Remittance Decay among Polish Emigrants in the UK, Germany, Netherlands and Ireland: An Age-Period-Cohort Approach

Abstract

Using data on Polish migrants living in four destinations within the European Union (i.e., Germany, the United Kingdom, Ireland, and the Netherlands), collected between the years 2008-2018, we examine the remittance decay hypothesis. We extend the literature on this topic in two ways. First, we use a variation of an age-period-cohort statistical model to disentangle duration effects from those of migration cohort and period, finding that duration sometimes operates independently of the other two effects. Second, we attempt to understand the decay effect in the context of the various destinations we study and find evidence for it in Germany and the United Kingdom, but only mixed results in Ireland and none in the Netherlands. We reason those factors associated with the movement and settlement of country-specific migration streams (e.g., the maturation of those streams or concentration of migration within time windows) influence the formation of the decay effect.

JEL Codes: J24, J22

Keywords: Remittance Decay, Poland, Age-Period-Cohort, Intra-EU Migration

Introduction

Migrant remittances, which refer to cash earnings or in-kind transfers sent from migrants back to their origin country, represent a significant source of foreign capital flow, rivaling that of official development assistance worldwide (Zardoub and Sboui 2021). While remittances are an important source of capital for many migration-origin households, a sizeable literature has documented the so-called *remittance decay effect*, or the tendency for remittance levels to decline over time as migrants' commitment and attachment to relatives and the home country weakens (Makina and Masenge 2015; Poirine and Dropsy 2019). Given the volume of capital flowing across national borders, declines in remittances can have a substantial impact on the economies of migration-origin countries. Yet, questions remain about how this decay effect operates, particularly in isolation from related factors that may plausibly be driving remittance patterns, such as period effects associated with such things as economic shocks, migration cohort effects which shape the nature of migration streams connecting the origin and destination countries, and migration destination contextual factors more generally.

In this paper, we attempt to fill this gap in the literature by disentangling the effect of migration duration from cohort and period influences using a methodology originally designed to separate age, period, and cohort effects. We also aim to understand how the decay effect operates within different national contexts. We do so using repeat cross-sectional microdata on Polish migrants living in four European Union (EU) destinations (i.e., the United Kingdom [UK], Ireland, the Netherlands, and Germany). The datasets contained extensive information about remittance-sending, including the amount sent by migrants to their country of origin, which allowed us to verify the remittance decay hypotheses both in terms of frequency of transfers and in terms of amount transferred. Since EU accession, Poland has become one of the preeminent migration-sending countries within the EU, making this an important study population. We find that the decay effect seems to operate independently of migration cohort and period effects in countries with long-established Polish migration streams (i.e., the UK and Germany), but less so in countries with relatively more recent migration (the Netherlands) or whose migration window was shortened by the global financial crisis of 2008 (Ireland).

Our data are from a time following Poland's EU accession and span a period between the initial year of the economic and financial crisis of 2008 and the year of the Covid-19 pandemic. The

freedom of movement afforded by EU membership has given Poles the opportunity to travel and work abroad in other EU member states, and money that they have repatriated to Poland has had a significant impact on Poland's economy (Chmielewska 2015). Although remittance inflows there have declined since their peak during the 2008 financial crisis, they grew steadily since (and even somewhat before) EU accession (World Bank 2022) and made up an important component of the country's overall transition toward a market economy since the fall of the Soviet Union. They have therefore been instrumental in facilitating EU integration by reducing economic inequalities between Poland, a former communist state, and the more established member states of the European Union. In what follows, we review pertinent theories of remittances and identify areas in which our research fills gaps in this literature. We focus on contextual factors related to migration duration (such as period and cohort effects) that are often neglected in discussions of remittance decay. We then describe our setting (Polish migration to four EU destinations), methodology, results, and conclusions.

Background

Microeconomic theories of migrant remittances have been formulated from both demand- and supply-side perspectives. While our data come from the latter (i.e., migration destinations), we nonetheless discuss both perspectives, because they are interrelated, and thus pertinent to a comprehensive understanding of the phenomenon.

Demand-side theories are usually built around three motives for sending remittances: altruism, self-interest, and so-called "tempered altruism" or "enlightened self-interest" (see Hagen-Zanker and Siegel 2007 for an overview). Altruism refers to the idea that migrants derive utility from the consumption of their families, and thus respond to factors such as poverty, exogenous shocks, or broadly to the origin household's wellbeing. Remittances motivated by self-interest include bequests of origin household assets (such as land, property, livestock, etc.) that act as enticements for remittances (de la Brière et al. 2002; Hoddinot 1994). Tempered altruism, an idea associated with the "New Economics of (Labor) Migration" (Lucas and Stark 1985), represents a middle ground between altruism/self-interest approaches. From this perspective, migrants and their households act as corporate units, jointly making – at the household level – decisions about migration and remittances. Migrants play the role of target earners (Piori 1979), responding to

market failures (e.g., in credit, insurance, and futures markets) by moving to areas with a different risk profile (non-correlated labor market) from that of origin. Doing so creates an opportunity for investment (e.g., in housing, small business, agricultural mechanization) and diversifies risk. Migration and remittances, furthermore, are seen as part of a self-enforcing mutually-beneficial implicit contract, which can take the form of coinsurance (in which migrants protect their origin household from economic shocks/downturns in exchange for a return option or for household assistance from risks such as unemployment), loan repayment (in which remittances are repayment for investments in migrants' education; see Brown and Poirine 2005), or exchange of service (whereby, e.g., remittances are payment for childcare provided by parents of absent migrants to their grandchildren; see Cox (1987)).

Supply-side theories include the *remittance decay hypothesis,* which describes, as noted above, the decline of remittance level with the passage of time at the destination. Mechanisms usually invoked in explaining this phenomenon include migrants' greater integration and earnings in the host society, which make implicit insurance from the risk of unemployment less salient (Cohen 2011). Such explanations also rest on the notion that it takes time to get established at the destination to have the ability to send money back, in combination with the idea that, over time, weakening altruism with loosening of family bonds occurs because of reunification with family members at destination (thus representing less need to send back money) (Poirine 2006). Empirical evidence of the decay effect is mixed (Carling 2008), with some studies finding no effect (cf. Brown and Poirine 2005) and others finding evidence of an inverted U-shaped time pattern: remittances increase and peak within the first 6-8 years of migration, then gradually decline (cf. Makina and Masenge 2015; Poirine and Dropsy 2019).

Given the mixed findings in the literature, clearly, a need exists to better comprehend the circumstances under which the remittance decay effect operates. In what follows we consider how insights from the life course perspective, a theoretical framework centered on understanding links between the unfolding of life histories within geographical place and historical time, can be used to help frame our analysis of the remittance decay effect. Specifically, we use insights from the so-called age-period-cohort conundrum (see Glenn 2003), which refers to the inherent challenges of disentangling the confounding influences of the process of ageing (i.e., age effect), the circumstance of being born into a particular birth cohort (i.e., cohort effect), and influence of

calendar time (period effects). In this framework an *age effect* refers to an aging-related developmental change, that occurs to all cohort members as they experience aging over time. Since the demographic event that defines migration is not birth, but the movement from country of origin to destination country, the aging effect in this case means the increasing number of years spent in the destination country. A *period effects* results from factors that are unique to a particular time period and bring about similar changes across all ages. An example of a *period effect* in the context of this research can be the change in the regulations introduced in a particular year and covering all emigrants. A *cohort effect* characterizes changes that are unique to a group of people who experience some event at the same time (a cohort), and which stays with that group as they get older. In the context of Polish migration, it can be seen as being a characteristic of waves of Poles that moved to particular countries in similar moments in time. Such an effect (not in the context of migration) is illustrated by Elder's (1974) acclaimed study of the influence of the Great Depression on life outcomes, in which historical effects on life course trajectories differentiated the life patterns of successive birth cohorts.

