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Working Papers, nº5-2010, Enero de 2011
ISSN 2172-0487

Accounting for the time pattern of remittances in the Spanish context

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It is now well established that the time pattern of migrants' remittances presents an inverted "U" shape, reaching its maximum level after 5 to 10 years of migration experience. From a macro perspective, however, remittances are believed to be a stable source of international revenue for developing countries. Global economic growth, continuous migrant flows, and an inclination to focus on success stories have enabled scholars to elude this obvious paradox; that of remittances fading at the individual level but increasing at the aggregate level. This article will address this paradox specifically by providing evidence of the inverted "U" shape and, more importantly, by investigating the microfoundations of declining remittances in Madrid and the Balearic Islands. Future research will be able to improve predictions on aggregate levels of remittances by combining this type of studies with macro data and adequate micro-macro links.

Introduction

It is now broadly accepted that remittances are a stable source of international revenue for developing countries, exhibiting lower volatility rates than capital markets flows, foreign direct investment or even official development assistance (Ratha, 2005). Short-term volatility, however, should not be confounded with long-term stability; remittances inflows might vary slightly from year to year but still dry up after a longer period. Historical evidence seems indeed to support this scenario, regardless of researchers' accounts of remittances' "success" stories such as current Mexico, China, Bangladesh or India. For instance, pecuniary remittances from Spanish emigrants living in Latin America were a vital and stable source of financing for the impoverished Spanish economy for at least 50 years – from 1880 to 1930. From 1930 onwards, however, migrants outflows plummeted and remittances fell accordingly. True, the cutback was gradual but by 1940 the American remittances were trivial compared with the golden age of remittances (García López, 1992). More recently, Turkey has experienced a similar phenomenon. Using data from the IMF and the World Bank, remittances inflows to Turkey have decreased from 4,560 million dollars in 2000 to 851 million dollars hardly six years later (-80%). West Bank and Gaza (-46%), Greece (-30%), or Thailand (-21%) have also shown important cutbacks in the same period, and Italy (-53%) and Portugal (-26%) for the 1990-2006 period. In this regard, is my belief that developing countries should be concerned with the big picture for some of them may see their incoming remittances shrinking in ten or even five years time, especially if migration outflows are not sustained. This concern should probably start by creating predictive models which would necessarily incorporate the

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microdynamics of remittances. This is precisely the aim of this work: the investigation of the microfoundations of declining remittances.

Drops in the aggregate level of remittances are actually the logical outcome of another conventional statement in the remittances literature; namely, that remittances fade with migrants' time of residence. This hypothesis is known as the time decay hypothesis and is based on migrants' eroding attachment to their home communities. A related and compatible hypothesis argues that the time pattern of remittances actually displays an inverted "U" shape, which differs only in that it takes into account migrants' inability to send their optimal amount of remittances in their unstable and indebted first years.

In what follows, evidence from two Spanish cross-sectional surveys will be presented in order to test both the time decay hypothesis and the inverted "U" time pattern. More importantly, the data will be used to disentangle the underlying mechanisms, or remittances' necessary conditions, behind these hypotheses: a) the potential remittances, b) the willingness to remit, and c) the potential recipients. If successful, the results from this study will allow policy-makers to understand why individual remittances fade with time and with an adequate micro-macro link to predict aggregate level of remittances inflows.

1. Remittances' time pattern in the literature

In spite of remittances being a matured academic topic and remittances' flows an important concern for policy-makers, its time pattern has scarcely been studied in depth. To my knowledge, no work has focused exclusively on this issue except for Amuedo-Dorantes and Pozo (2006a) and Poirine (2006), though the latter adopts a theoretical perspective which applies only to microstates affected by extremely high emigration rates. The lack of interest is even more startling, as time of residence may be thought as a blunt but straightforward way of predicting future flows of remittances.

Previous work on the microdeterminants of remittances has traditionally included time of residence as a control variable and found unclear and contradictory findings. Some studies have found a positive effect of time on the probability to remit (Agarwal and Horowitz, 2002) or on the level of remittances (Lucas and Stark, 1985; Durand *et al.* 1996). Other studies have rejected any statistically significant effect of time on the probability to remit (Funkhouser, 1995; Durand *et al.*, 1996) or on the amount of remittances (Menjivar et al., 1998; Semyonov and Gorodzeisky, 2005). Finally, a few studies support the hypothesis of the time decay for the probability to remit (Menjivar *et al.*, 1998), for the level of remittances (Funkhouser, 1995), or for both (Marcelli and Lowell, 2005; Amuedo-Dorantes and Pozo, 2006b). All these studies have in common that they were not explicitly interested in finding evidence for the time pattern of remittances. This fact explains why only the study by Brière *et al.* (2002), and the already cited by Amuedo-Dorantes and Pozo (2006a), can claim to have found an inverted "U" time pattern by introducing as an independent variable both the time of residence and its quadratic form.[2] More precisely, Brière *et al.* find that the level of remittances starts to decay after 10 years (*Figure 1*), while Amuedo-Dorantes and Pozo detect a fading of remittances after 5.5 years (*Figure 2*).

As this study is to a degree an extension of Amuedo-Dorantes and Pozo (2006a), an in-depth description of their work and its shortcomings is essential. Their aim is to identify the time profile of migrants' remitting behavior using data from the Mexican Migration Project (MMP107). They find that remittances appear to exhibit a "hump-shaped" pattern, both for migrants who have and who have not left their spouses and partners remaining in Mexico, although the decay rate is higher for the latter. On average, remittances start to decay after 5.5 years of U.S. experience. They hypothesize, though don't test, that remittances initially rise as migration costs are recovered and labor conditions improve, and shrink as their attachments to their country of origin become weaker.

[2] It is important to mention that Lucas and Stark (1985) did also find some empirical evidence for the inverse "U" shape, by introducing dummy variables for the duration of migration.

The great merit of their analysis is that they have showed clear evidence of the inverted "U" shape pattern, which almost any rational model would predict whether they are based on altruistic or self-interest motivations. However, three noteworthy shortcomings are to be mentioned.

