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Elderly Mobility in Italy: an Interpretative Model

ABSTRACT

Elderly mobility has been often studied in Anglo-Saxon countries, where mobility rates are traditionally higher than in Europe and Italy. But Europe (and especially Italy) has now the most aged population in the world. And national and international flows are going to different directions, compared to the past. Italy became a destination country for young people coming from Africa and Eastern Europe (mainly looking for a job), but also for elderly coming from Northern Europe and USA (looking for "amenity"). But still it is dominant the return migration among the elderly. This paper tries to distinguish this return migration from other types of elderly migrations, and to make hypotheses on the elderly mobility in Italy at the beginning of the new century. Italy is, at the same time, origin and destination of elderly mobility. Italy was in fact one of the main origin of internal and international migration flows, now it is one of the main destination. It is interesting to explore what happens to these flows at retirement age of migrants and to see the "new" elderly mobility that is not "affected" by "return" migration. We especially focus on amenity-seekers and on assistance-seekers elderly migrants. This study has been done using register individual data (inscriptions/cancellations), the origin/destination matrix approach, and a multilevel analysis. We selected the Genoa Province, because is the biggest province of Liguria, the most aged region of Italy.

Elderly Mobility became during the last decades a major investigation issue of Demographic and Social Science, especially in the United States.
That is because United States and Australia, overall, experimented traditionally a larger amount of internal migration, comparing with European standards. That's why internal migration of elderly became an interesting topic in the United States already in the seventies (Chevan & Fisher, 1979), while in Europe the issue is now coming out, starting from the nineties, attempting to study in particular the movements of elderly from Northern to Southern Europe (Warnes, 2001).
Studies on internal mobility in Italy were centred on the migration of people from the South to the North, due to the lack of job opportunities, and the traditional migrations from Italy to the United States and to Northern Europe.
But few efforts (Bonaguidi, 1985; Bonaguidi & Terra Abrami, 1993; Birindelli & Heins, 1999) were done, so far, to study the phenomenon of elderly migration, that, in a large part, is "affected" by the former migration course, because of "return migration".
We think that, even in a country such Italy, where internal mobility is still a minor phenomenon, and where the registration of movements often doesn't correspond to a real move (there are many moves that are not registered, and other moves that are registered only for fiscal matters) is worth to try a study of elderly mobility, as it's surely a social issue that will become more and more important, just only thinking of the fact that elderly people are destined to become more and more larger proportion of population and amount in the near future.

The focus of our work is to analyse elderly migration as a system, distinguish between the types of migrants.
Looking at the motivation that can bring to an elderly migration we can have these types of migration:
Return migration: a movement that people does to the former place of staying, after finishing his working period. This movement can be captured in population register data looking at the place of birth.
Amenity related migration: this is the movement that brings aged people to sunny places (Frey et al., 2000). In the U.S., researchers clearly identified the creation of "retirement states" (Lin,

1999): some of them promoted incoming elderly migration. This movement can be captured in population register data looking at the movements from towns to "warm places".
Job migration: this can be a new phenomenon (Guillemard & Rein, 1993), that sees retired people as still active people. This kind of mobility can be hardly seen looking at population register data, as we don't have information about it. But we assume that is actually absent from the Italian flows.
Economic related migration: the natural decrease of old people's richness and the impossibility or difficulty of still maintain the tenor of life of working age, can bring old people from the centre of a town to the periphery or to the belt across the urban area. This kind of movement might be seen in population register data, isolating the movements from the big town to the nearest small towns, but it's not our goal at the moment, as we concentrated the analysis on migrations to Genoa municipality, not distinguishing the flows inside the municipality.
Assistance-seeking migration: it's a kind of migration that can bring the old people to move from his normal place of living to a place where there is a better health sanitary system (Findley, 1988) or a better assistance (that is associated with return elderly migration: Frey et al., 2000). This movement can be seen in population register data, crossing it with data about the welfare system of each town, and the diffusion of hospitals and old people centres (Duncombe et al., 2001).
Family migration: migrations to the neighbourhood of family (children). That is probably the most interesting field of elderly mobility (Boyd, 1989), but it's difficult to study, with just census or population register data. It could be also correlated with return migration.
Looking at the spatial dimension, we can also distinguish migrations in:
Short-distance internal migrations: migrations internal to the province
Long-distance internal migrations: change of residence through the provinces and from a region to another
International migrations
Summarising, thanks to population register data, we suppose to be able to see how old people migrate in Italy: if they are moved by a return, assistance or amenity reason.

DATA AND RESEARCH METHODS
Data were taken from Population Register from ISTAT about inscriptions/cancellations. We isolated all people that, in year 2.000, inscribed the population registers in Genoa province or cancelled from Genoa province: in other words immigrations and emigrations to and from Genoa.
Population Register data collections in Italy include two big statistics: the one with all the people inscribed into each municipality's register (data were published each year), and the one with only the movements (inscriptions/cancellations). These last are the data we use here. They have only a few variables (sex, age, place of birth, origin and destination of the move, education level and work position).
We use the origin-destination matrix (Gesano, 1987) for all the municipalities of Genoa province. We choose this province because it's in Liguria region, one of the main destination of elderly migration (national and international). Liguria is also the most aged region of Italy and the most uniformly "old". Among the four municipalities of Liguria, Genoa is the biggest, in terms of population.
The matrix was built for year 2000. We selected people aged 55 and more. The inscriptions/cancellations data were used to have the movements between the 67 municipalities of Genoa province, then we collected together movements outside the province but inside the same region (Liguria), then the internal national migrations (inside Italy) and, finally, international migration. We excluded all the data regarding "formal" registrations (due to checks from the census or other).

Map 1 – Genoa Province, Rest of Liguria Region, Rest of Italy

ORIGINS AND DESTINATIONS

In Genoa Province 3.302 people aged 55 or more inscribed to the registers, while 3.767 cancelled during year 2.000. The total net shows as Genoa province is not an attractive province as a whole. That's why it's important to analyse in detail the moves among the province. Genoa has 67 municipalities inside its territory. Among these, there is the big Genoa's municipality.