Applying this logic to the case of the remittance decay effect, what may, at least in part, account for the mixed results in the literature is the inherent challenge of establishing the *ceteris paribus* effect of migration duration in econometric analysis. Specifically, it is difficult to disentangle factors related to migration duration (in this circumstance akin to "age" in the age-period-cohort framework) from time (period, calendar year) and migration cohort (the group of people who in a certain moment in time experienced migration to a specific country for the first time). As an illustration, consider this problem from the perspective of a migrant contemplating sending remittances in the year 2010. Suppose this migrant moved to a particular destination in the year 2006 (and thus has a migration duration of 4 years). In this scenario, it is unclear whether the effect of duration at destination on remittance-sending is due to: a) factors related to the year in which the migrant is contemplating sending remittances (in this case 2010, representing a period effect, b) factors related to the timing of migration (i.e., membership in a particular – in this case 2006 – migration cohort), or c) the actual duration of residence (the duration effect, which in this case is 4 years). Note that these three factors are linearly dependent (i.e., duration is measured as the difference between the year of migration and the year of survey); our empirical approach thus attempts to parse these three influences to isolate the effect of duration from the other two factors. Indeed, while some attempts in this direction have already been made (e.g., Amuedo-Dorantes and

Pozo 2006) analysis of Mexican migrants in the United States successfully differentiated between the period of entry and length of residence), to our knowledge no study has heretofore successfully fully disentangled duration from both these other influences. This is an important gap in the empirical literature because duration effects on remittances may reflect underlying differences in characteristics of migrants moving in different years (i.e., migration cohorts) or be influenced by economic fluctuations related to period factors (such as, e.g., the 2008-2009 financial crisis).

Considering first the potential independent effects of duration, migration cohort, and time period, if migration duration is akin to an aging effect, it ought to occur over time as migrants spend more time in the destination. Our first hypothesis (Hypothesis 1), consistent with the literature, therefore, is that the duration effect should be negatively related to remittance sending. Moreover, although existing literature makes it challenging to predict the remittance behavior of specific migration cohorts or in particular time periods, we can nonetheless attempt to make some generalizations. Starting with period effects, insofar as past literature has described altruistic and risk-diversifying motives for sending remittances (Hoddinot 1994; Lucas and Stark 1985), we might expect that years around the time of the 2008 financial crisis should be associated with higher remittances relative to other years in all the destination countries that we study (Hypothesis 2). There may also be other, country-specific, period effects that are related to higher or lower remittance levels, such as the year 2011 in Germany, when certain migration restrictions were lifted, or the 2016 Brexit referendum in the UK (we return to these points below). In terms of migration cohort effects, we might expect to find some differences that are an artefact of the nature of our data, which captures the prime working years of younger cohorts who migrated more recently (i.e., 2008 or later; who are therefore more likely to be earning and sending remittances) but not older cohorts who migrated in the past.

Aside from how these three factors may operate independently of one another we might imagine that the decay effect is confounded by historical circumstances (such as, e.g., barriers to movement or financial crises) that shape the window of opportunity for migration arrival (or need for sending remittances), which also differentiates migrants with respect to migration cohort timing (and, therefore, by extension to the duration of residence). We might reason, for example, that a decay effect would fail to materialize in migration streams characterized by more compressed migration windows (or perhaps ones characterized by the relative absence of long-term settlers)

(Hypothesis 3). Put differently, we would not anticipate a decay effect in a relatively immature migration stream that only developed within a short time, but rather would expect it in a migration stream with a long history in which a mix of both long- and short-term migrants can be found in the migration destination. As we discuss in more detail below, Polish migrants have had a long history of migration to some EU destinations (e.g., Germany), but a relatively shorter history of migration to other destinations (e.g., the Netherlands). The migration window in Ireland was relatively short, related to the timing of EU accession (in 2004) and the financial crisis (in 2008). Thus, we would anticipate that a remittance decay effect would be more pronounced in the former, but not the latter countries.

While past research has attempted to examine how some contextual features of the migration streams might shape the decay effect, it has largely ignored the mechanisms we identify here and has rather focused more on such aspects as variation in the effect across various ethnic groups residing in the same migration destination. For example, Arun and Ulku (2011) found evidence of remittance decay for Indian and Pakistani migrants in the UK, but not for Bangladeshi migrants. In this regard, our research represents another potential contribution to the literature, in that rather than examining different ethnic groups within the same migration-receiving society, we examine Polish migrants (from the same migration origin society) in different migration-receiving societies. Being mindful of the fact that migration destinations also influenced the nature of selectivity of migrants from Poland (as we discuss below), the results of our research, in a combination with those of other studies, can help adjudicate between factors specific to ethnic groups versus migration destination settings as determinants of the decay effect.

Factors relayed to remittance decay and the confounding influence of migration cohort and time periods notwithstanding, past literature has also identified other micro-determinants of remittances, which, to the extent that our data allow, we treat as control variables in our analysis. For example, gender differences in remittance behavior, when they have been detected, reveal that men generally are more likely to remit and do so in larger amounts (Cai 2003; Carling 2008; Makina 2013; for an exception, see Osaki 2003). However, the difference might reflect gender differences in occupation (Cohen 2011). In fact, migrant women (who often have lower-paying jobs than their male counterparts) have been found to remit more relative to their income compared to men (Holst, Schafer, and Schrooten 2012). There is also mixed evidence of skill level

influencing remittance-sending. With regard to education, studies such as Niimi, Ozden and Schiff (2008) contradict findings such as those of Faini (2007), which found a negative relationship between education level and remittances sent home. However, high skill immigrants are often more welcome by destination countries compared to low skill immigrants, which can translate into lower paying jobs (and lower remittances) for the latter (Cohen 2011). Moreover, related to return plans/intentions, migrants in a more temporary or insecure situation (perhaps related to their legal status) are found to be more likely to remit (Amuedo-Dorantes and Pozo 2006).

Setting

Having described our general theoretical approach, we now turn to the context of Polish migration (i.e., contemporary movement to Europe), both in terms of major contemporary eras of population movement and more specifically regarding migration to the four EU countries that we study.

While the first contemporary era of Polish migration to Europe was during the lead-up to, and fall of, the communist system in the 1980s-1990s (Fihel and Grabowska 2014) EU accession in the year 2004 saw Poland (along with the Czech Republic, Estonia, Cyprus, Lithuania, Hungary, Latvia, Malta, Slovenia, and Slovakia) join the European common market, and ultimately resulted in the largest temporary migration flows in Europe since the end of the WW II. Poland became one of the main sending countries in Central and Eastern Europe (CEE), ranking only behind Romania in terms of the number of citizens residing within the territory of the EU-15 (Fihel and Grabowska 2014). Between 2004 and 2014, it is estimated that 2.4 million people left Poland (Statistics Poland 2015). Most of these migrants moved to the UK or Germany.

With EU accession came freedom of movement, as 'old' EU member states (UK, Sweden, Ireland) opened their labor markets to new EU member states without restriction (Organisciak-Krsykowska 2017). Because of these changes, Poles were entitled to move/settle freely, no longer being bound by residence or work permits. While free movement in all EU countries became possible, most states applied for a transition period to prevent the uncontrolled inflow of immigrant workers and prevent negative influences on their labor markets (e.g., France, Holland, Italy and Germany required work permits for labor migrants). Besides the UK

and Ireland, the sample analyzed in this paper also includes the Netherlands, which fully implemented freedom of movement for Polish citizens in 2008, and Germany, which fully opened its labour market in 2011.

Polish migrants moving within the EU in the few years following EU accession were generally described as young (under 35), relatively high educated, and single. Many found employment in the low-wage or service sector, often experiencing occupational downgrading, which has been attributed in part to low language skills (Grabowska-Lusinska and Oklski 2009; Kaczmarczyk and Okolski 2008; Lubbers and Gijsberts 2016). Some scholars (e.g., Friberg 2012) suggest that Polish migrants start out as target earners, but gradually become transnational commuters or ultimately settle down permanently with their families.

A significant shift in the era of Polish migration to the EU occurred during the Financial Crisis of 2008. According to the estimates of the Polish Central Statistical Office (Statistics Poland 2015) in the years 2008-2010, the number of Polish migrants residing abroad decreased by about 200 thousand but started increasing afterwards reflecting strong economic pull factors. Even as Polish labor market has improved significantly after EU enlargement, the economic downturn did lead to polarization of migration strategies. This was characterized by the departure of more mobile, circular migrants, with those who were less mobile staying and settling (Janicka and Kaczmarczyk 2016).