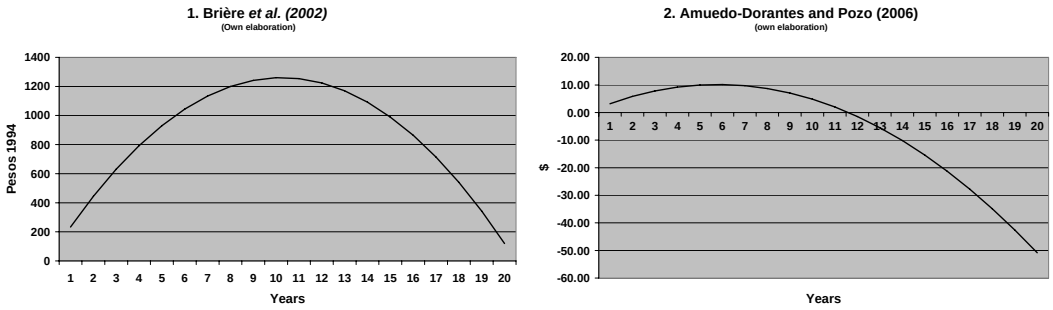
To start with, the authors don't capture the fundamental nature of time. Time rarely exerts an independent effect itself. If results show a misleading time effect, it is usually because time is correlated with other variables, which may have not been included in the model such as the probability of naturalization, the decay of attachment to home communities, the improvement of labor conditions or the probability of family reunification. This explains, together with the inadequacy of the functional form they adopt, why the time pattern detected in their study seems to be so "unrealistic". Strictly speaking, they find a time pattern for the effect of time on remittances but not a time pattern for remittances. The specific nature of time requires time to be included in a regression model either as a control variable - controlling for past values of unobserved variables - as the only independent variable or conjointly with time-invariant covariates. In addition, what turns the time pattern of remittances relevant for policy makers is its predictive power, which may be distorted, when introducing other variables into the model. Following Amuedo-Dorantes and Pozo (2006a), policy-makers might accept a scenario with negative remittances after twelve years of migration experience if they confound the effect of time on remittances with the level of remittances (*Figure 2*).

Furthermore, although the authors suggest several causal mechanisms which could explain the inverted "U" shape, no tests for them is provided. That is, the time pattern's "black box" remains unveiled.

Last, the causal mechanisms suggested seem to affect only the earnings remitted for consumption but not those remitted for savings, investment or real estate. This limitation is unexpected, given that consumption and investment are clearly distinguished elsewhere (Amuedo-Dorantes and Pozo, 2006b).

Here, I intend to overcome these deficiencies. Therefore, the focus will be on establishing a reliable time pattern for remittances, hypothesizing why remittances exhibit a particular time pattern, and searching for empirical evidence supporting these hypotheses.

Figure 1 and 2. The time pattern of remittances



2. Time "effects" and the inverted "U" shape

Whether one believes time is a "container" for events, or a conceptual device capable of describing a sequence of events,[3] it is difficult to argue that an independent time effect exists. True, remitting behavior changes with time but this is rarely the effect of time itself. More likely, remitting behavior may change following the occurrence of certain events which, in turn, might transform actors' preferences, beliefs and actions. Such events include naturalization, fading of attachments towards home communities, growing knowledge of host

[3] This distinction follows Newton and Leibniz's competing views.

markets, family reunification or the formation of new families. Consequently, by introducing time-varying covariates what is finally identified is a time pattern of the effect of time on remittances which, in fact, should develop into a flat – or not significant - function if the model is correctly specified. This is the case in Merkle and Zimmermann (1991), where time of residence becomes statistically not significant, once planned duration of stay in Germany is introduced.

In short, if the aim is to control for unobserved past events, time may be introduced as a "comprehensive" control variable, taking into consideration that its coefficient has no unequivocal interpretation. This is the case in Amuedo-Dorantes and Pozo (2006a), where the time decay and the inverted "U" hypotheses were unconvincingly proved by introducing as independent variables not only time and time squared in the U.S. but also socio-economic background, family structure and other control variables.

Conversely, if the aim is to find an interpretable time pattern, as is the case here, the best alternative is to introduce time as the only independent variable or, if results are to be exported to other contexts, to introduce, along with time, time-invariant variables or identify time patterns for different groups and contexts. Additionally, when the dependent variable is multifaceted, as is the case with remittances, different time patterns can also be found for each component.

In this work we follow the latter alternative and, as a result, remittances' time patterns will be identified for two geographical contexts (Madrid and the Balearic Islands), for two different foreign-born communities (Ecuador and foreign-born) and for six different subsamples (All, Consumption, Savings / Investment / Real Estate, Men, Women and Senders). Confidence is expected to increase as remittances across contexts, nationalities and types of remittances reveal analogous time patterns.

As regards the length of residence variable, a set of dummy variables have been created satisfying the next criteria: maintain the distance among groups while keeping a minimum of 50 cases per group. Due to the unequal distribution of migrants regarding their time of residence, the 50 cases condition has rendered partially ineffective the equal distance criterion. This problem becomes more critical from 10 years of migration experience onwards due to the short Spanish experience with massive immigration (*e.g.* more than 50% of Ecuadorians entered Spain for the first time in the period 2000-2003). For interpretation clarity purposes, the group with the highest level of remittances is the reference group so that all dummies' coefficients are negative.

Both Tobit and OLS standard regression models have been employed depending on the nature of the dependent variable. Tobit models are strongly recommended whenever the minimum or the maximum values of the dependent variable represent a significant proportion of the whole distribution. Regarding remittances, this is the case when both remitters and non-remitters are included in the sample. Tobit models, left-censored at 0, are supported by the literature in an attempt to deal with the discrete and continuous nature of remittances (Funkhouser, 1995; Brière *et al.*, 2003; Marcelli and Lowell, 2005; Amuedo-Dorantes and Pozo, 2006a). OLS regression models are recommended when the dependent variable follows a continuous distribution, as when senders solely are included in the sample. Finally, and in order to correct for potential heterokedasticity, robust standard errors have been calculated.

In what follows, micro evidence will be presented in an attempt to test the time decay and the inverted "U" hypotheses. If the inverted "U" shape is to be born out, we expect dummies for groups with short and long stays to have lower coefficients than groups with medium length stays while for the time decay hypothesis we expect groups with longer stays to have lower coefficients than groups with shorter ones.

Data originates from two cross-sectional surveys of foreign-born residents conducted in 2007 by *remesas.org* in Madrid and the Balearic Islands and financed by their corresponding regional governments. Madrid's survey consists of 827 foreign-born individuals coming from countries with lower GDP per capita than Spain and the Balearic survey includes 451 foreign-born Ecuadorians.