32% of the flows departing from Genoa municipality were directed to a municipality of the same province. On the other hand, 30% of the flows arriving to Genoa municipality were done by people coming from another municipality of the same province.

Thinking of the total amount of elderlies'flows that interest at least one municipality of Genoa province, the most of the flows were done by people coming or arriving from an italian municipality out of Liguria (Table 1).

Table 1 – Flows of elderly in Italy and Liguria, year 2000

	Absolute values				*Percentage(rows)*			*Percentage (column)*			
					Destination						
Origin	**Liguria**	**Rest of Italy**	**Abroad**	**Total**	**Liguria**	**Rest of Italy**	**Abroad**	**Liguria**	**Rest of Italy**	**Abroad**	**Total**
Liguria	4.056	3.150	266	7.472	54,3	42,2	3,6	51,3	1,9	3,6	4,0
Rest of Italy	3.325	151.931	7.177	162.433	2,0	93,5	4,4	42,1	89,3	96,4	87,6
Abroad	524	15.091	-	15.615	3,4	96,6	-	6,6	8,9	-	8,4
Total	7.905	170.172	7.443	185.520	4,3	91,7	4,0	100,0	100,0	100,0	100,0

Source: own calculations on Population Register, ISTAT

The province of Genoa has more cancellations than inscriptions of elderlies. But it has, comparing to other provinces, a considerable number of movements of aged people in both directions. It is important to notice that the net is postitive, regarding to the international flows (Table 2).

Table 2 - Genoa Province - Inscriptions/Cancellations of elderly, Population Register, 2000 (ISTAT)

Genoa	**Inscriptions**	**Cancellations**	**Net**
Same province	1.745	1.745	-
Same region (but other province)	170	309	*-139*
Italy (other region)	1.147	1.603	*-456*
Abroad	240	108	*+132*
Total	***3.302***	***3.767***	***-463***

Source: own calculations on Population Register, ISTAT

RETURN MIGRATION

First, we distinguish, among all the migrations, the *return* migrations.
These are (as we defined them):
- inside the province: the aged people who moved from a city to their *city* of birth (that is different from the departure town).
- Migrants from and to the rest of Italy and abroad have been classified as return migrants if they moved to their *province* of birth (for national migrants) or simply to their *country* of birth (for international migrants).

We want to notice that this method of defining "return migration" is an under-estimate of the total phenomeno, as the place of birth not always correspond to the real place where the people return, and it is not the only one, in a life.
So that, we are able to have an idea about how much are the return migrants. They are 17,1% of people coming to Genoa province and 19,2% of old people going away from Genoa (Table 3).
Among the migrants to Genoa from abroad, return migrants are an higher percentage.
We can look at the following table. With a simple hypothesis we "explained" almost 20% of migrations from and to Genoa.
As we can see, almost one third of people coming to Genoa from other provinces of the same region, were born in Genoa. That might signify that many people went to work in other provinces of Liguria (we remind that especially the eastern part of the region is highly industrialized).

Table 3 - Return Migrations of elderly by origin/destination. Genoa povince, 2000

Area	Return	Inscriptions	%	Return	Cancellations	%
Same province	282	1.745	*16,2*	282	1.745	*16,2*
Same region (but other province)	53	170	*31,2*	59	309	*19,1*
Italy (other region)	178	1.147	*15,5*	373	1.603	*23,3*
Abroad	51	240	*21,3*	9	108	*8,3*
Tot.	**564**	***3.302***	*17,1*	**723**	***3.767***	*19,2*

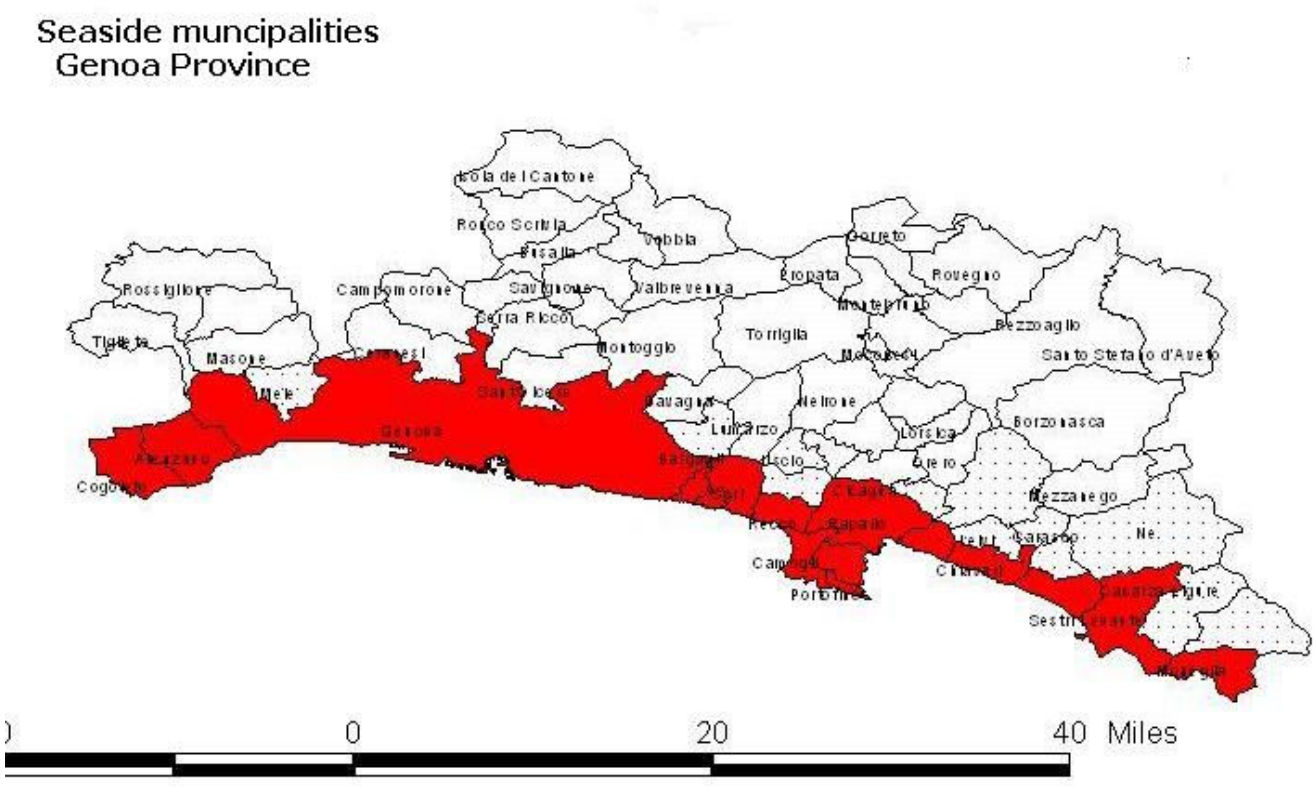
Source: own calculations on Population Register, ISTAT