This larger context of migration notwithstanding, Polish migration to the four migration destinations that we study have noteworthy specific features to which we now turn our attention. Overall, in terms of the characteristics of migrants in the countries in our sample, a National Bank of Poland (Chmielewska, Grzegorz, and Strzelecki 2018) report reveals that in 2016, Polish migrants in the UK and Ireland were most frequently employed in the industrial and restaurant sectors, with the UK having a disproportionate number of managers relative to other countries in our sample. In Ireland, contract and casual work prevailed, constituting over half of the migrant employment across sectors. The Netherlands had the highest proportion of unskilled workers, with a disproportionate share of workers in the agricultural sector, as well as in transportation/warehouse management. Here Polish immigrants had the lowest unemployment rate of any of the countries we study. The labor market of Polish migrants in Germany was the most diversified, with qualified workers (particularly those employed in home health/care)

making up about a third of workers. These differences reflect historical processes shaping migration streams from Poland to each respective country. Geographically close labour markets in Germany and Netherlands attracted relatively low-skilled and short-term migrants, perhaps more oriented to transferring income to their home country, while the liberal and multinational labour market in United Kingdom before brexit offered relatively fast labour market integration prospects for persons with good English language skills and high-demand qualifications. The UK and Ireland were also the first two countries that fully opened labour markets after Poland joined EU in 2004, so they were the first choice for many well-educated graduates of Polish universities that represented the baby boom generation, which had difficulties finding work in Poland at that time (in 2003 the LFS unemployment rate in Poland hit 20% and was almost twice as high among young people).

There are also other features of migrants from Poland that reflect the context of destination countries. Polish migration to Germany has a long history dating back to the late 19th century (Kępińska and Stark 2013; Marks-Bielska et al. 2015) and many of migrants that came to Germany in the twentieth century now have dual (Polish-German) citizenship. Given its geographical proximity, it is unsurprising that the Polish diaspora in Germany is the largest in Europe (and the second largest in the world) and Germany is also a daily commuting work destination for many Polish citizens.

The United Kingdom also has a long history of Polish migration, which well pre-dates Poland's EU accession (Mąkosa 2018; Marks-Bielska et al. 2015) and it is mainly a result of political emigration after WW II during the time of the communist regime in Poland. After EU accession, the UK witnessed the largest single inflow of migrants in its history, Poles being one of the largest ethnic minority groups to move there. Polish migrants were attracted by economic factors, such as higher wages and better employment opportunities. While experiencing a slowdown, growth in migration occurred even during the 2008 financial crisis, especially after 2010. In 2016, about one million Poles were estimated to be living in the UK (Mąkosa 2018) the year that the Brexit referendum (a vote to leave the European Union) took place. A report from the National Bank of Poland (Chmielewska et al. 2018) shows the referendum did not significantly affect Polish migrants plans to return from the UK, with 20 percent of migrants in the sample already having residency status necessary to stay there in that year. However, many

of the migrants in the sample saw the referendum as worsening relations among Poles and British natives.

Ireland, unlike Britain, had no significant history of Polish migration. Nonetheless, the country emerged as major destination for Polish migrants since 2004**.** Poles were by far the largest nationality group among all "new migration system" migrants in Ireland (Krings et al. 2013 report 300,000 recent arrivals). Like in other destinations, Polish migration was driven by a combination of economic push-pull factors, including high unemployment in Poland and higher earnings potential in Ireland.[1] The tight Irish "goldrush" labor market created endless demand for new labor, but two decades of economic growth during the "Celtic Tiger" years ended abruptly in 2008 with the advent of an economic recession. Compared to the UK, the labor market in Ireland became far worse (with the unemployment rate rising to 14% compared to 4.5% in 2005-2007; compare the UK's rate of 5% pre-crisis to 8% in 2008/2009) (Janicka and Kaczmarczyk 2016). Consequently, there was a relatively low inflow of new migrants. Janicka and Kaczmarczyk (2016) report that the unemployment rate of Polish migrants they studied using the EU Labor Force Survey data was only visible in Ireland but not in other countries, underscoring the severity of the situation in Ireland.

Turning to migration to the Netherlands, there was a sharp increase after Poland's EU accession (Kleinepier, de Valk, and van Gaalen 2015; Lubbers and Gijsberts 2016). In the decade following EU accession, Polish nationals became the largest group of immigrant arrivals in the Netherlands. Specifically, according to Statistics Netherlands (2018), there are over 173,000 first or second generation Polish-origin immigrants residing there. Initially, employment permits were required for labor migrants, but such requirements were lifted in May 2007. Polish migration to the Netherlands is characterized by a high return migration rate, with about 60% of those who arrived in past decade leaving the country within 7 years (Statistics Netherlands 2014).

While studies of remittances sent by Polish migrants are limited, regional studies are nonetheless informative of broad trends. From the years 2004 to 2015, 10 countries of Central and Eastern Europe saw total inflow of EUR 166.6 bn from those working abroad (Organisciak-

[1] Indeed in 2004, purchasing power was approximately three times higher in Poland than in Ireland (Cizkowicz and Hołda 2007).

Krsykowska 2017). The highest level of transfers was noted for Poland (EUR 6.43 bn), Romania (EUR 5.76 bn) and Hungary (EUR 1.59 bn). Moreover, micro-level studies, such as Drinkwater and Garapich (2015), found that financial issues are a key determinant of Polish migrants' migration plans in the UK, with migrants who were most likely to send remittances having the most definite migration plans and longer residence duration. Their qualitative interviews indicated that some Polish migrants had little else beyond work and money keeping them in the UK. A National Bank of Poland report (Chmielewska et al. 2018) showed that Polish migrants in the countries included in our study most commonly used remittances for their own consumption needs, with current expenses, followed by savings, housing renovations, and debt repayment making up (in decreasing order of frequency) there main uses. Remittance transfers were most commonly made once a month in all countries (often through bank transfers), although the UK is notable in that transfers there were made less frequently (i.e., every 7-12 months, every 4-6 months) and were more often made in person or through specialty companies like Western Union.

Empirical Strategy

In summary, in this paper we start with the verification of the remittances decay hypothesis using the rich and large survey datasets carried out by National Bank of Poland to assess remittances flows in the years of large emigration waves after Poland's EU accession. The main research aim of this analysis is to verify the remittance decay hypothesis in relation to Polish migrants in four Western European countries. Migration from Poland to Western Europe in the last decades consisted of a mixture of different types of migrants. It started long before Polish EU accession, and even after several years from EU enlargement in 2004, different migration strategies were observed at the same time (settlement migration, circulatory migration, and initial migration). In addition, many period-specific effects also affected migration and the propensity to send remittances, like for example, the economic and financial crisis in the years 2008-2009. To deal with these problems, we defined migration cohorts (as persons who have the same duration of years living abroad) and we applied a methodology which allowed us to decompose age (i.e., duration), period and cohort effects applied to each observed individual observation. Thanks to this analytical approach it was possible to verify the hypothesis that controlling for other possible factors that influence remittances, the propensity to send remittances declined with duration of stay

abroad (hypothesis 1) or with period factors, such as the 2008 financial crisis (hypothesis 2). We also examined whether the confounding effects of migration cohort and period, within the context of migration to various destinations, influenced the formation of the remittance decay effect, with for example, notable differences between countries such as Germany and the Netherlands being indicative of, respectively, relatively long and short histories of Polish migration. It was possible therefore to verify the hypothesis that migration decay is not observed in countries with short time windows (the Netherlands) if there are factors that compress the window of immigration (such as in countries like Ireland, which received the majority of Polish migrants between EU accession in 2004 and the timing of the 2008 financial crisis) - hypothesis 3). More detailed information about the dataset and method used in this paper can be found below.