2.1. Madrid

The reference groups from *Figure 3* show a consistent peak of remittances between the seventh and eighth year of migration experience in Spain. This is the case for five out of six subsamples. Moreover, in five out of six models, the coefficient of the group with the longest migration experience in Spain is statistically different from the "peak" group. The only exception is the *Savings, Investment and Real Estate* subsample which, overall, presents a more erratic time pattern. Moreover, in two models the most recent groups in Spain have coefficients which are statistically different from the reference group, and the other four models present the expected signs according to the inverted "U" shape hypothesis. All in all, it is reasonable to accept the inverted "U" time pattern for all the subsamples, except for one subsample. The results also appear to confirm the time decay hypothesis, which claims that remittances will shrink through time, as remittances are lower for the groups with the longest migration experiences in Spain than for the groups with the shortest migration experiences. Yet, due to the low number of respondents with long "stays", the time decay hypothesis could not be robustly tested. Interestingly, longer migration experiences have a general negative impact on remittances, but the strength of this effect varies by subsamples. Women and senders reduce their deliveries gradually, while men reduce them at a faster rate. One plausible explanation for the gender differences in remitting behaviour may be linked to a higher incidence – and a stronger impact - of family reunification for men, as the lion's share of their remittances are sent to members of the nuclear family, whereas women keep additional ties with member of the extended family.

Figure 3. Time pattern of Remittances in Madrid

Time of residence	TOBIT I. All	OLS II. Consum.	OLS III. Sav./ Inv./ R. Estate	TOBIT IV. Men	TOBIT V. Women	OLS VI. Senders
From 1 to 2 years	-815.8** (-2.28)	-453.1 (-1.18)	-854.7 (-0.68)	-1395.6*** (-2.67)	-319.9 (-0.82)	-485.4 (-1.46)
From 3 to 4 years	-195.9 (-0.52)	-231.3 (-0.58)	-903.0 (-0.69)	-619.3 (-1.14)	-54.3 (-0.12)	-176.3 (-0.51)
From 5 to 6 years	-148.4 (-0.40)	-377.0 (-1.01)	-1592.2 (-1.41)	-569.5 (-1.06)	**ref.** **ref.**	-359.5 (-1.06)
From 7 to 8 years	**ref.** **ref.**	**ref.** **ref.**	**ref.** **ref.**	**ref.** **ref.**	-146.4 (-0.32)	**ref.** **ref.**
From 9 to 11 years	-821.7 (-1.49)	-457.7 (-0.73)	-3215.5*** (-2.93)	-812.3 (-1.00)	-1023.7 (-1.64)	-533.0 (-1.03)
12 or more years	-1667.2*** (-3.08)	-868.2* (-1.86)	-948.0 (-0.81)	-2139.4*** (-2.71)	-1284.3** (-2.05)	-904.3* (-1.71)
N	820	636	113	500	320	657
(Left) Censored Obs.	163	--	--	94	69	--
LR Chi2 (5)	16.51	--	--	12.75	6.70	--
Log Likelihood	-6336.1	--	--	-3939.8	-2370.3	--

In brackets, N for correlations and t-value for regressions models
*Significant at the 0,1 level; **significant at the 0,05 level, ***significant at the 0,01 level

2.2. Balearic Islands

Overall, results for the Balearic Islands (*Figure 4*) don't differ outstandingly from Madrid's, though some differences are to be noted. To start with, the "Savings, Investment, and Real Estate" now joins the inverted "U" shape time pattern. Besides, the "hump-shaped" pattern is unambiguous in all cases with no unexpected downturns or upturns. Remittances rise from the initial group to the reference group, and decrease constantly beyond that point. Furthermore, in four out of six subsamples the peak is reached within 7 years of migration

experience, while in two cases the maximum lies between 5 and 7 years of Spanish experience. Startlingly, the peak for women matches in both surveys (5 to 6 years), although the context and the countries of origin included change significantly. Finally, the results do not support the time decay hypothesis, as coefficients are similar for recent and "old" migrant groups. It could be the case that Ecuadorians with especially long migration experiences (*i.e.* more than ten years) send significantly fewer remittances but the fact that a small number of Ecuadorians arrived to Spain before 1999 – and its corresponding impact on the sample - prevent us from verifying this hypothesis robustly.

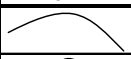
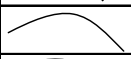
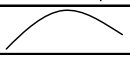
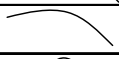
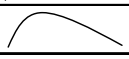
A summary of the findings is displayed graphically in *Figure 5*. On the whole, it is reasonable to accept the inverted "U" time pattern for all samples and subsamples, except for the *Savings, Investment and Real Estate* subsample in Madrid's survey. The graphics do not show a continuous fading of remittances since migrants' arrival, in accordance with the time decay hypothesis, though further evidence is needed. Interestingly, the peak of remittances is quite stable across the different samples and subsamples: always between 5 and 8 years, and in most cases between 7 and 8 years.

Figure 4. Time pattern of Remittances in the Balearic Islands

	TOBIT	OLS	OLS	TOBIT	TOBIT	OLS
Time of residence	**I. All**	**II. Consum.**	**III. Sav./ Inv./ R. Estate**	**IV. Men**	**V. Women**	**VI. Senders**
From 1 to 4 years	-1043.4**	-470.8	-4110.8***	-1862.1***	-647.7	-833.5*
	(-2.23)	(-1.21)	(-2.89)	(-2.54)	(-1.21)	(-1.85)
5 years	-247.9	-183.0	-2265.6	-893.4	**ref.**	-547.4
	(-0.56)	(-0.47)	(-1.37)	(-1.20)	**ref.**	(-1.31)
6 years	-4.1	**ref.**	-2357.3	-130.8	-238.5	-421.6
	(-0.01)	**ref.**	(-1.46)	(-0.19)	(-0.48)	(-1.03)
7 years	**ref.**	-253.8	**ref.**	**ref.**	-389.8	**ref.**
	ref.	(-0.64)	**ref.**	**ref.**	(-0.73)	**ref.**
8 or more years	-786.9	-469.0	-5423.3***	-1256.7*	-702.9	-837.0*
	(-1.60)	(-1.02)	(-4.02)	(-1.67)	(-1.22)	(-1.79)
N	448	345	47	213	235	388
(Left) Censored Obs.	60	--	--	30	30	--
LR Chi2 (4)	8.37	--	--	9.27	2.25	--
Log Likelihood	-3699.2	--	--	-1755.6	-1929.7	--

In brackets, N for correlations and t-value for regressions models
*Significant at the 0,1 level; **significant at the 0,05 level, ***significant at the 0,01 level

Figure 5. Summary of results on the time pattern of remittances

	Madrid		Balearic Islands	
	Functional form	**Maximum**	**Functional form**	**Maximum**
I. All		7 to 8 years		7 years
II. Consumption		7 to 8 years		6 years
III. Sav./ Inv./ R.Estate		7 to 8 years		7 years
V. Men		7 to 8 years		7 years
V. Women		5 to 6 years		5 years
VI. Senders		7 to 8 years		7 years

3. Accounting for the inverted "U" shape

Thus far, results have confirmed the curvilinear time pattern shown in previous studies. We now elaborate upon this time pattern by identifying its underlying mechanisms. Potential mechanisms or variables must satisfy two necessary conditions: a) they must affect in a significant way the level of remittances, and b) they must vary with time of residence. The time pattern of remittances is thus the aggregated effect of time-varying remittances' determinants. That seems to be the case for the intervening variables in the often claimed hypothesis, as in Amuedo-Dorantes and Pozo (2006a), where remittances are supposed to rise initially with time of residence as migration costs are recovered and better employment secured, and decrease as migrants' attachments to their home communities weaken. Migration costs, employment status and attachments to home communities all seem to vary with time of residence and are likely to affect the amount of migrants' remittances.