We are not surprized by the relatively high percentage of return migrant between the elderly people coming from abroad, considering the migratory history of Italy.
A 23.3% of elderlies going out from Genoa and coming to other places of Italy (out of Liguria), are coming back to their born province. These two numbers are probably part of the two big italian flows of the past: one from Genoa to abroad, the other from southern Italy to north-western Italy.

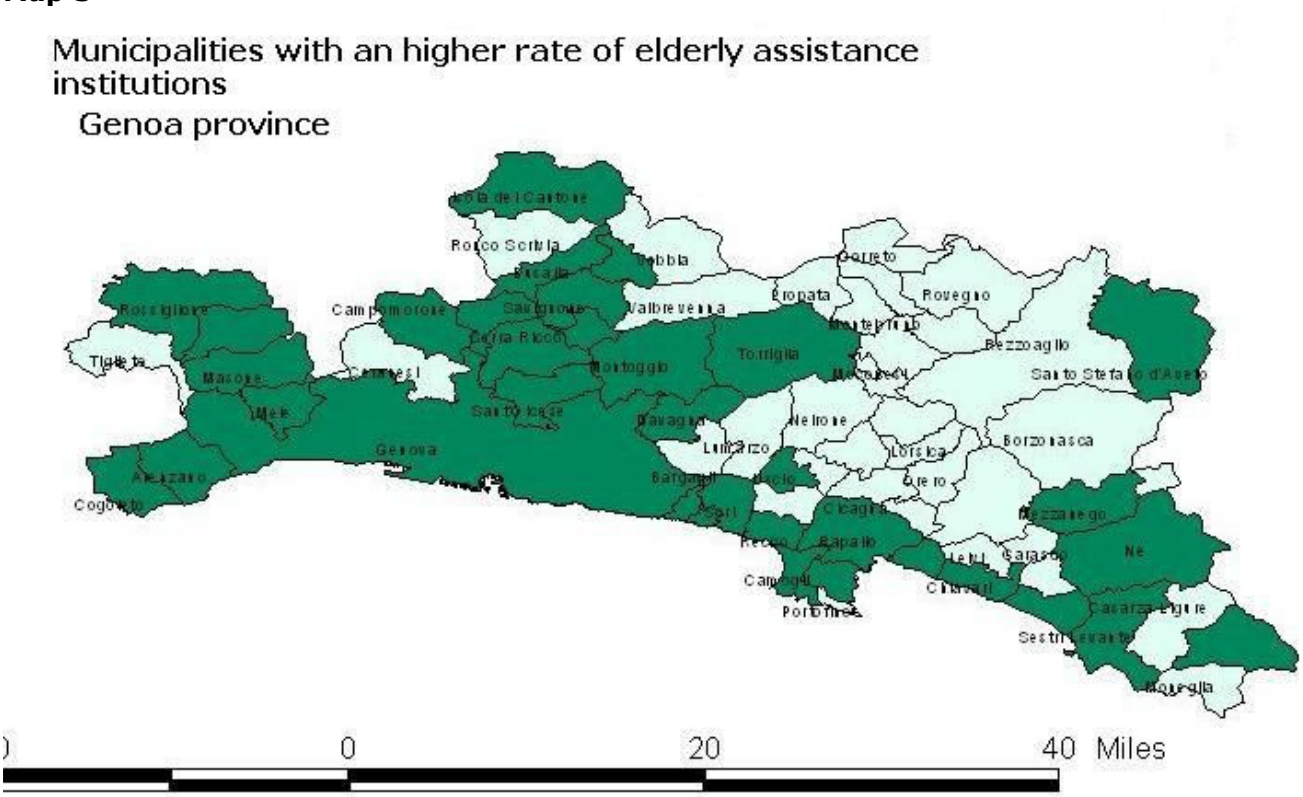
AMENITY AND ASSISTANCE SEEKING MIGRATIONS

Then, we defined amenity migration. As we focused on a muncipality detail, and as we don't have many indexes at that level, we choose to isolate all the flows that are directed to a seaside place, and to define that flows as "amenity related".
At the same time, to define the assistance-seeking migrations, we isolated the municipalities of Genoa province that have a number of health institutes for aged people (data from the 2001 Census) bigger than the average (see Appendix A).

Map 2



Map 3



Looking at Map 1 and 2, we can see that many of muncipalities that are seaside have also an over-average assistance system. This means that the two typologies of migration will be very associated, as it is possible that a return migration was done to one of that muncipalities.
That's why we present all the possible mixes of the three typologies in the following tables.