Data

In our analysis we used individual data from surveys carried out by the National Bank of Poland among migrants from Poland in four main destination countries in the Western Europe: the United Kingdom, Ireland, Netherlands, and Germany in the period 2008-2018. Due to the lack of a sampling frame, stratified sampling was used (with strata defined by region, gender, age and employment sector). The proportions of strata were based on the official data sources about the population and external data sources like official registers or Labour Force Surveys which reduced the risk of self-selection of people with certain characteristics. The sample sizes of the surveys were determined on the one hand by the know numbers of Polish citizens who live in these countries, and on the other hand by the minimum values needed for obtaining statistical significance of the results (i.e., power analysis). So, in the pooled sample, countries with smaller migration stocks (i.e., Ireland and the Netherlands) are slightly overrepresented, although this has no bearing on the separate results for each country that we study. Interviews were carried out until 2011 using a PAPI technique and since 2011 using CAPI (more on the details of the surveys can be found in Chmielewska (2015) and in Chmielewska, Panuciak, and Strzelecki (2019)). The surveys used in this paper cover the year 2008, when the surveys were carried out only in the United Kingdom and Ireland, and in the years 2009-2012, when the survey was repeated annually. Since 2012, the survey was carried out every two years until 2018. Table 1 shows the sample sizes for each country by year. Data for the Netherlands and Germany were not collected in 2008 and for Ireland in 2018.

[Table 1 about here]

Remittances, the dependent variable in our analysis, is a dichotomous measure of whether the respondent indicated transferring money to Poland (Yes = 1, No = 0).[2] Our main independent variable of interest is the duration of residence; this measure combines the number of years and months (expressed as fractions of years) a respondent reported living in the destination country. As we discuss in more detail below, our models account for calendar year (i.e., 2008-2018) and migration cohort (which we grouped into four categories: 1964-2003, 2004-2008, 2009-2013, 2014-2018).

Control variables include planned duration of stay in the destination country (dummy variables for less than 1 year, 1 to 3 years, over 3 years but not permanent, and permanent), sex (a dummy variable in which male = 1, female = 0), age (a series of dummy variables for age ranges: 18-24, 25-34, 35-44, 45-54, and 55-65), education (dummy variables for primary, vocational, middle, and higher education), professional sector (dummy variables for professional, skilled craftsman, unskilled workers, other, and not in the labor force), presence of family at destination or origin (dummy variables, respectively, for whether a spouse/partner, dependent/adult child(ren), parent (or in-laws) live in the destination, live in origin, or whether are not present anywhere), origin city population size (dummy variables for village, city up to 100,000 population, city between 100,000-500,000 population, and city over 500,000 population). We also include country fixed or random effects (depending on the model) in our pooled statistical models.

Method

We estimate separate models by country as well as a pooled model with all countries. Our analytical approach has two parts. First, we regress our remittance measure against duration and controls and migration cohort fixed effects using a logit specification. This model excludes a measure of year, which cannot be included along with duration and year fixed effects in a conventional modeling framework due to the so-called "identification problem" (i.e., age, period,

[2] We acknowledge that using a measure of whether remittances were sent, rather than the amount sent, is an imperfect test of the decay hypothesis (which is based on the level or amount of remittances). Nonetheless, although we faced some empirical challenges in doing so (described in more detail below), we include a sensitivity test using the amount of remittances as a dependent variable.

and cohort are a linear combination, which creates perfect collinearity in a standard regression model).

Second, we estimate a variation of the Age-Period-Cohort random effects model (APC-RE) developed by Yang and Land (2008) which purports to solve the identification problem by estimating a multilevel model in which one of the three variables (e.g., age) is included in the fixed effects portion of the model and the remaining two variables (e.g., period and cohort) are included as random effects. The insight is that, with repeat cross-sectional data, cohorts are observed at different ages in different years, creating hierarchical clustering which can be accounted for via a cross-nested multilevel model. The identification problem is still an issue in our analysis because migration cohort is constructed as the difference between period (survey year) and duration (thus duration, migration cohort, and period are a linear combination). Our model also uses a logit specification to deal with the dichotomous dependent variable.

A simplified version of the model (showing duration as the sole fixed effect) can be written as follows:

$$ln\left(\frac{\pi_{ijk}}{1-\pi_{ijk}}\right) = \beta_0 + \beta_1 Duration_{ijk} + u_j + u_k$$

where π_{ijk} is the probability of sending remittances; i indexes individual observations (of various migration durations), j indexes time periods (i.e., 2008-2018) and k indexes migration cohorts; u_j and u_k are random effects for, respectively, time periods and cohorts. There is a debate about the appropriateness of using this model. Although the APC-RE model has been criticized for making arbitrary constraints on model parameters (implying results dependent greatly on the underlying assumptions) (cf. Fosse and Winship 2019; Luo and Hodges 2020), proponents of the model (e.g., Yang and Land 2008) claim that it solves the identification problem through the multilevel design. The model has become a widely used approach to dealing with age-period-cohort modeling challenges.

We present results in terms of raw logit coefficients, and, for the APC-RE models, we compute predicted probabilities of sending remittances, calculated by varying some variables of interest (i.e., duration, time-period, migration cohort, respectively) while keeping all other variables at

their actual value in the dataset. These probabilities account for random effects for period and cohort, as needed.

Results and Discussion

From Table 2, we see that, across all countries and time periods, about half of Polish migrants sent remittances. Across the four countries, the percentage sending remittances was highest in Ireland (51%) and the Netherlands (48%) and lowest for Germany (44%) and the UK (45%). The average duration of residence is about five years overall, although is highest in Germany (6.4 years) and lowest for the Netherlands (under 4 years). Notable also is the relatively small standard deviation of duration in Ireland, which reflects the narrow distribution of migration cohorts in that country. The distribution of migration cohorts generally varies across the four countries, although in the pooled data, we see that about half migrated between 2004 and 2008. In Ireland, however, most (71%) migrants came during this period, while in the German sample migration cohorts are more widely distributed, reflecting its longer history of Polish migration. Also, in the Netherlands, the distribution of migration cohorts is narrower, with the majority arriving in more recent years.

[Table 2 about here]

Due to space considerations, we only mention general patterns for some of the other variables in our analysis. About a third of migrants indicate that they want to stay in their destination country permanently. The age distribution skews more toward younger ages, with a peak in the 25-34 age range (although note the difference in the German sample, which has a less pronounced peak, again probably due to the longer history of Polish-German migration). The modal educational category is vocational; skilled craftsman (e.g., welders, machine operators, tailors, etc.) and unskilled workers (e.g., maids, crop pickers, waiters/waitresses, domestic workers, etc.) make up the most common professions represented. In our sample it is most common for Polish migrants' spouse or partner to live in the migration destination, followed by dependent children, adult children, and parents (including in-laws), while parents, spouse/partner dependent children, and adult children (in order of frequency) are also not found in the migration destination (presumably many of them are in the place of origin). The modal size of origin city (in Poland) is up to 100,000 people; in combination with the other categories, it is thus clear that most migrants are not coming from Poland's largest cities, such as Warsaw or Cracow.

We turn to results of our statistical models, shown in Tables 3 (logit regressions showing the coefficients of duration, migration cohort fixed effects, and controls) and 4 (APC-RE logit regressions that further account for period effects). Table 3 shows, consistent with the remittance decay hypothesis, a significant negative coefficient of duration for the pooled sample and all country subsamples, which on its face supports our first hypothesis, confirming the decay effect described in the literature. The model also accounts for the effects of migration cohorts, and shows that across all countries, all three groupings of migration cohorts (2004-2008, 2009-2013, 2014-2018) are less likely to send remittances compared to the reference category (1964-2003). However, before we make firm conclusions about duration and migrant cohort effects from this model, we should consider that it does not account for period effects, which could affect the results for duration and migration cohort. We need to thus examine the results of Table 4, the APC-RE model, to see whether this result holds when we account simultaneously for duration, migration cohort, and time period. Table 4 shows that when all three of these factors are accounted for simultaneously, the duration effect remains significant (and negative) in only the UK and Germany and falls to non-significance in Ireland and the Netherlands. Moreover, we see from the bottom portion of the table that the variance component (showing variation in the random effects) for both migration cohort and year effects are statistically significant, suggesting that there is significant variation in remittances across migration cohorts and time periods. The only exception is the year effect in Germany, which is non-significant.

