Chapter 10

A METHODOLOGICAL ASSESSMENT OF IMMIGRANTS´ SETTLEMENT PATTERNS AND HOUSING TYPOLOGIES IN METROPOLITAN AREAS

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ABSTRACT

The research reported in this chapter fits into recent international researches on the relevance of immigrants for urban and regional sustainability, and on the relationship between immigrants´ settlements and socio-economic, territorial and dwellings characteristics.

An innovative methodology is proposed in order to describe settlement and housing typologies of different groups of immigrants that live in a certain metropolitan area, according to respective demographic, economic, professional and dwelling characteristics. It consists in the setting of a management information system with different demographic, economic, professional, and location/housing characteristics, development of a simulation and cartographic display interface, then integrated into a set of "tableaux de bord" (to monitor the evolution of variables, and to compare different groups of immigrants and different territorial spaces); adjustment of an explanatory model for their housing locations (based on the methodology of hierarchical classification trees), and settlement of housing typologies, according to immigrants´ characteristics.

This methodology is intended - through data identification, organization and structuring – to support the strategic formulation and implementation of housing policies, considering the real and predictable characteristics of different groups of immigrants in a certain territory, strictly articulated with sectorial and territorial strategies. It also enables settlement patterns and housing typologies´ monitoring along time.

It is applied, as a case study, to the Oporto Metropolitan Area (Portugal) but can be easily generalized to different metropolitan and urban realities, thus supporting the harmonization of housing policies targeted to immigrants, within the scope of different institutional and legal frameworks.

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This chapter further stresses - through the identification of inter-population and inter-territorial housing inequalities - the importance of urban planning and management interventions in order to ensure assess to favorable housing conditions to all people living in a certain metropolitan area.

1. INTRODUCTION

The research reported in this article fits recent international researches on the relevance of immigrants for urban and regional sustainability, and on the relationship between immigrants´ settlements patterns and their socio-economic, territorial and dwellings characteristics[1].

A methodology is proposed in order to describe settlement and housing typologies of different groups of immigrants that live in a certain metropolitan area. It begins by setting a management information system with different demographic, economic, professional, and location/housing characteristics. A simulation and cartographic interface is then developed, and integrated with a set of "tableaux de bord" in order to monitor the variables and respective evolution, and to compare different groups of immigrants and different territorial spaces. Following on, an explanatory model is adjusted for immigrants´ housing locations, based on the methodology of hierarchical classification trees. Finally, housing and settlement typologies are established, according to the characteristics of specific groups of immigrants.

This methodology is intended to support the strategic formulation and implementation of housing policies, considering immigrants´ real and predictable characteristics in the studied territory, strictly articulated with sectorial and territorial strategies.

This study further stresses the importance of planning and management interventions in order to ensure a generalized access to favorable home conditions.

2. THEORETICAL FRAMEWORK

The inter-connection between territory and immigrants´ socio-economic, location and housing characteristics is critically important for the analysis of settlement patterns (Arbaci, 2008; Fonseca, 1999; Fonseca, Malheiros, Ribas-Mateos, White & Esteves, 2002; Malheiros, 2002; Massey, 1990; Musterd & Van Kempen, 2007; Peach, 2002; Teixeira & Murdie, 1997). These patterns - which shape immigrants´ socio-economic and territorial integration - are explained by a set of reasons that include the socio-spatial differentiation (due to the characteristics of the urban economies); the performance of housing and labor markets; the spatial, socio-economic and professional mobility of immigrants; and their proper characteristics, respective social networks, and integration processes[2] (Rebelo, 2010a, 2010b, 2011).

The socio-spatial differentiation of urban layouts reflect the characteristics of urban and metropolitan economies, the initiatives of firms, the territorial distribution of capital[3] (Arbaci, 2008; Malheiros, 2002; Massey, 1990), the mobility and availability of urban transports, and

[1] Immigrant is a resident in a certain host-society who does not have the correspondent nationality.
[2] Integration refers to durable processes that support immigrants´ stay in a certain host-society.
[3] Capital refers to public and private investments that lead to the creation of employments.

the existence of housing, infrastructures and urban equipment near the main employment poles. It explains settlement patterns through the identification of the activities most responsible for the attraction of immigrant labor, their location, and accessibility (especially in relation to the places where immigrants live).

Housing policies and the structure of housing markets are some of the characteristics that better explain immigrants´ settlement patterns. They reflect the real or predictable existence of dwellings, infrastructures and equipments; the filtering processes and succession in land uses; the existence of classic versus non-classic dwellings; the existence of renting market and respective characteristics, and the access to home loans (Arbaci, 2008; Fonseca et *al*., 2002; Madoré, 1997; Malheiros, 2002; Musterd & Van Kempen 2007; Peach, 2002; Teixeira & Murdie, 1997). Accessibility conditions and transport and communication networks further condition the location of immigrants (Goering, Haghighi, Stebbins & Siewert, 1995; Kleit, 2001; Rosebaum, Friedman, Schill & Buddlemeyer, 1999; Wellman, 1988) and, therefore, their socio-economic and professional integration.