Between return and amenity migrations there is not a big connection (Table 4). It's a bit more the connection between return and assistance migration (Table 5), but it's very considerable the connection between amenity and assistance migrations (Table 6).
Almost 75% of flows to Genoa province are, contemporary, assistance and amenity "oriented".
In spite of that, we tried to use these distinct definitions, to see how they can be useful, and because we think they could be a base for extended calculations (for other geographic zones, or with additive hypotheses).
Anyway, only 9.5% of the flows are not explained by none of these definitions.
We present all possible crossings between the three considered typologies, as one migration can be identifies, at the same time, by more typologie. For example, a return migration can be done until an amenity or assistance related muncipality.

Table 4 - Flows of elderly to Genoa province by typology of migration, year 2000. Return and amenity realted

Typology of migration	Count	Percentage
Only Return	108	3.3
Only Amenity	2017	61.1
Return & Amenity	487	14.7
Nor return nor amenity	690	20.9
Total	***3302***	100.0

Source: own calculations on Population Register, ISTAT

Table 5 – Flows of elderly to Genoa by typology of migration, year 2000. Return and assistance seeking

Typology of migration	Count	Percentage
Only Return	66	2.0
Only Amenity	2355	71.3
Return & Amenity	529	16.0
Nor return nor amenity	352	10.7
Total	***3302***	100.0

Source: own calculations on Population Register, ISTAT

Table 6 - Flows to Genoa province, year 2000 by typology of migration. Amenity and assistance seeking

Typology of migration	Count	Percentage
Only Assistance	425	12,9
Only Amenity	45	1,4
Assistance & Amenity	2459	74,5
Nor assistance nor amenity	373	11,3
Total	***3302***	100,0

Source: own calculations on Population Register, ISTAT

Almost 60% of migrations of elderlies to Genoa province are related both to assistance and amenity reasons. That means the municipalities targeted by elderly are often at the same time by the sea and having an higher assistance level. More, almost 15% are movements that are amenity related, assistance seeking and return migrations.
Between the flows that are not connected with other, the assistance-seeking one is the strongest reason (11.4%).

Table 7 – Typology of migration of elderly to Genoa province, year 2000

Typology of migration	Frequency	Percentage
Only Return	60	1.8
Only Amenity	39	1.2
Only Assistance	377	11.4
Return & Amenity	6	0.2
Return & Assistance	48	1.5
Amenity & Assistance	1978	59.9
Return & Amenity & Assistance	481	14.6
None	313	9.5
Total	***3302***	100.0

Source: own calculations on Population Register, ISTAT

The distribution of typologies of migration by sex is not highly significant (Table 8). It seems that all types of migration are caracterized more or less by the same proportion of males and females.
Among male migrants, there is an higher percentage of unexplained movements, comparing to females.
This could mean that male elderly migration is less affected than female by the three big typologies we used here. Also the marital status seems not strongly connected with any particular type of flow.
The educational level seems, on the other hand, slightly positively connected to the assistance and amenity migrations (Table 9).

Table 8 – Amenity and assistance seeking migrations of elderly to Genoa province by sex, year 2000

Typology of migration	Male	%	Female	%	Total
Only Return	26	*43,3*	34	*56,7*	60
Only Amenity	18	*46,2*	21	*53,8*	39
Only Assistance	178	*47,2*	199	*52,8*	377
Return & Amenity	1	*16,7*	5	*83,3*	6
Return & Assistance	22	*45,8*	26	*54,2*	48
Amenity & Assistance	795	*40,2*	1183	*59,8*	1978
Return & Amenity & Assistance	221	*45,9*	260	*54,1*	481
None	154	*49,2*	159	*50,8*	313
Total	*1415*	*42,9*	*1887*	*57,1*	*100.0*

Source: own calculations on Population Register, ISTAT

Table 9 – Educational level by tipology of migration of elderly, Genoa province, year 2000

	Typology of migration		
Educational Level	**Assistance**	**Amenity**	**Movements 55+**
No education	89.2	74.3	241
Primary School	84.6	68.8	1399
Mid School	86.9	77.3	794
High School A	81.1	70.0	90
High School B	93.1	87.2	537
Universitary degree	92.5	90.0	241
Total	*87.3*	*75.8*	*3302*

Source: own calculations on Population Register, ISTAT

MIGRATIONS FROM ABROAD

On the 3302 migrations of elderlies to Genoa province, 240 are from abroad.

Table 10 – Migrations of elderly from abroad to Genoa province, year 2000

Typology of migration	Frequency	%
Only Return	3	*1,3*
Only Amenity	0	*0,0*
Only Assistance	13	*5,4*
Return & Amenity	0	*0,0*
Return & Assistance	3	*1,3*
Amenity & Assistance	168	*70,0*
Return & Amenity & Assistance	42	*17,5*
None	11	*4,6*
Total	*240*	*100,0*

Source: own calculations on Population Register, ISTAT

Most of them are to municipalities that stand seaside and also have a good health service (87,5%). 48 of them (20,1%) are return migration.
Only a few of them (5,4%) are just to municipalities with a good assistance structure (in the internal part of the province).
Migrants from abroad are not a relevant number. It's hard to conclude something, and to make a deeper analysis.

MIGRATIONS FROM ITALY: MULTILEVEL ANALYSIS

We use multilevel analysis to verify the effect of the explananatory variables on the three typologies of elderly migration, at micro and macro level.
The micro level is identified in this case by the individual characteristics; the macro level is examined looking at the provincial characteristics.
The multilevel model allows us also to verify the existence of a macro level impact and, eventually, its importance.
We isolated migrations from Italy (3.062 cases) and we analized them with multilevel method, with three different models, to explain return, assistance and amenity related migrations.
The models include individual characteristics (sex, age, marital status, educational level, occupational status) and macro characteristics, at provincial level. We took a set of different indexes from official statistics: demographic, environmental and social indicators were included into the models (see Appendix B).
Return migrations, according to our model, are not connected to context variables, as expected. Return migrations are significantly associated only with the age class 60-64 of the people, and they are negatively associated with the marital status "unmarried".
The ρ^2 coefficient, that is an extimate of the intraclasses correlation coefficient[1], is 0,09 in the base model (the one without covariates), as well in the model with individual covariate: that means only 9% of the unexplained variance is due to second level variables. That is why in this model we did not include them.
Return migration, according to our model, are not connected to the context variables, as expected, because we think the characteristics of the province where people lives are not important, but the links the individual has with his "moorings" and with his origin family. Actually, return migrations are neither much associated with individual variables we considered. Return migration are significantly associated only with the age class 60-64 and they are negatively associated with the marital status "unmarried".
It is important to notice that the relation with age is decreasing, because the return migration is associated with the retirement moment, and then it is decreasing.
Another important result is that, regarding return migration, we can not observe different behaviours between the two sexes.

