõju. Lisaks kaaluti tugevuskontrolle võimalike Covid-19 mõjude kontrollimiseks.

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