[Tables 3 and 4 about here]

The graphs of predicted probabilities of remittances for duration, period, and cohort effects help visualize the patterns we observe in the statistical models. Regarding the duration effect, we see a linear decline in all countries, but a more pronounced downward-sloping curvilinear trend for the UK and Germany (as well as the pooled data, shown as "all countries"), the only countries in which it remained statistically significant. The more marked decline in remittances with increasing duration in the UK than in Germany perhaps reflects the greater variation in durations in the former than the latter, due to its longer history of Polish migration. The panel showing the pattern across cohorts reveals a lowered likelihood of older cohorts sending remittances (but keep in mind that their prime migration/work years were not captured in the data), an uptick among those migrating between EU accession and the financial crisis, followed by a downtick among

those migrating after 2008 (except for the Netherlands), and finally an uptick among those migrating between 2014-2018 (especially in Ireland). Consistent with our second hypothesis, the year effects panel bears out the apparent influence of the financial crisis[3], in that remittance-sending was higher in years of the financial crisis (i.e., 2008 and 2009), followed by a dip in 2010 and another peak in 2011, and lower thereafter.

[Figure 1 about here]

Although we find a statistically significant effect of duration for the UK and Germany, the lack of statistical significance for Ireland and the Netherlands deserves some discussion. We believe that the findings reflect larger features of the migration streams spanning Poland and these respective countries. In the Netherlands, for example, the relative recency of migration (recall from Table 2 that the lowest duration of residence was found there), perhaps in combination with the timing of the financial crisis, likely translated into a non-significant duration effect because migrants may simply have not had enough time to establish themselves for differences in duration to manifest themselves across short- and long-term migrants. Moreover, as noted in the literature, many migrants to the Netherlands do not settle there, so in combination with the short history of Polish migration to this country, this too may imply that there are too few longer-term migrants to contrasts with those of shorter-term migrants. Similarly in Ireland, although the average migration duration is relatively longer (at least compared to the Netherlands), as we saw in Table 2, the standard deviation was the smallest of the four countries. This reflects the fact that that migration cohorts were rather compressed into a narrow window, with the majority migrating between 2004 and 2008. As noted in our setting section, Ireland's economy was hit particularly hard by the crisis, which may explain the observed pattern of migration concentration.

The effect of the year 2011 also requires some discussion. Janicka and Kaczmarczyk (2016) report that Poland's economy did relatively well during the 2008-2009 financial crisis, but experienced a visible decline in the second wave of the crisis in 2012/2013. Perhaps there were signs of decline as early as 2011, which would explain why that year has a higher average remittance period effect in the models. These authors also report that post-2008 migration flows of Poles can be divided into two phases: 1) from the outburst of crisis until 2010, characterized by

[3] Note that we cannot include macro-economic measures in the model to confirm this speculation, as they would be highly collinear with the period measures.

a decline of migration flows, and 2) a post-crisis phase, characterized by increasing mobility. This second phase seems consistent with the higher remittances in 2011. Recall also that in Germany restrictions were lifted allowing free entry of Poles to the German labor market in 2011.

With consideration to space limitations, we only briefly discuss patterns for control variables. The pooled model shows that remittance sending, on average, was higher in all other destinations compared to the UK (although the difference between Germany and the UK was not statistically significant). Generally, men are more likely to remit than women (consistent with the literature), except in the Netherlands, which may reflect the high percentage of male migrants working in low skilled jobs there. Those who intend to stay permanently in their destination generally have a lower probability of sending remittances compared to those with short-term time horizons (less than 1 year) consistent with a circular migration pattern described by some New Economics of Labor Migration research, but those with intermediate time horizons (1-3 years, over 3 years) are more likely to remit than this group. Remittance sending becomes more likely with increasing age, but, judging by the magnitude of the coefficients, seems to peak in the 45-54 age range, and is mostly not present in Ireland and Germany. Compared to professional occupations (the reference category), those who are not in the labor force are less likely to remit. Consistent with the literature, having relatives that were not in the migration destination (i.e., spouse/partner, dependent and children, parents or in-laws) is generally positively associated with remittance sending. Having parents (or in-laws) and dependent children at destination was negatively associated with remittance sending in some countries. In the case of partner/spouse, whether they were in the destination or not, remittance sending was more likely, compared to not having a spouse/partner at all. Except for the German sample, origin city population coefficients are nearly all statistically significantly different (all are negative) from the reference category "village" (although less so in the APC-RE model), which shows that those of rural origin are most likely to send remittances.

Additional Analyses

In addition to the main results presented in the previous section, we performed a range of sensitivity analyses based on specific questions or on additional data. First, we tried estimating our models with different approaches to coding migration cohort. Specifically, we collapsed the 1964-1989 cohorts (i.e., those migrating prior to the collapse of communism) together, as well as

collapsing the 1990-2003 cohorts together (i.e., those migrating after the communist collapse but before EU accession), and we collapsed the 2016-2018 cohorts together (because these were small-sized cohorts). We also tried single-year cohorts. Because of the sparseness of some of the cohorts (especially in the Netherlands subsample) we believe that the coding scheme we present in our final models are those that gave the most stable estimates. Moreover, our main results were not sensitive to various coding schemes we tried. We also tested for non-linear effects of duration (i.e., using squared terms and log transformation) but rarely found evidence for such effects using these specifications.

We also had some data on the remittance amount sent (albeit we lose about 7% of our analytical sample who did not report either their income or remittance amount sent), measured as a set of ordinal categories, which varied across the settings we studied. To harmonize these measures across countries, we divided them by the migrants' earnings at destination, resulting in a variable which can be interpreted as support sent from abroad measured as a percentage of average wage in their country of residence. Using a Tobit regression (with a similar APC-RE specification used for our previous models; see Table 5) we found evidence that confirmed our earlier results for remittance sending. There was however, one difference: for Ireland we found evidence of a curvilinear effect of duration on the amount of remittances sent: remittance amount increases with increasing duration up to a point, but then declines. Although we can only speculate why we find such an effect, we believe that the drop-off might be an artefact of generally the narrow migration window, and its abrupt closing due to the financial crisis of 2008.

[Table 5 about here]

Conclusions

In this paper we use data on Polish migration to four migration destinations within the EU to study the remittance decay hypothesis. We do so in the following two ways. First, using a variation of the age-period-cohort model developed by Yang and Land (2008) we attempt to isolate the effect of migration duration from that of time period and migration cohort. Second, we attempt to understand why the remittance decay effect manifests itself differently in the different migration destinations. We hypothesized that factors such as the maturation of migration streams and

compression of migration windows, an indication of underlying dynamics shaping the movement and settlement of migration cohorts, were key mechanisms in shaping the decay effect.

Our results show that, when it was found (e.g., in the UK and Germany), remittance decay seemed to operate largely independently of migration cohort and period factors. However, in Ireland and the Netherlands, the duration effect did not remain when we accounted for the migration cohort and period effects, which we attribute to the timing and compression of patterns of movement and settlement of various migration cohorts and the way that the migration context within different destinations was shaped by period factors such as the 2008 financial crisis. While we detected a decay effect in Germany and the UK, both of which have a long history of Polish migration and can be distinguished by the presence of both older and younger migration cohorts with varying durations of residence in the destination. We did not detect it in the Netherlands and Ireland (at least not consistently), the former having a generally shorter history of Polish migration (and notably higher rate of return migration) and the latter having a decidedly more compressed history of Polish migration, which, in our sample, tended to occur mostly between 2004 and the 2008 financial crisis, which hit that country particularly strongly.