Table 11 - Return Migration – Results of the multilevel model with individual covariates

Variable		β	S.E.	
Sex	Male	+0,058	0,113	
	Female	Ref.	-	
Age	55-59	+0,028	0,170	
	60-64	+0,479	0,160	*
	65-69	Ref.	-	
	70-79	-0,100	0,160	
	80+	-0,249	0,186	
Educational Level	Low	Ref.	-	
	High	+0,163	0,114	
Occupational status	Occupied	-0,151	0,182	
	Retiree	-0,034	0,133	
	Other	Ref.	-	
Marital Status	Married	Ref.	-	
	Unmarried	-0,294	0,144	*
	Widowed	+0,099	0,0130	
	Divorced	-1,470	1,039	

ρ^2= 0,09

[1] $\rho^2 = \sigma^2/ \sigma^2+\varepsilon^2$, where $\sigma^2$is the second level variability and ε^2 the first level variability.

The amenity related migrations are, in other hand, connected to the sex, as it is more common to think (it seems for males is less likely to make this type of movement), and to the educational level, as we expected. Indeed, an higher educational level gives more probability to make an amenity migration, beacuse an higher education is a proxy of a good socioeconomic level, that is the basis for this "amenity-related" choice.
For this type of migations, we also expect there is a second level effect, because we think if you start from a negative point is easier to choice a better destination. There is an effect of second level variables: the ρ^2 in the base model is 0,16 (in other words, the 16% of variability is explained by the second level effect) and becomes, after the introduction of context covariates, 0,04. This means that the macro variables we consider, explain the most of second level variability.
But the explanation of the macro effects is contradictory. The two variables that are significant are the demographic ones: aging rate and mean age. It seems that people departing from a province with an higher aging level have less probability to make an amenity-seeking move, while the ones that live in a province with a higher mean age have an higher probability to do it.

Table 12 - Amenity related Migrations – Results of the multilevel model with individual and contex variables

Variable		β	S.E.	
Sex	Male	-0,322	0,105	**
	Female	Ref.	-	
Age	55-59	-0,033	0,156	
	60-64	+0,017	0,153	
	65-69	Ref.	-	
	70-79	+0,105	0,148	
	80+	-0,060	0,168	
Educational Level	Low	Ref.	-	
	High	+0,724	0,123	**
Occupational status	Occupied	+0,137	0,171	
	Retiree	+0,014	0,126	
	Other	Ref.	-	
Marital Status	Married	Ref.	-	
	Unmarried	+0,034	0,126	
	Widowed	+0,201	0,126	
	Divorced	-0,336	0,496	
Provincial indexes	Bag-snatchings	+0,002	0,005	
	Mountain	-0,013	0,009	
	Hill country	-0,001	0,008	
	Low lands	-0,004	0,008	
	Environmental monitoring machines	+0,005	0,069	
	Density	+0,000	0,000	
	Aging	-0,041	0,017	**
	Dependency	+0,012	0,064	
	Mean Age	+0,763	0,318	**
	Ecotomography machines	-0,003	0,003	
	Health personnel	-0,012	0,007	
	Long term bed in hospital	-0,004	0,006	

$\rho^2 = 0,04$

The assistance-seeking migrations are more connected with the macro context, as the ρ^2 is in the base model 0,22 and it becomes 0,08 after the introduction of individual and macro covariates (see Appendix C). This is because if we need assistance it is easier to choice a migration, that, for italian elderly is generally a very uncommon choice.
But the only significant effect is the educational level, with the expected relation between high level and this type of migration.

Table 13 -Assistance seeking migrations

Variable		β	S.E.	
Sex	Male	-0,224	0,132	
	Female	Ref.	-	
Age	55-59	-0,042	0,185	
	60-64	+0,086	0,184	
	65-69	Ref.	-	
	70-79	+0,278	0,183	
	80+	+0,327	0,215	
Educational Level	Low	Ref.	-	
	High	+0,526	0,154	**
Occupational status	Occupied	+0,046	0,208	
	Retiree	+0,078	0,158	
	Other	Ref.	-	
Marital Status	Married	Ref.	-	
	Unmarried	+0,182	0,162	
	Widowed	+0,177	0,160	
	Divorced	-0,380	0,547	
Provincial indexes	Bag-snatchings	-0,006	0,006	
	Mountain	-0,016	0,013	
	Hill country	-0,008	0,010	
	Low lands	-0,006	0,010	
	Environmental monitoring machines	-0,023	0,096	
	Density	+0,000	0,000	
	Aging	-0,013	0,024	
	Dependency	-0,004	0,089	
	Mean Age	+0,091	0,450	
	Ecotomography machines	-0,007	0,004	
	Health personnel	+0,007	0,008	
	Long term bed in hospital	-0,012	0,008	

ρ^2= 0,04

CONCLUSIONS
With this study, we found an interesting dicotomy, between the "old" type of elderly migration (return migration) on one hand, that seems linked to individual characteristics (like age and marital status) and, on the other hand, the "new" types of elderly migrations: assistance and amenity seeking, linked to an higher educational level and to macro variables. For these typologies of migration, the multilevel method would be really appropriated.