Although this is a sound hypothesis, it needs some reformulation in order to be tested, disaggregating the so-called migrants' attachments into two components: social networks (*e.g.* location of migrants' relatives) and place attachment (migrants' intention to return net of family attachments). In this sense, I would argue that remittances initially rise as potential remittances increase (*i.e.* net income net of current expenses), and decrease as family reunification takes place, new families are formed in the host society, migrants' siblings migrate (*i.e.* shifting their status from potential beneficiaries to potential contributors) and emotional attachments to their home communities fade.

In the remainder of the article, this hypothesis will be tested using two connected approaches: an indirect method (*Section 3*) in which variables accounting for the inverted "U" shape ought to i) explain the level of remittances, and ii) vary with the time of residence, and a direct method (*Section 4*) in which candidates are introduced directly in a regression model accounting for the time pattern of remittances.

3.1. The indirect method

i) A model for remittances' determinants

Elsewhere, I have claimed that remittances' determinants are encompassed in five necessary elements or steps of the remitting process: a) a stock of migrants, b) potential remittances (net income net of current expenses), c) willingness to remit,[4] d) transfer channels, and e) potential recipients. With this theoretical framework in mind, and ignoring the first (a) and fourth (d) steps,[5] the following potential explanatory variables are to be included in the analyses.

Regarding the potential remittances (b), two variables have been included in the analysis: *annual income*, which can also perform as a proxy for wealth, and the *number of dependent relatives in Spain*, which shapes migrants' current expenses in the host economy. *Annual income* is expected to present a positive effect on total remittances and rise with time of residence, whilst the *number of dependent relatives in Spain* is expected to have a negative effect on remittances and increase with time spend in Spain through family reunification or formation.

[4] The debate about the motivations of remitting (*i.e.* altruism, self-interest, insurance, investment portfolio) may be incorporated into this element.

[5] The stock of migrants (a) is disregarded as our sample only includes actual migrants. Transfer channels (d) are also overlooked by assuming individuals face a similar transfer business environment. However, even though the money transfer business has evolved primarily through time, significant differences remain across different countries of origin. For instance, money transfers to Africa are known to be exceptionally expensive, while the US-Mexico market is highly competitive. In this article, ignoring (d) may cause problems for Madrid's survey, as all foreign-born groups are included, but for the Balearic Islands' context, where the sample is composed exclusively by Ecuadorians, it is reasonable to assume (d) is controlled for.

Concerning the willingness to remit (c) - which can be thought as the proportion of potential remittances that migrants are willing to donate - two variables have been incorporated, both measuring the psychological attachment to their home communities: the *frequency of contact with relatives* and the *intention to return*. Increasing values in both variables should be positively related to the level of remittances and both variables are expected to fade with time of residence. For theoretical and empirical reasons, *migrants' intention to return* appears as a more adequate proxy for the willingness to remit. Unfortunately, the response rate was low and a disproportionate number of cases were missed. Therefore, the preferred proxy for the willingness to remit is the *frequency of contact with relatives* though the *intention of return* has been included for comparability reasons in the Balearic Islands' models.

Finally, as regards potential recipients (e), the *number of dependent children*, the *number of parents* and *other dependent relatives* residing in the country of origin, *partners' country of residence*, and the *number of siblings who are international migrants* have been examined. Dependent relatives residing in the country of origin should have a positive effect on remittances, whereas the number of siblings who are international migrants should present a negative effect, as they are expected to share the burden of supporting common dependent relatives. As for their variation with migrants' time of residence, nuclear family members living in the country of origin are expected to decrease due to family reunification processes. Other dependent relatives belonging to the migrant's extended family, including parents, are expected to be uncorrelated with time of residence. Finally, siblings who are international migrants are expected to increase with migrants' migration experience as the likelihood of migrating is expected to increase with the number of relatives abroad (*i.e.* "siblings follow siblings effect").

Additionally, gender and age are included as control variables.

Five regression models have been carried out to identify potential candidates accounting for the time pattern of remittances. The first two models are identical, though for different contexts (Madrid and Balearic Islands). The third, fourth and fifth models incorporate a greater array of variables but could only be applied to the Balearic survey, due to insufficient data for Madrid. The dependent variable is for every model the annual amount of remittances which includes remitters and non-remitters and. It is thus measuring both the probability to remit and the level of remittances. Since the dependent variable is simultaneously discrete and continuous, with high incidence of "0" values, Tobit models have been employed.

Figure 6. Remittances' determinants

Tobit Models. Dependent Variable is the Annual Amount of Euros Sent by Migrant > 16 years

	Madrid I	Balearic Islands II
Partner lives in country of origin	20.37 (-0.07)	393.95 (-1.00)
Number of dependent children living in country of origin	711.18** (-8.05)	531.09** (-4.76)
Number of other dependent relatives living in country of origin	399.72** (-5.69)	394.56** (-4.37)
Number of siblings who are international migrants	-73.86 (-1.30)	-83.24 (-1.06)
Annual Income (1000€)	221.06** (-12.71)	85.93** (-4.67)
Number of dependent relatives in Spain	-91.62 (-0.95)	-301.41* (-2.39)
Frequency of contact with relatives (1=Never, 5=Everyday)	521.41** (-4.22)	843.26** (-5.36)
Gender (1=Female, 2=Male)	-126.19 (-0.61)	48.92 (-0.17)
N	739	435
(Left) Censored Observations	137	59
LR Chi2 (8)	285.88	147.02
Log Likelihood	-5657.1	-3518.5

In brackets, t-value
*Significant at the 0,05 level; **significant at the 0,01 level
Models include a constant

In *Figure 6* we can observe that all variables have the expected signs, though some coefficients exhibit unanticipated values. For instance, leaving the partner back home has a positive effect but this is statistically not significant. Theoretically, this outcome is not unsound as partners staying back home often participate in the local labour market and, consequently, may be in no need of additional income. This is not the case for dependent children and other dependent relatives who, by definition, rely on migrants' remittances and other external sources of income. In this regard, it is not surprising that their coefficients are statistically significant in both models.