Our research thus contributes to a better understanding of how features of the migration context shape duration effects on remittances in the specific context of intra-EU migration since Poland's accession to the European Union, which assured free movement of labor. Taken together with other research (e.g., Arun and Ulku's 2011 study of Indian, Pakistani and Bangladeshi migrants in the UK), our study helps to clarify how ethnic-group-specific versus migration-destination-specific factors may influence declining remittances over time. While Arun and Ulku (2011) found that different ethnic groups in the same destination exhibit differences in the decay effect, our study adds the insight that the same ethnic group (Poles) does not necessarily exhibit the an identical pattern of remittance decay in every migration destination. Thus, we can conjecture that it is the interplay of ethnic-group-specific and migration-destination-specific factors (including selectivity therein) that shape the manifest of the remittance decay effect in various settings.

Our research findings need to be considered in light of some limitations of our approach. Specifically, the age-period-cohort technique that we employ for part of our analysis has been criticized for producing results that are sensitive to (often arbitrary) model assumptions and constraints. Nonetheless, the model we use is one that is widely employed in studies of age-period-

cohort decompositions in many research studies. Second, our analysis was based on (repeat) cross-sectional data, rather than panel data, so we cannot determine how remittance sending changes as individual migrants' duration of residence changes with, for example, moves to multiple migration destinations. Even if we had panel data, however, it is unclear whether panel attrition related to movement across countries, would not create similar problems. Third, we also cannot fully account for the nature of self-selection into various migration destinations (e.g., the tendency for the Netherlands to attract more agricultural workers or for Polish home/health care workers to move to Germany) nor for the representativeness of our sample of migrants. This is of course a problem that all destination-based migration data must contend with and is not a unique failing of our study. Fourth, we do not have measures of transnationalism that capture feelings of attachment to one's home country (or possibly cross-border entrepreneurial activities) that might induce migrants to continue sending remittances net of attachments to family or other influences. Future research should attempt to analyze this phenomenon using panel data (perhaps using matched origin-destination data to account for migrant selectivity) and incorporate measures of factors like feelings of attachment to home country to attempt to measure the transnationalism effect.

Despite its limitations, our paper contributes to the literature on the remittance decay effect, an important topic especially for countries whose economies depend on informal flows of capital sent by migrants moving abroad. It also contributes to knowledge on migration from Poland, one of the largest sending countries within the European Union, particularly in the period following EU expansion. A diversification of immigration strategies and a manifest lack of the remittance decay effect in the countries which experienced almost their entire migration inflow after EU enlargement can also be interesting from the perspective of the perception of the EU as a single market characterized by freedom of labor movement.

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Table 1: Sample Sizes by Countries and Years

	Year							
Country	2008	2009	2010	2011	2012	2014	2016	2018
United Kingdom	1500	1513	1508	1501	1500	1503	1500	1501
Ireland	1001	1000	1010	1000	1000	1007	1009	
Netherlands		700	701	700	700	700	719	711
Germany		300	1548	1539	1500	1504	1504	1511

Table 2: Descriptive Statistics, Pooled Sample and by Countries

	Pooled Sample		UK		Ireland		Netherlands		Germany	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Sent Remittances	0.46	0.50	0.45	0.50	0.51	0.50	0.48	0.50	0.44	0.50
Dest. Residence Duration (in Yrs)	4.94	4.74	4.38	3.73	4.58	2.95	3.98	3.87	6.42	6.63
Planned Duration of Stay										
Lt 1 yr	0.14	0.35	0.13	0.33	0.11	0.31	0.20	0.40	0.16	0.37
1-3 yrs	0.22	0.41	0.22	0.41	0.27	0.45	0.24	0.43	0.17	0.37
Over 3 yrs	0.30	0.46	0.31	0.46	0.31	0.46	0.26	0.44	0.31	0.46
Permanent	0.33	0.47	0.34	0.48	0.31	0.46	0.30	0.46	0.36	0.48
Sex (male)	0.51	0.50	0.50	0.50	0.52	0.50	0.52	0.50	0.51	0.50
Age										
18-24	0.20	0.40	0.25	0.44	0.21	0.40	0.27	0.44	0.11	0.31
25-34	0.41	0.49	0.46	0.50	0.47	0.50	0.42	0.49	0.29	0.46
35-44	0.21	0.41	0.17	0.37	0.22	0.41	0.17	0.38	0.28	0.45
45-54	0.12	0.33	0.09	0.29	0.08	0.27	0.09	0.29	0.20	0.40
55-65	0.06	0.23	0.03	0.17	0.03	0.16	0.05	0.22	0.12	0.32
Education										
Primary	0.03	0.17	0.03	0.16	0.01	0.12	0.02	0.15	0.05	0.22
Vocational	0.41	0.49	0.36	0.48	0.40	0.49	0.43	0.50	0.46	0.50
Middle	0.25	0.43	0.29	0.45	0.24	0.43	0.27	0.44	0.21	0.41
Higher	0.31	0.46	0.33	0.47	0.34	0.47	0.28	0.45	0.28	0.45
Profession										
Professional	0.19	0.39	0.21	0.41	0.21	0.40	0.12	0.33	0.17	0.38
Skilled Craftsman	0.25	0.43	0.25	0.43	0.23	0.42	0.24	0.43	0.27	0.44
Unskilled Workers	0.29	0.45	0.29	0.45	0.26	0.44	0.36	0.48	0.28	0.45
Other	0.18	0.39	0.17	0.38	0.19	0.39	0.21	0.40	0.18	0.39
Not in LF	0.09	0.29	0.08	0.27	0.11	0.32	0.07	0.25	0.10	0.30
Spouse or Partner										
No Spouse or Partner	0.33	0.47	0.36	0.48	0.28	0.45	0.38	0.49	0.30	0.46
not in Dest.	0.27	0.44	0.22	0.42	0.24	0.43	0.27	0.44	0.34	0.47
in Dest.	0.40	0.49	0.42	0.49	0.48	0.50	0.35	0.48	0.37	0.48
Dependent Child										
No Dependent Child	0.72	0.45	0.75	0.43	0.62	0.49	0.77	0.42	0.73	0.44
not in Dest.	0.13	0.33	0.10	0.30	0.14	0.35	0.12	0.33	0.15	0.36
in Dest.	0.15	0.36	0.15	0.35	0.24	0.43	0.10	0.30	0.12	0.32
Adult Child										
No Adult child	0.84	0.37	0.89	0.31	0.88	0.32	0.86	0.35	0.73	0.44
not in Dest.	0.09	0.28	0.05	0.22	0.06	0.23	0.08	0.28	0.15	0.36
in Dest.	0.07	0.26	0.06	0.23	0.06	0.24	0.06	0.23	0.12	0.32
Parent (or In-Law)										
No Parent (or in-law)	0.46	0.50	0.44	0.50	0.45	0.50	0.38	0.49	0.55	0.50
not in Dest.	0.46	0.50	0.49	0.50	0.48	0.50	0.56	0.50	0.36	0.48
in Dest.	0.07	0.26	0.07	0.25	0.07	0.26	0.06	0.24	0.09	0.28
Origin City (in PL) Pop.										
Village	0.21	0.41	0.18	0.38	0.18	0.39	0.28	0.45	0.25	0.43
City up to 100k	0.45	0.50	0.45	0.50	0.53	0.50	0.39	0.49	0.42	0.49
City 100-500k	0.22	0.41	0.23	0.42	0.19	0.39	0.23	0.42	0.22	0.42
City 501K+	0.12	0.32	0.14	0.35	0.10	0.30	0.10	0.30	0.11	0.31
Migration Cohort										
1964-2003	0.11	0.31	0.07	0.25	0.04	0.20	0.07	0.26	0.22	0.41
2004-2008	0.48	0.50	0.56	0.50	0.71	0.45	0.38	0.48	0.26	0.44
2009-2013	0.31	0.46	0.27	0.44	0.22	0.42	0.42	0.49	0.36	0.48
2014-2018	0.11	0.31	0.10	0.30	0.02	0.15	0.13	0.34	0.16	0.37
N	32496		11845		6557		4871		9223	