The row definitions we used were the best we could do at municipality level. In the case of Genoa province, that encountered the problem of a strong connection between the muncipalities by the sea and having a good level of assistance. But they could be more useful, if they are extended to a regional or national level, and if the definition itself will be upgraded. These are the next steps we want to do.

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Appendix A
Genoa Municipality by Assistance insitutions for elderly and by geographical position

Muncipality	Health Institutes for Aged People per 1.000 inhabitants (Census 2001)	Seaside (1= seaside, 0 = not)
Arenzano	0,7	1
Avegno	0,0	2
Bargagli	0,0	2
Bogliasco	0,6	1
Borzonasca	0,0	0
Busalla	0,5	0
Camogli	0,9	1
Campo Ligure	1,5	0
Campomorone	0,3	0
Carasco	0,0	2
Casarza Ligure	0,0	2
Casella	2,1	0
Castiglione Chiavarese	1,6	2
Ceranesi	0,0	0
Chiavari	0,4	1
Cicagna	0,0	0
Cogoleto	0,6	1
Cogorno	0,0	2
Coreglia Ligure	0,0	2
Crocefieschi	3,8	0
Davagna	1,3	0
Fascia	0,0	0
Favale di Malvaro	0,0	0
Fontanigorda	0,0	0
Genova	0,3	1
Gorreto	0,0	0
Isola del Cantone	1,5	0
Lavagna	0,5	1
Leivi	0,0	2
Lorsica	0,0	0
Lumarzo	0,0	0
Masone	2,1	0
Mele	2,0	2
Mezzanego	2,1	0
Mignanego	0,8	0
Moconesi	0,0	0
Moneglia	0,0	1
Montebruno	0,0	0
Montoggio	1,3	0
Ne	2,1	2
Neirone	0,0	0
Orero	0,0	0
Pieve Ligure	3,0	1
Portofino	0,0	1

Propata	0,0	0
Rapallo	0,4	1
Recco	0,3	1
Rezzoaglio	0,0	0
Ronco Scrivia	0,0	0
Rondanina	0,0	0
Rossiglione	0,7	0
Rovegno	0,0	0
San Colombano Certenoli	0,0	2
Santa Margherita Ligure	0,4	1
Sant'Olcese	1,3	0
Santo Stefano d'Aveto	3,4	0
Savignone	1,1	0
Serra Riccò	0,4	0
Sestri Levante	0,5	1
Sori	1,8	1
Tiglieto	0,0	0
Torriglia	1,0	0
Tribogna	0,0	0
Uscio	1,1	2
Valbrevenna	0,0	0
Vobbia	0,0	0
Zoagli	1,0	1
Genoa province	*0,4*	

Source: own calculations on census data, ISTAT, 2001

Appendix B – Variables included in the models

Variable	
Sex	Male
	Female
Age	55-59
	60-64
	65-69
	70-79
	80+
Educational Level	Low (no, primary & mid school)
	High (high school and university)
Occupational status	Occupied
	Retiree
	Other (housewife, student, unemployed)
Marital Status	Married
	Unmarried
	Widowed
	Divorced
Provincial indexes	Bag-snatchings (per 100.000 inhabitants, 2000)
	Mountain (percentage of mountains municipalities)
	Hill country (percentage of hill municipalities)
	Low lands (percentage of low lands municipalities)
	Environmental monitoring machines (per 100.000 inhabitants, 2000)
	Density (inhabitants per km^2, year 2000)
	Aging (Population 65 and over / Total Population, 1.1.2001)

	Dependency ((Population 65 and over + Population 0-14)/Total Population, 1.1.2001)
	Mean Age (1.1.2001)
	Ecotomography machines (in Health Institutions, year 2001)
	Health personnel (in Health Institutions, year 2001)
	Long term bed in hospital (in Health Institutions, year 2001)

Source: ISTAT (Environmental Statistics, Justice Statistics, Health Statistics, Demographic data)

Appendix C - Multilevel model

1) Return Migration
Base Model

$$\left.\begin{aligned} \text{ritorno}_{ij} &\sim \text{Binomial}(\text{denom}_{ij}, \pi_{ij}) \\ \text{ritorno}_{ij} &= \pi_{ij} + e_{0ij}\text{bcons}^{*} \end{aligned}\right\}$$

$$\text{logit}(\pi_{ij}) = \beta_{1j}\text{Intercept}$$

$$\beta_{1j} = -1{,}804(0{,}119) + u_{1j}$$

$$\begin{bmatrix} u_{1j} \end{bmatrix} \sim \text{N}(0,\ \Omega_u) \ :\ \Omega_u = \begin{bmatrix} 0{,}327(0{,}146) \end{bmatrix}$$

$$\text{bcons}^{*} = \text{bcons}[\pi_{ij}(1 - \pi_{ij})/\text{denom}_{ij}]^{0.5}$$

$$\begin{bmatrix} e_{0ij} \end{bmatrix} \sim (0,\ \Omega_e) \ :\ \Omega_e = \begin{bmatrix} 1{,}000(0{,}000) \end{bmatrix}$$