Potential remittances, represented by *annual income* and the *number of dependent relatives in Spain*, have a positive impact on the amount remitted. Every additional thousand Euros increase annual remittances by about two hundred Euros in Madrid and by about one hundred Euros in the Balearic Islands. Moreover, every additional dependent relative in Spain reduces annual remittances, and potential remittances, roughly by one hundred Euros in the first model, and approximately by three hundred Euros in the second model, presenting a significant effect only in the latter case.

Finally, contacting family members back home has a very strong influence on the level of remittances. For instance, migrants who declare daily contacts with their relatives are expected to send a thousand more Euros annually than those declaring weekly contacts in Madrid's survey, and around one thousand six hundred Euros more in the Balearic survey. This variable aims at measuring the willingness or the propensity of migrants to donate part of their savings.

Three additional models are presented for the Balearic context in *Figure 7*, pursuing two objectives. First of all, give a better account of the influence of the structure and location of migrants' families, separating parents from other relatives such as nephews, siblings and grandparents and introducing a quadratic form for the children's effect. The results confirm the quadratic effect for children, probably accounting for household economies of scale in consumption, and the stronger effect for dependent parents compared with that for other dependent relatives.

Secondly, test if the influence on remittances of contacting relatives back home differs from that of intending to return to the country of origin. The results show a similar effect for both variables, based on its *t* value, more akin if we bear in mind the differences in sample sizes. However, the correlation between both variables is moderate and, hence, they seem to be tapping different aspects of the willingness to remit. A further proof of this difference is the fact that the decrease in the Log Likelihood is greater when the *intention of return* is included in the regression model. Actually, following the correlations between these and other independent variables, the *Frequency of contact* seems to be associated with a social networks component of attachment, whereas the *intention of return*, which is scarcely correlated with the number of relatives back home, seems to measure a more psychological aspect of migrants' attachment towards their home communities (*i.e.* place attachment). All in all, the *Intention of Return* seems as a more appropriate proxy for the willingness to remit.

Figure 7. Remittances' determinants

Tobit Model.
Dependent Variable is the Annual Amount of Euros Sent by Migrant > 16 years.

	Balearic Islands III	Balearic Islands IV	Balearic Islands V
Partner lives in country of origin	366.40	340.06	142.14
	(-0.92)	(-0.81)	(-0.34)
Number of dependent children living in country of origin	962.33**	1013.42**	907.44**
	(-3.51)	(-3.48)	(-3.16)
Number of dependent children living abroad squared	-133.21*	-165.94*	-138.63*
	(-1.98)	(-2.37)	(-2.01)
Number of dependent parents living in country of origin	530.72**	718.21**	632.08**
	(-3.25)	(-4.03)	(-3.58)
Number of other dependent relatives living in country of origin (exc.parents)	345.67**	535.65**	480.61**
	(-3.11)	(-4.41)	(-4.00)
Number of siblings who are international migrants	-87.78	-203.22*	-137.07
	(-1.13)	(-2.37)	(-1.60)
Annual Income (1000€)	76.09**	128.57**	121.14**
	(-4.12)	(-5.44)	(-5.22)
Number of dependent relatives in Spain	-316.97*	-419.65**	-399.96**
	(-2.48)	(-2.95)	(-2.85)
Frequency of contact with relatives (1=Never, 5=Everyday)	792.38**	--	627.66**
	(-5.03)	--	(-3.70)
Intention of return (0=No, 1=Yes)	--	1144.12**	1030.41**
	--	(-3.91)	(-3.56)
Gender (1=Female, 2=Male)	222.24	-315.36	-146.98
	(-0.76)	(-0.98)	(-0.46)
Age	42.18**	50.46**	45.21**
	(-2.97)	(-3.17)	(-2.88)
N	434	369	369
(Left) Censored Observations	59	54	54
LR Chi2 (10)	159.89	144.71	158.29
Log Likelihood	-3502.82	-2945.09	-2938.30

In brackets, t-value
*Significant at the 0,05 level; **significant at the 0,01 level
Model includes a constant

ii) Time variance

In order to explain the time pattern of remittances, candidates must not only have an impact on remittances but also vary with time of residence. It is therefore necessary to identify the time pattern of remittances' determinants. To do so, in *Figure 8* a set of correlations between time of residence and the aforementioned variables are presented. It is important to note, however, that correlations may disguise complex time patterns - such as curvilinear relationships – from which we could draw false conclusions. To avoid such a risk, I end this

section with a set of graphics representing the time pattern of all the potential explanatory variables. It can be observed (*Figure 9*) that, on the whole, time patterns are linear and, therefore, correlations shown in *Figure 8* offer an acceptable picture of real time patterns. Correlations between time of residence and covariates of the level of remittances portray the expected signs though only four are statistically significant in both Madrid and the Balearic Islands contexts. This is the case for the *number of dependent children living abroad*, the *number of relatives in Spain*, the *intention to return* to the country of origin and the *annual income*. In sum, what the data is telling us is that the nuclear family, whether through reunification or new formation, the annual income and the intention of return may possibly have a significant effect on the time pattern of remittances.

Figure 8. The time pattern of remittances' determinants

Pearson Correlations

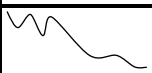
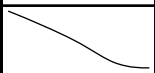
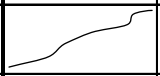
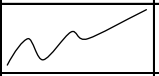
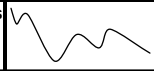
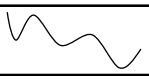
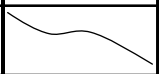
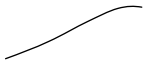
	Madrid (N=827)	Balearic Islands (N=451)
	Time of residence	
Partner lives abroad	-0.125**	-0.047
Number of dependent children living abroad	-0.183**	-0.125**
Number of other dependent relatives living abroad (incl.parents)	0.046	-0.031
Number of parents living abroad	-	0.045
Number of other dependent relatives living abroad (excl.parents)	-	-0.003
Number of dependent relatives in Spain	0.211**	0.203**
Siblings who are international migrants	0.165**	0.081
Frequency of contacts with relatives	-0.057	-0.015
Intention of return	-0.129**	-0.131**
Annual income	0.218**	0.193**

*Significant at the 0,05 level; **significant at the 0,01 level

iii) The joint effect: Identifying remittances' determinants varying with time of residence

As stated previously, the time pattern of remittances is produced by the aggregated effect of remittances' determinants that vary with time of residence. That is, to find out whether a variable has any effect on the time pattern it is necessary that both conditions are met. Following the previous analyses, this is clearly the case for four variables: *number of dependent children living abroad*, *number of dependent relatives in Spain*, *the intention of return* to the country of origin and the *annual income*. A summary of the results can be found in *Figure 9*.