Table 3: Logistic Regression of Remittance Sending, Pooled Sample and by Country

	Pooled Sample	UK	Ireland	Netherlands	Germany
Variables					
Dest. Residence Duration (in Yrs)	−0.073***	−0.091***	−0.14***	−0.063***	−0.057***
	0.0043	0.0078	0.014	0.012	0.0069
Planned Duration of Stay					
Lt 1 yr	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
1-3 yrs	0.30***	0.11	0.44***	0.66***	0.032
	0.040	0.068	0.099	0.094	0.078
Over 3 yrs	0.032	−0.074	0.059	0.25**	0.0039
	0.038	0.065	0.099	0.092	0.070
Permanent	−0.46***	−0.59***	−0.63***	−0.17	−0.36***
	0.040	0.067	0.11	0.097	0.074
Sex (male)	0.10***	0.15***	0.15*	−0.041	0.12*
	0.024	0.040	0.057	0.063	0.046
Age					
18-24	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
25-34	0.14***	0.21***	0.27***	0.15	0.094
	0.033	0.051	0.077	0.079	0.082
35-44	0.16***	0.32***	0.16	0.13	0.17*
	0.041	0.069	0.098	0.11	0.085
45-54	0.41***	0.61***	0.28	0.14	0.44***
	0.052	0.090	0.14	0.14	0.094
55-65	0.22***	0.49***	−0.11	−0.55**	0.35**
	0.066	0.14	0.21	0.18	0.11
Education					
Primary	−0.16*	−0.13	0.052	0.11	−0.21
	0.073	0.13	0.24	0.21	0.11
Vocational	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
Middle	−0.047	−0.084	−0.27***	−0.059	0.16**
	0.031	0.051	0.073	0.077	0.060
Higher	−0.010	−0.090	−0.086	0.055	0.12
	0.031	0.051	0.071	0.084	0.061
Profession					
Professional	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
Skilled Craftsman	0.0061	−0.036	−0.12	0.057	0.13
	0.039	0.061	0.090	0.12	0.075
Unskilled Workers	−0.18***	−0.23***	−0.31***	−0.13	−0.069
	0.038	0.060	0.087	0.11	0.074
Other	−0.097*	−0.14*	−0.26**	−0.11	0.067
	0.040	0.064	0.091	0.12	0.077
Not in LF	−0.95***	−0.77***	−1.46***	−1.05***	−0.73***
	0.054	0.090	0.12	0.16	0.097
Spouse or Partner					
No Spouse or Partner	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
not in Dest.	0.52***	0.43***	0.66***	0.51***	0.59***
	0.034	0.057	0.086	0.084	0.061
in Dest.	0.17***	0.11*	0.28***	0.22**	0.16**
	0.031	0.048	0.073	0.078	0.062
Dependent Child					
No Dependent Child	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*

not in Dest.	0.51***	0.46***	0.34***	0.90***	0.48***
	0.040	0.072	0.094	0.11	0.068
in Dest.	−0.16***	−0.15*	−0.13	−0.37**	0.016
	0.039	0.063	0.079	0.12	0.079
Adult Child					
No Adult child	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
not in Dest.	0.69***	0.79***	0.96***	0.91***	0.59***
	0.050	0.10	0.15	0.14	0.071
in Dest.	0.014	−0.071	0.029	0.25	−0.0067
	0.054	0.098	0.14	0.16	0.084
Parent (or In-Law)					
No Parent (or in-law)	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
not in Dest.	0.34***	0.29***	0.44***	0.47***	0.22***
	0.026	0.044	0.061	0.071	0.051
in Dest.	−0.19***	−0.18*	−0.27*	0.029	−0.27**
	0.051	0.087	0.12	0.14	0.088
Origin City (in PL) Pop.					
Village	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
City up to 100k	−0.16***	−0.26***	−0.30***	−0.18*	0.0093
	0.032	0.055	0.077	0.077	0.057
City 100-500k	−0.12**	−0.33***	−0.27**	−0.14	0.19**
	0.037	0.063	0.094	0.088	0.067
City 501K+	−0.23***	−0.44***	−0.31**	−0.25*	0.053
	0.044	0.071	0.11	0.12	0.084
Country					
UK	*ref.*				
Ireland	0.15***				
	0.034				
Netherlands	0.10**				
	0.037				
Germany	0.00067				
	0.033				
Migration Cohort					
1964-2003	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
2004-2008	−0.39***	−0.33***	−0.51***	−0.20	−0.18
	0.055	0.091	0.15	0.16	0.094
2009-2013	−0.92***	−0.82***	−1.26***	−0.60***	−0.74***
	0.061	0.10	0.17	0.17	0.11
2014-2018	−1.14***	−0.96***	−1.55***	−1.00***	−1.00***
	0.071	0.12	0.24	0.19	0.12
Intercept	0.47***	0.74***	1.22***	0.033	−0.092
	0.090	0.15	0.23	0.24	0.17
N	32496	11845	6557	4871	9223
-2 Log Likelihood	40694.7	14944.7	7647.0	6054.3	11620.8
BIC	41047.9	15235.4	7919.5	6317.5	11903.8
AIC	40762.7	15006.7	7709.0	6116.3	11682.8

Standard errors in second row

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4: APC-RE Logistic Regression of Remittance Sending, Pooled Sample and by Country

	Pooled Sample	UK	Ireland	Netherlands	Germany
Variables					
Dest. Residence Duration (in Yrs)	-0.015^{***}	-0.033^{***}	-0.0063	-0.0089	-0.020^{**}
	0.0043	0.0082	0.016	0.010	0.0061
Planned Duration of Stay					
Lt 1 yr	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
1-3 yrs	0.29^{***}	0.17^{*}	0.48^{***}	0.60^{***}	0.042
	0.042	0.071	0.10	0.097	0.082
Over 3 yrs	0.15^{***}	0.075	0.20^{*}	0.27^{**}	0.15^{*}
	0.040	0.068	0.10	0.094	0.073
Permanent	-0.27^{***}	-0.35^{***}	-0.43^{***}	-0.082	-0.17^{*}
	0.042	0.071	0.11	0.098	0.078
Sex (male)	0.11^{***}	0.16^{***}	0.15^{*}	-0.052	0.097^{*}
	0.025	0.041	0.058	0.064	0.047
Age					
18-24	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
25-34	0.19^{***}	0.24^{***}	0.21^{**}	0.21^{*}	0.13
	0.034	0.053	0.079	0.081	0.084
35-44	0.21^{***}	0.36^{***}	0.16	0.18	0.19^{*}
	0.042	0.071	0.100	0.11	0.088
45-54	0.40^{***}	0.56^{***}	0.20	0.16	0.43^{***}
	0.053	0.092	0.15	0.14	0.098
55-65	0.15^{*}	0.38^{**}	-0.21	-0.61^{***}	0.33^{**}
	0.068	0.14	0.21	0.18	0.11
Education					
Primary	-0.11	-0.22	0.13	0.095	-0.082
	0.074	0.13	0.25	0.21	0.11
Vocational	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
Middle	-0.097^{**}	-0.14^{**}	-0.29^{***}	-0.10	0.087
	0.032	0.052	0.075	0.078	0.062
Higher	-0.064^{*}	-0.17^{**}	-0.037	-0.013	-0.0032
	0.032	0.053	0.073	0.085	0.064
Profession					
Professional	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
Skilled Craftsman	0.15^{***}	0.12	-0.078	0.23	0.34^{***}
	0.040	0.064	0.093	0.12	0.079
Unskilled Workers	-0.00096	-0.020	-0.21^{*}	0.068	0.14
	0.039	0.062	0.089	0.12	0.078
Other	0.014	-0.038	-0.19^{*}	0.046	0.22^{**}
	0.041	0.067	0.093	0.12	0.081
Not in LF	-0.77^{***}	-0.65^{***}	-1.28^{***}	-0.97^{***}	-0.42^{***}
	0.055	0.092	0.12	0.17	0.10
Spouse or Partner					
No Spouse or Partner	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
not in Dest.	0.47^{***}	0.38^{***}	0.62^{***}	0.45^{***}	0.58^{***}
	0.034	0.058	0.088	0.085	0.063
in Dest.	0.17^{***}	0.12^{*}	0.30^{***}	0.19^{*}	0.15^{*}
	0.031	0.050	0.074	0.078	0.064
Dependent Child					
No Dependent Child	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*