$\rho^2 = 0{,}09$

Model with individual covariates

$$\left.\begin{aligned} \text{ritorno}_{ij} &\sim \text{Binomial}(\text{denom}_{ij}, \pi_{ij}) \\ \text{ritorno}_{ij} &= \pi_{ij} + e_{0ij}\text{bcons}^{*} \end{aligned}\right\}$$

$$\begin{aligned} \text{logit}(\pi_{ij}) = \beta_{1j}\text{intercept} &+ 0{,}058(0{,}113)\text{male}_{ij} + 0{,}028(0{,}170)\text{age55-59}_{ij} + 0{,}479(0{,}160)\text{age60-64}_{ij} + \\ &-0{,}100(0{,}160)\text{age70-79}_{ij} + -0{,}249(0{,}186)\text{age80+}_{ij} + 0{,}163(0{,}114)\text{edu+}_{ij} + \\ &-0{,}034(0{,}133)\text{retiree}_{ij} + -0{,}151(0{,}182)\text{occupied}_{ij} + -0{,}294(0{,}144)\text{unmarried}_{ij} + \\ &0{,}099(0{,}130)\text{widow}_{ij} + -1{,}470(1{,}039)\text{divorced}_{ij} \end{aligned}$$

$$\beta_{1j} = -1{,}830(0{,}198) + u_{1j}$$

$$\left[u_{1j}\right] \sim \text{N}(0,\ \Omega_u)\ :\ \Omega_u = \left[0{,}326(0{,}146)\right]$$

$$\text{bcons}^{*} = \text{bcons}[\pi_{ij}(1 - \pi_{ij})/\text{denom}_{ij}]^{0.5}$$

$$\left[e_{0ij}\right] \sim (0,\ \Omega_e)\ :\ \Omega_e = \left[1{,}000(0{,}000)\right]$$

$\rho^2 = 0{,}09$

2) Amenity related migrations

Base Model

$$\left.\begin{aligned} \text{ambient}_{ij} &\sim \text{Binomial}(\text{denom}_{ij}, \pi_{ij}) \\ \text{ambient}_{ij} &= \pi_{ij} + e_{0ij}\text{bcons}^{*} \end{aligned}\right\}$$

$$\text{logit}(\pi_{ij}) = \beta_{1j}\text{intercept}$$

$$\beta_{1j} = 2{,}534(0{,}163) + u_{1j}$$

$$\left[u_{1j}\right] \sim \text{N}(0,\ \Omega_u)\ :\ \Omega_u = \left[0{,}604(0{,}273)\right]$$

$$\text{bcons}^{*} = \text{bcons}[\pi_{ij}(1 - \pi_{ij})/\text{denom}_{ij}]^{0.5}$$

$$\left[e_{0ij}\right] \sim (0,\ \Omega_e)\ :\ \Omega_e = \left[1{,}000(0{,}000)\right]$$

$\rho^2 = 0{,}16$

Model with individual covariates

$$\left.\begin{aligned} ambient_{ij} &\sim Binomial(denom_{ij}, \pi_{ij}) \\ ambient_{ij} &= \pi_{ij} + e_{0ij} bcons^{*} \end{aligned}\right\}$$

$$\begin{aligned} logit(\pi_{ij}) = {} & \beta_{1j} intercept + \underset{(0,106)}{-0,319} male_{ij} + \underset{(0,156)}{-0,053} age55\text{-}59_{ij} + \underset{(0,153)}{0,003} age60\text{-}64_{ij} + \underset{(0,148)}{0,088} age70\text{-}79_{ij} + \\ & \underset{(0,168)}{-0,086} age80+_{ij} + \underset{(0,122)}{0,710} edu+_{ij} + \underset{(0,126)}{0,010} retiree_{ij} + \underset{(0,171)}{0,129} occupied_{ij} + \\ & \underset{(0,126)}{0,033} unmarried_{ij} + \underset{(0,126)}{0,204} widow_{ij} + \underset{(0,496)}{-0,325} divorced_{ij} \end{aligned}$$

$$\beta_{1j} = \underset{(0,217)}{2,408} + u_{1j}$$

$$\begin{bmatrix} u_{1j} \end{bmatrix} \sim N(0, \Omega_u) : \Omega_u = \begin{bmatrix} \underset{(0,266)}{0,580} \end{bmatrix}$$

$$bcons^{*} = bcons[\pi_{ij}(1 - \pi_{ij})/denom_{ij}]^{0.5}$$

$$\begin{bmatrix} e_{0ij} \end{bmatrix} \sim (0, \Omega_e) : \Omega_e = \begin{bmatrix} \underset{(0,000)}{1,000} \end{bmatrix}$$

$\rho^2 = 0,15$

Model with individual and provincial covariates

$$\left.\begin{aligned} ambient_{ij} &\sim Binomial(denom_{ij}, \pi_{ij}) \\ ambient_{ij} &= \pi_{ij} + e_{0ij} bcons^{*} \end{aligned}\right\}$$

$$\begin{aligned} logit(\pi_{ij}) = {} & \beta_{1j} intercept + \underset{(0,105)}{-0,322} male_{ij} + \underset{(0,156)}{-0,033} age55\text{-}59_{ij} + \underset{(0,153)}{0,017} age60\text{-}64_{ij} + \underset{(0,148)}{0,105} age70\text{-}79_{ij} + \\ & \underset{(0,168)}{-0,060} age80+_{ij} + \underset{(0,123)}{0,724} edu+_{ij} + \underset{(0,126)}{0,014} retiree_{ij} + \underset{(0,171)}{0,137} occupied_{ij} + \\ & \underset{(0,126)}{0,034} unmarried_{ij} + \underset{(0,126)}{0,201} widow_{ij} + \underset{(0,496)}{-0,336} divorced_{ij} + \underset{(0,003)}{0,001} postiger_{j} + \\ & \underset{(0,005)}{0,002} giu066_{j} + \underset{(0,009)}{-0,013} ter\_004_{j} + \underset{(0,008)}{-0,001} ter\_005_{j} + \underset{(0,008)}{-0,004} ter\_006_{j} + \\ & \underset{(0,069)}{0,005} centr100_{j} + \underset{(0,017)}{-0,041} vecchiai_{j} + \underset{(0,064)}{0,012} dipenden_{j} + \underset{(0,318)}{0,763} etamedia_{j} + \\ & \underset{(0,000)}{0,000} densità_{j} + \underset{(0,003)}{-0,003} ecotomo_{j} + \underset{(0,007)}{-0,012} tassoper_{j} + \underset{(0,006)}{-0,004} lungodeg_{j} \end{aligned}$$

$$\beta_{1j} = \underset{(12,815)}{-22,120} + u_{1j}$$

$$\begin{bmatrix} u_{1j} \end{bmatrix} \sim N(0, \Omega_u) : \Omega_u = \begin{bmatrix} \underset{(0,102)}{0,121} \end{bmatrix}$$

$$bcons^{*} = bcons[\pi_{ij}(1 - \pi_{ij})/denom_{ij}]^{0.5}$$

$$\begin{bmatrix} e_{0ij} \end{bmatrix} \sim (0, \Omega_e) : \Omega_e = \begin{bmatrix} \underset{(0,000)}{1,000} \end{bmatrix}$$