Figure 9. A summary of the time-varying remittances' determinants (indirect method)

	Madrid		Effect on remittances' time pattern?	Balearic Islands		Effect on remittances' time pattern?
	Time pattern	Effect on remittances		Time pattern	Effect on remittances	
Partner lives abroad		+-	NO EFFECT		+	WEAK
Number of dependent children living abroad		+++	VERY STRONG		++	STRONG
Number of other dependent relatives living abroad (incl.parents)		++	NO EFFECT		++	NO EFFECT
Number of parents living abroad	----------	X	X		++	NO EFFECT
Number of other dependent relatives living abroad (excl.parents)	----------	X	X		++	NO EFFECT
Number of dependent relatives in Spain		-	WEAK		--	STRONG
Siblings who are international migrants		-	WEAK		-	WEAK
How often interviewee contacts family members living in country of origin		++	WEAK		++	NO EFFECT
Intention of return		X	X		++	STRONG
Annual Income		+++	VERY STRONG		++	STRONG

--- Strong negative effect; -- Negative effect; - Slight negative effect; +- No effect; + Slight positive effect; ++ Positive effect; +++ Strong positive effect; X No data

3.2. The direct method: Specifying variables' effect on remittances' time pattern

Four variables have been shown to affect considerably the time pattern of remittances. Nonetheless, it is necessary to go one step further and specify how these variables shape precisely the time pattern. That is, find out which variables are responsible for the upward and the downward slopes of the inverted "U".

To my knowledge, unfortunately, I don't know of any conventional methodology to carry out this task. An attractive method consists of incorporating into a regression model, with remittances as the dependent variable and time of residence dummies as independent variables, the potential variables - or mechanisms – that are believed to shape the time pattern of remittances. Observing the changes in the coefficients of the dummy variables can provide us with useful information. As additional variables are introduced into the regression models, I expect the correlation between time of residence and remittances to weaken and, at the same time, the inverted "U" shape to become flatter.

To ease the interpretation, three steps had to be taken. First of all, simplify the analysis by taking as the dependent variable just the remittances sent for consumption, leaving to one side remittances dedicated to savings, investment and real estate, which are more complicated to account for. Moreover, match the sample sizes of all regression models by dropping a number of cases. Madrid's sample had to be reduced to 589 cases and the Balearic survey to 280 cases. Finally, turn the group with the peak of remittances into the reference group (7-8 years for Madrid and 5 years for the Balearic Islands). It has to be noted that these necessary steps, especially the dropping of cases, have altered considerably some results, the most important one being the transformation of the inverted "U" into a sort of "M". Still, the essential features are maintained: the "M" form still rises in $t - 1$ and decreases in $t + 1$.

Results in *Figure 10* and *12* are interpreted as following. The upper numbers represent the OLS coefficients of the time of residence dummies, when no additional variables are included (for the base model) or when one additional variable is included (for the rest). The lower numbers, in italics, are the differences in OLS coefficients between the base model and the rest of the models. They represent the difference in the amount of remittances that would be sent - in comparison with the reference group - if a specific variable was controlled for. For instance, in *Figure 10*, migrants with the shortest migration experience would send 219 less Euros if the number of children living abroad was the same for everyone in the sample. This difference is largely explained by the fact that migrants with shorter migration experiences have more children back home. The same effect for *annual income* is a staggering 761€. That is, recent migrants would sent 700€ more yearly if they had the sample mean income. Besides, the number in italics can also be thought as their contribution to the curvilinearity of the remittances' time pattern. When positive, they contribute to the steepness of the slopes, both in *t – 1* and *t + 1*; when negative, to its flatness. In the bottom part of the tables, the aggregated effect of all additional variables is shown, when introduced separately and simultaneously,[6] together with the percentage of the inverted "U" shape explained.
It is important to note, however, that a set of variables which would likely have an effect on the time pattern could not be included due to data limitations, such as migrants' current expenses in the host society. As a result, the time pattern could not be flattened entirely.

3.2.1. *Madrid*
Only two variables seem to affect considerably the time pattern of remittances in Madrid's context: *annual income* and the *number of dependent children in the country of origin*. Results show that income alone explains the difference between remittances in *t-1* and *t* (*t* being the reference group), offsetting the positive effect that migrants' relatives' location have on remittances during this migration period. Low earnings reduce drastically the potential remittances that migrants can send back home, frustrating to some extent their willingness to support their relatives. In fact, controlling for income, the time pattern of remittances would not be curvilinear but linear and negative. In other words, if income did not change with time of residence, remittances would decrease since the initial migration experience, even accounting for the effect of migration costs, bearing out the time decay hypothesis.

[6] The correspondence between these results determines the reliability of the individual results. The equivalence of both outcomes would imply that the effects of the individual variables on the time pattern are independent among them. Results show that independence between variables is significant, though not complete.

Figure 10. Time-varying remittances' determinants in Madrid (Direct method)

Madrid. Variations in OLS coefficients.
Dependent variable is the ammount of remittances sent yearly.

	Time of residence					
	t - 1			t	t + 1	
	0-2 years	3-4 years	5-6 years	7-8 years	9-11 years	12+ years
No additional variables (Base Model)	-310.30 -	-107.96 -	-234.44 -	**ref.**	-370.51 -	-705.92 -
I. Number of dependent children living abroad	-529.07 *-218.77*	-241.02 *-133.06*	-282.77 *-48.33*	**ref.**	-240.33 *130.18*	-566.05 *139.87*
II. Partner lives abroad	-391.48 *-81.18*	-169.84 *-61.88*	-237.86 *-3.42*	**ref.**	-417.19 *-46.68*	-642.23 *63.69*
III. Other depdendent people living abroad (including parents)	-320.31 *-10.01*	-108.37 *-0.41*	-225.45 *8.99*	**ref.**	-404.83 *-34.32*	-764.8 *-58.88*
IV. Number of dependent relatives in Spain	-406.78 *-96.48*	-172.81 *-64.85*	-282.71 *-48.27*	**ref.**	-348.72 *21.79*	-728.57 *-22.65*
V. Siblings who are international migrants	-331.36 *-21.06*	-117.42 *-9.46*	-246.94 *-12.50*	**ref.**	-355.23 *15.28*	-684.73 *21.19*
VI. Annual income	450.71 *761.01*	299.42 *407.38*	218.05 *452.49*	**ref.**	-549.88 *-179.37*	-562.02 *143.90*
Aggretated effect of additional variables introduced: ***separately***	*333.51*	*137.72*	*348.96*	**ref.**	*-93.12*	*287.12*
concurrently	*426.19*	*208.74*	*-363.65*		*-48.00*	*258.46*
Slope explained	*137.35%*	*193.35%*	*155.11%*		*12.96%*	*36.61%*