not in Dest.	0.50^{***}	0.42^{***}	0.41^{***}	0.88^{***}	0.46^{***}
	0.041	0.074	0.096	0.11	0.070
in Dest.	-0.12^{**}	-0.099	-0.063	-0.38^{**}	-0.0094
	0.040	0.065	0.080	0.12	0.082
Adult Child					
No Adult child	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
not in Dest.	0.70^{***}	0.82^{***}	0.92^{***}	0.89^{***}	0.60^{***}
	0.051	0.11	0.16	0.14	0.073
in Dest.	-0.00077	0.073	0.014	0.20	-0.040
	0.055	0.10	0.14	0.16	0.088
Parent (or In-Law)					
No Parent (or in-law)	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
not in Dest.	0.24^{***}	0.25^{***}	0.29^{***}	0.43^{***}	0.12^{*}
	0.027	0.045	0.063	0.072	0.053
in Dest.	-0.17^{**}	-0.081	-0.30^{*}	0.051	-0.23^{*}
	0.052	0.090	0.12	0.14	0.090
Origin City (in PL) Pop.					
Village	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
City up to 100k	-0.15^{***}	-0.20^{***}	-0.24^{**}	-0.20^{*}	-0.046
	0.032	0.057	0.079	0.078	0.059
City 100-500k	-0.056	-0.19^{**}	-0.18	-0.083	0.12
	0.038	0.065	0.096	0.090	0.069
City 501K+	-0.19^{***}	-0.39^{***}	-0.26^{*}	-0.22	0.087
	0.045	0.073	0.11	0.12	0.087
Country					
UK	*ref.*				
Ireland	0.17^{***}				
	0.035				
Netherlands	0.16^{***}				
	0.038				
Germany	0.029				
	0.034				
Constant	-0.56^{**}	-0.33	-0.21	-0.75^{**}	-0.88^{***}
	0.21	0.24	0.29	0.23	0.27
Year					
Variance Component	0.31^{*}	0.34^{*}	0.34^{*}	0.17^{**}	0.35
	0.15	0.14	0.15	0.25	0.14
Migration Cohort					
Variance Component	0.0048^{***}	0.0043^{***}	0.018^{***}	0.0033^{**}	0.0069^{***}
	1.21	1.64	1.07	3.05	1.41
N	32496	11845	6557	4871	9223
-2 Log Likelihood	39367.2	14347.3	7504.0	5991.2	11161.6
BIC	39710.0	14628.7	7767.6	6246.0	11435.4
AIC	39433.2	14407.3	7564.0	6051.2	11221.6

Standard errors in second row

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5: APC-RE Tobic Regression of Remittance Amount Sending (Relative to Destination Earnings), Pooled Sample and by Country

	Pooled Sample	UK	Ireland	Netherlands	Germany
Variables					
Dest. Residence Duration (in Yrs)	-0.058^{***}	-0.056^{***}	0.15^{*}	-0.049	-0.067^{***}
	0.014	0.013	0.060	0.046	0.018
Duration Squared			-0.0078^{*}		
			0.0034		
Planned Duration of Stay					
Lt 1 yr	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
1-3 yrs	0.46^{***}	-0.0069	0.62^{***}	1.41^{***}	0.14
	0.11	0.12	0.17	0.40	0.27
Over 3 yrs	0.31^{**}	-0.099	0.18	1.07^{**}	0.46
	0.11	0.11	0.18	0.39	0.24
Permanent	-0.98^{***}	-0.91^{***}	-1.17^{***}	-0.75	-0.65^{*}
	0.12	0.12	0.20	0.42	0.26
Sex (male)	0.24^{***}	0.12	0.22^{*}	0.24	0.32^{*}
	0.070	0.070	0.10	0.26	0.16
Age					
18-24	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
25-34	0.47^{***}	0.44^{***}	0.45^{**}	0.76^{*}	0.13
	0.098	0.090	0.14	0.34	0.29
35-44	0.55^{***}	0.63^{***}	0.18	1.39^{**}	0.34
	0.12	0.12	0.18	0.45	0.30
45-54	0.91^{***}	1.08^{***}	0.37	1.42^{*}	0.81^{*}
	0.15	0.16	0.26	0.59	0.33
55-65	0.25	0.61^{**}	-0.12	-0.81	0.23
	0.19	0.23	0.36	0.76	0.38
Education					
Primary	-0.14	0.045	0.13	-0.43	0.052
	0.21	0.22	0.43	0.92	0.38
Vocational	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
Middle	-0.26^{**}	-0.17^{*}	-0.35^{**}	-0.34	0.0084
	0.089	0.087	0.13	0.32	0.21
Higher	-0.079	-0.18	0.11	-0.036	0.12
	0.090	0.090	0.13	0.35	0.22
Profession					
Professional	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
Skilled Craftsman	0.41^{***}	0.12	0.051	0.56	1.04^{***}
	0.11	0.11	0.16	0.49	0.26
Unskilled Workers	0.026	-0.096	0.016	0.10	0.21
	0.11	0.10	0.16	0.47	0.26
Other	0.050	-0.031	-0.078	0.011	0.53^{*}
	0.11	0.11	0.16	0.49	0.27
Not in LF	-2.42^{***}	-2.27^{***}	-2.22^{***}	-2.55^{***}	-1.50^{***}
	0.17	0.20	0.23	0.75	0.36
Spouse or Partner					
No Spouse or Partner	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
not in Dest.	1.01^{***}	0.49^{***}	0.99^{***}	1.45^{***}	1.36^{***}
	0.096	0.097	0.15	0.35	0.21
in Dest.	0.48^{***}	0.22^{**}	0.49^{***}	0.95^{**}	0.39

	0.089	0.084	0.13	0.33	0.22
Dependent Child					
No Dependent Child	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
not in Dest.	1.14***	0.62***	0.56***	1.99***	1.42***
	0.11	0.12	0.16	0.40	0.23
in Dest.	−0.12	0.0020	−0.16	−1.36**	0.39
	0.11	0.11	0.14	0.51	0.28
Adult Child					
No Adult child	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
not in Dest.	1.58***	0.99***	0.86***	1.89***	2.13***
	0.14	0.16	0.25	0.55	0.24
in Dest.	0.036	0.044	0.30	−0.072	0.15
	0.16	0.17	0.25	0.67	0.30
Parent (or In-Law)					
No Parent (or in-law)	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
not in Dest.	0.38***	0.18*	0.22	1.45***	0.22
	0.077	0.077	0.11	0.30	0.18
in Dest.	−0.52***	−0.23	−0.51*	0.50	−0.71*
	0.15	0.16	0.23	0.62	0.31
Origin City (in PL) Pop.					
Village	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
City up to 100k	−0.49***	−0.33***	−0.52***	−0.85**	−0.33
	0.089	0.093	0.13	0.32	0.20
City 100-500k	−0.18	−0.063	−0.27	−0.56	0.032
	0.10	0.11	0.16	0.37	0.24
City 501K+	−0.62***	−0.56***	−0.36	−1.16*	−0.17
	0.13	0.12	0.20	0.50	0.30
Country					
UK	*ref.*				
Ireland	0.52***				
	0.099				
Netherlands	0.71***				
	0.11				
Germany	0.62***				
	0.095				
Constant	−2.88***	−0.92*	−2.54*	−5.29***	−3.83***
	0.45	0.37	1.24	0.82	0.76
Variance Components					
Year	1.20*	0.82*	9.58	1.12	2.41
	0.61	0.42	6.28	0.69	1.32
Migration Cohort	0.069	0.034	0.095	0.15	0.27
	0.059	0.023	0.065	0.30	0.15
Error Variance	23.6***	8.59***	9.70***	53.2***	34.5***
	0.32	0.20	0.30	1.77	0.92
N	29526	10882	5729	4520	8395
-2 Log Likelihood	89134.4	28070.2	15932.3	16048.9	25523.2
BIC	89484.4	28358.4	16209.2	16309.8	25803.3
AIC	89202.4	28132.2	15996.3	16110.9	25585.2

Standard errors in second row

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figure 1. Predicted Probability of Remittance Sending by Duration, Period, and Migration Cohort across Countries