$\rho^2 = 0,04$

3) Assistance seeking migrations

Base model

$$\left.\begin{aligned} \text{assist}_{ij} &\sim \text{Binomial}(\text{denom}_{ij}, \pi_{ij}) \\ \text{assist}_{ij} &= \pi_{ij} + e_{0ij}\text{bcons}^{*} \end{aligned}\right\}$$

$$\text{logit}(\pi_{ij}) = \beta_{1j}\text{intercept}$$

$$\beta_{1j} = 3{,}260(0{,}215) + u_{1j}$$

$$\begin{bmatrix} u_{1j} \end{bmatrix} \sim \text{N}(0,\ \Omega_u) \ :\ \Omega_u = \begin{bmatrix} 0{,}916(0{,}448) \end{bmatrix}$$

$$\text{bcons}^{*} = \text{bcons}[\pi_{ij}(1 - \pi_{ij})/\text{denom}_{ij}]^{0.5}$$

$$\begin{bmatrix} e_{0ij} \end{bmatrix} \sim (0,\ \Omega_e) \ :\ \Omega_e = \begin{bmatrix} 1{,}000(0{,}000) \end{bmatrix}$$

$\rho^2 = 0{,}22$

Model with individual covariates

$$\left.\begin{aligned} \text{assist}_{ij} &\sim \text{Binomial}(\text{denom}_{ij}, \pi_{ij}) \\ \text{assist}_{ij} &= \pi_{ij} + e_{0ij}\text{bcons}^{*} \end{aligned}\right\}$$

$$\begin{aligned} \text{logit}(\pi_{ij}) = \beta_{1j}\text{intercept} &+ -0{,}218(0{,}131)\text{male}_{ij} + -0{,}057(0{,}184)\text{age55-59}_{ij} + 0{,}077(0{,}183)\text{age60-64}_{ij} + 0{,}255(0{,}181)\text{age70-79}_{ij} + \\ &0{,}294(0{,}213)\text{age80+}_{ij} + 0{,}502(0{,}151)\text{edu+}_{ij} + 0{,}079(0{,}156)\text{retiree}_{ij} + 0{,}044(0{,}206)\text{occupied}_{ij} + \\ &0{,}169(0{,}160)\text{unmarried}_{ij} + 0{,}180(0{,}159)\text{widow}_{ij} + -0{,}365(0{,}543)\text{divorced}_{ij} \end{aligned}$$

$$\beta_{1j} = 2{,}942(0{,}274) + u_{1j}$$

$$\begin{bmatrix} u_{1j} \end{bmatrix} \sim \text{N}(0,\ \Omega_u) \ :\ \Omega_u = \begin{bmatrix} 0{,}890(0{,}434) \end{bmatrix}$$

$$\text{bcons}^{*} = \text{bcons}[\pi_{ij}(1 - \pi_{ij})/\text{denom}_{ij}]^{0.5}$$

$$\begin{bmatrix} e_{0ij} \end{bmatrix} \sim (0,\ \Omega_e) \ :\ \Omega_e = \begin{bmatrix} 1{,}000(0{,}000) \end{bmatrix}$$

$\rho^2 = 0{,}21$

$$\left.\begin{aligned} assist_{ij} &\sim Binomial(denom_{ij}, \pi_{ij}) \\ assist_{ij} &= \pi_{ij} + e_{0ij} bcons^{*} \end{aligned}\right\}$$

$$\begin{aligned} logit(\pi_{ij}) = \beta_{1j} intercept &+ -0{,}224(0{,}132) male_{ij} + -0{,}042(0{,}185) age55\text{-}59_{ij} + 0{,}086(0{,}184) age60\text{-}64_{ij} + 0{,}278(0{,}183) age70\text{-}79_{ij} + \\ &0{,}327(0{,}215) age80+_{ij} + 0{,}526(0{,}154) edu+_{ij} + 0{,}078(0{,}158) retiree_{ij} + 0{,}046(0{,}208) occupied_{ij} + \\ &0{,}182(0{,}162) unmarried_{ij} + 0{,}177(0{,}160) widow_{ij} + -0{,}380(0{,}547) divorced_{ij} + -0{,}006(0{,}006) giu066_{j} + \\ &-0{,}016(0{,}013) ter\_004_{j} + -0{,}008(0{,}010) ter\_005_{j} + -0{,}006(0{,}010) ter\_006_{j} + -0{,}023(0{,}096) centr100_{j} + \\ &-0{,}013(0{,}024) vecchiai_{j} + -0{,}004(0{,}089) dipenden_{j} + 0{,}091(0{,}450) etamedia_{j} + 0{,}000(0{,}000) densità_{j} + \\ &-0{,}012(0{,}008) lungodeg_{j} + 0{,}007(0{,}008) tassoper_{j} + -0{,}007(0{,}004) ecotomo_{j} \end{aligned}$$

$$\beta_{1j} = 3{,}367(18{,}111) + u_{1j}$$

$$\left[u_{1j}\right] \sim N(0,\ \Omega_u) \ :\ \Omega_u = \left[0{,}275(0{,}199)\right]$$

$$bcons^{*} = bcons[\pi_{ij}(1 - \pi_{ij})/denom_{ij}]^{0.5}$$

$$\left[e_{0ij}\right] \sim (0,\ \Omega_e) \ :\ \Omega_e = \left[1{,}000(0{,}000)\right]$$

$\rho^2 = 0{,}08$