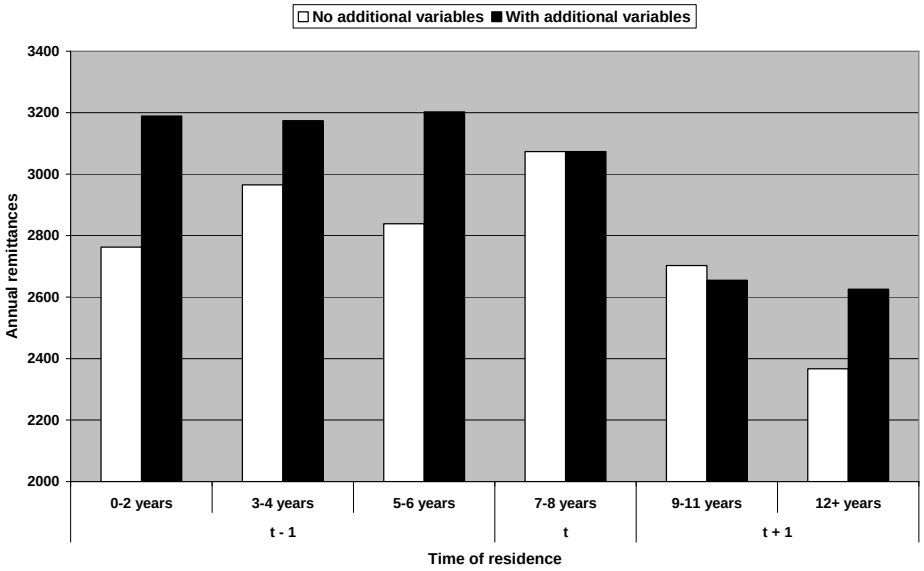
N = 589 for all models

Regarding the downward part of the time pattern in *t+1,* it is only partially explained by the additional variables introduced in the regression model. About a quarter of the slope is explained, mainly by the *number of dependent children living abroad*. The effect of this variable is due primarily to family reunification and is especially important in the first years of migration experience. For instance, migrants' children location account for a difference of 350€ of remittances yearly between the "0-2 years" group, where scant children reunification has taken place, and the "9-11 years" group, where looked-for children reunifications have been by and large undertaken.

The remaining variables either do not have a significant impact, as was predicted in the previous section, or their impact is unclear.

In *Figure 11*, the level of remittances is shown for both the base model and the "controlled" model (*i.e.* all variables are introduced concurrently). It can be clearly observed how the inverted "U" time pattern becomes a linear and negative functional form.

Figure 11. Time pattern with and without additional variables (Madrid)



3.2.2. Balearic Islands

Three differences are to be noted between Madrid and the Balearics Islands, as regards the individual variables. To begin with, the effect of income is moderate, instead of strong, in the latter which explains why the effect of potential recipients' location cannot be cancelled out entirely. Besides, in the Balearic Islands the *number of dependent relatives in Spain* has a significant effect, negative in *t – 1* and positive in *t + 1*. Finally, the *number of dependent children abroad* has a stronger effect in Madrid. In spite of these differences in coefficients' significance, the signs are as expected in both Madrid and the Balearic Islands, confirming the results from *Figure 9*.

As for the aggregated effect, the results seem unconvincing for period t – 1. Actually, the introduction of variables - separately or simultaneously - has a sharpening effect on the curvilinear shape instead of a flattening expected one. Non-included variables such as current expenses faced by migrants in Spain, expected to be higher in the initial migration period, may account for the unanticipated aggregated outcome.

Results show a clearer picture for the *t + 1* period, where not only individual variables, but also the aggregated effect portray anticipated results. In addition to the number of dependent children abroad, the number of dependent relatives in Spain has also a significant and negative impact on period *t + 1*. The former is related with family reunification, while the latter is related with family reunification and family formation in the Spanish context. Hence, for Ecuadorians who have resided in the Balearic Islands for more than five years, the formation of new families in the host society - whether it means finding a partner and giving birth or just giving birth - reduces significantly their level of remittances. Both variables compensate the positive effect that income presents in *t + 1*, which rises in this period though at a decreasing rate.

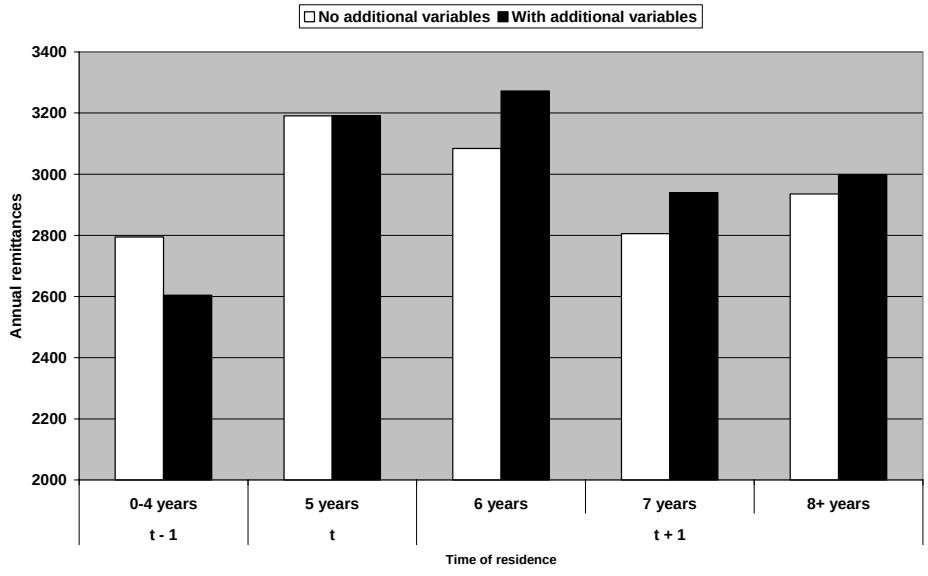
Figure 12. Time-varying remittances' determinants in the Balearic Islands (Direct method)

Balearic Islands. Variations in OLS coefficients
Dependent variable is the ammount of remittances sent yearly.

	Time of residence				
	t - 1	t	t + 1		
	0-4 years	5 years	6 years	7 years	8+ years
No additional variables (Base model)	-396.57	ref.	-106.59	-385.30	-255.82
	-		-	-	-
I. Number of dependent children living abroad	-547.90	ref.	-9.86	-139.45	-159.09
	-151.33		*96.73*	*245.85*	*96.73*
II. Number of dependent relatives in Spain	-510.45	ref.	79.67	-125.95	-70.40
	-113.88		*186.26*	*259.35*	*185.42*
III. Partner lives abroad	-429.74	ref.	-135.09	-489.95	-286.74
	-33.17		*-28.50*	*-104.65*	*-30.92*
IV. Number of parents living abroad	-372.15	ref.	-132.73	-407.96	-279.64
	24.42		*-26.14*	*-22.66*	*-23.82*
V. Number of other dependent relatives living abroad	-444.09	ref.	-143.92	-360.17	-194.38
	-47.52		*-37.33*	*25.13*	*61.44*
VI. Siblings who are international migrants	-399.69	ref.	-112.09	-339.57	-176.65
	-3.12		*-5.50*	*45.73*	*79.17*
VII. Annual income	-359.86	ref.	-142.91	-601.10	-464.84
	36.71		*-36.32*	*-215.80*	*-209.02*
VIII. Intention to return	-447.15	ref.	-113.01	-339.63	-245.54
	-50.58		*-6.42*	*45.67*	*10.28*
Aggretated effect of additional variables introduced: ***separately***	*-338.47*	ref.	*142.78*	*278.62*	*169.28*
concurrently	-190.67		187.83	134.46	62.74
Slope explained	48.08%		176.22%	34.90%	*24.53%*

N = 280 for all models

Figure 13. Time pattern with and without additional variables (Balearic Islands)



The Balearic Islands' results, however, need to be cautiously analyzed due to Ecuadorians high concentration in the five to eight years time of residence range. More than half of Ecuadorians residing in Spain arrived between

1999 and 2001 and more than 90% after 1998, which complicates inference amid those Ecuadorians with extreme values in their migration experience.

4. Conclusion

Although the time decay hypothesis and the inverted "U" time pattern are widely accepted in the remittances' *microworld*, to date empirical support for any of them is rare, especially within the academic literature. The reason for it relates with a startling lack of interest for the time pattern of remittances, as time of residence is either included as a control variable, or together with time-varying covariates, blurring – indeed flattening – remittances' time pattern. An exception to this indifference includes Amuedo-Dorantes and Pozo's (2006a) and Poirine (2006). Following these studies, empirical evidence has been presented which bears out the inverted "U" time pattern in Madrid and the Balearic Islands, and for six different subsamples (i.e. foreign-born, consumption, investment, men, women and senders), the only exception being *investment, savings and real estate* in Madrid's context. Conversely, the time decay hypothesis could only be partially confirmed in Madrid's context but this is likely the result of highly skewed samples where few migrants have long migration experiences (in accordance with Spanish foreign-born population).

The next step in the research has been to establish a mechanism for the observed inverted "U" time pattern. Amuedo-Dorantes and Pozo (2006a) argue that remittances initially rise as migration costs are recovered and labor conditions improve, and shrink as their attachments to their country of origin become weaker. An extension of their hypothesis – following three of the five necessary conditions of remitting (i.e. potential remittances, willingness to remit and potential recipients) - was tested by the use of a direct and an indirect method. Results show that four variables affect the time pattern of remittances in a significant way: *number of dependent children living abroad*, *number of dependent relatives in Spain*, *the intention of return to the country of origin* and the *annual income.* More importantly, these variables seem to affect differently different parts of the time pattern:

- The *annual income* has a negative impact on the level of remittances in the initial years of migration and a positive one in the later years.
- The *number of dependent children living abroad,* the *number of dependent relatives in Spain*, and the *intention of return* exert a positive effect first and a negative effect after the peak of remittances is reached.

Although the results from this study are satisfactory and policy implications may be derived straightforward it is important to note several shortcomings. Foremost, a significant part of the time pattern of remittances remains unexplained, as can be observed in Figures *11* and *13* where $t - 1$ seems better explained in Madrid and $t + 1$ in the Balearic context. If we had been successful, the graphs should portray a gentle slope. Unobserved variables and the cross-sectional and skewed character of the sample (*i.e.* high concentration of recent migrants, especially in the Balearic Islands) might be potential candidates for this weakness. Last but not least, analysing a time pattern with cross-sectional surveys is all but a promising way of tackling the problem. Migration waves might be easily confounded with time of residence effects, which could lead the researcher to false conclusions. Nonetheless, with such a short migration experience, this may not yet be a relevant problem in the Spanish context save for a few foreign-groups with successive and distinctive migration waves (*e.g.* Argentineans, Peruvians). Further research on this topic will necessarily adopt a longitudinal perspective.

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Appendix

A. Descriptive Statistics

Variables (All refer to the last 12 months)	Madrid	Balearic Islands	Values
Propensity to Remit	78.4	86.3	*In % (Yes)*
Number of Remittances	9.22	10.64	*No.*
Ammount per Remittance	314.5	347.8	*Euros*
Number of Recipients	3.40	3.45	*No.*
Use:			
For Food	88.2	89.0	
For Education	42.9	54.9	
For Health	47.3	55.4	
For Transport	22.8	20.5	
For House Rent / Upkeep	18.9	38.3	*In %*
For Real Estate	11.1	10.3	
For Investment / Savings	6.6	3.4	
For Debt Payment	7.0	2.8	
Recipients:			
Partner	16.8	9.4	
Children	36.7	44.6	
Parents	59.4	62.8	
Siblings	31.3	32.0	*In %*
Other relatives	12.6	31.0	
Interviewee	10.2	9.3	
Other	0.9	1.0	
Net Income (Monthly)	893.7	1001.7	*Euros*
Spanish Nationality	12.1	9.1	*In % (Yes)*
Returned to Country of Origin	38.7	35.1	*In % (Yes)*
Time of Residence	5.2	5.9	*Years*
Married or Stable Partner?	54.4	61.6	*In % (Yes)*
Have Children?	60.8	77.1	*In % (Yes)*
Number of Children	2.16	1.89	*No.*
Siblings	4.53	5.04	*No.*
Age	34.0	33.42	*Years*
Sex	0.49	0.49	*0 = Female 1 = Male*
Included in the Municipal Register?	93.7	96.8	*In % (Yes)*
N	827	451	