The perception and appropriation of urban neighborhoods (Fieldhouse, 1999; Pecoud, 2002; Scott, 1980; Stoll, Melendez & Valenzuela, 2002) – characterized by different urban morphologies and building typologies, resources, infrastructures and equipment – condition immigrants to social networks (Borjas, Freeman & Katz, 1996; Cameron, 2000; Li, 1998; Peach, 1998; Rosebaum et *al*., 1999; Scott, 1980; Wellman, 1988), and to natives and other communities (Ellen and Turner, 1997; Goering et *al*., 1995; Kleit, 2001; Scott, 1980; Wellman, 1988). So neighborhoods influence their access to socio-economic and professional opportunities (Briggs, 1998; Fonseca, 2007; Galster, 1987; Goering et *al*., 1995; Kleit, 2001; Massey, 1990; Massey & Denton, 1993; Rosebaum, 1991; Rosebaum et *al*., 1999; Scott, 1980; Wilson, 1986, 1996).

The settlement locations of different groups of immigrants are also strongly related to the performance of the labor markets concerning, namely, the available employments; the relevance of work in their neighborhoods and networks; their spatial mobility, labor turnover and diversity, and the ability of employers to assign them the most adequate working posts (Benson-Rea & Rawlinson, 2003). Firms – which increasingly diversify their spatial locations, and organize into structured and flexible networks (Baganha, Ferrão & Malheiros, 1999; Salt & Findlay, 1989) – resort again and again to temporary and flexible labor, what generally fits immigrants´ features. As they are usually quite mobile, more dynamic firms and regions strongly attract them and, as a result, also model their settlement patterns.

Choices of residential locations depend on the distances to main and secondary urban centers, where most employments and services locate (Alonso, 1964; Mills, 1972; Muth, 1969; Wingo, 1961). So the balance amongst housing, transports and other expenses; the territorial concentration or dispersion characteristics (Crone & Voith, 1999), and the relative locations of home and work are outstanding in these decisions.

Socio-economic and professional mobility depends on the perception that urban economies distribute resources and opportunities unevenly in space and, thus, immigrants move in order to reach the highest social and professional levels they can (Arbaci, 2008; Fonseca, 1999; Fonseca et *al*., 2002; Malheiros, 2002; Massey, 1990; Musterd & Van Kempen, 2007; Peach, 2002; Teixeira & Murdie, 1997). So the attraction or repulsion exerted by economic and social characteristics depends on a set of different reasons, such as immigrants´ motivations, academic qualifications and professional skills; trade-offs between professional and family/community reasons; pre-settled labor agreements, and employment

expectancy (Borjas, Freeman & Katz, 1996; Pecoud, 2002). Immigrants respond to labor market requirements according to their motivations and integration processes (Logan, 2006), either taking jobs not disputed by natives (namely in domestic services, social services, construction or production activities), or jobs that require higher levels of academic and professional qualifications (thus entering straight competition with natives) (Altonji & Card, 1991; Borjas, 1994; Card, 1990; Fieldhouse, 1999; Fonseca, 2007; LaLonde, 1991; Massey, 1990; Massey & Denton, 1993; Reimers, 1998; Rosebaum, 1991; Rosebaum et al., 1999; Stoll et *al*., 2002; Wilson, 1986, 1996). These are additional reasons that influence immigrants´ settlement patterns.

The integration of immigrants, by its turn, mainly depends on cultural norms and contextual factors (Bolt, Van Kempen, & Van Ham, 2008; Fortuijn, Musterd, & Ostendorf, 1998; Portuguese National Statistics Institute, 2001) - including the behavior of natives - that may involve integration or segregation processes at socio-economic, professional or housing levels (Ellis, 2001; Logan, 2006; Madoré, 1997, 2005; Massey, 1990). However, the multiculturalist social discourses that prevail in certain countries – such as the United States of America, Portugal and Brazil – that face diversity as a synergistic complement and not as a threat (Ellis, 2001) - ensure the equality principle, and favor the socio-economic and professional integration of immigrants whether in residential neighborhoods or in the labor markets.

3. METHODOLOGY AND CASE STUDY

3.1. Methodological Outline

The methodology pursued in order to characterize different groups of immigrants´ settlement and housing patterns (Figure 1) starts with the development of a metropolitan management information system with different demographic, economic, professional, and location/housing characteristics (by country of origin, at the level of parishes). It is made up by three databases: the first one refers to immigrants´ demographic, economic and professional characteristics; the second to dwelling locations and to the relative locations of home and work; and the third to the characteristics of dwellings and respective buildings (according to the country of origin of the dwelling holder).

A cartographic module and a mathematical simulation interface are linked together with the metropolitan management information system and with a set of “tableaux de bord”. Then a hierarchical classification tree is adjusted to data. It relates the prevailing housing locations of each group of immigrants (at the municipality level) with respective demographic, economic and professional features (country of origin, economic activity and professional group).

This proposed set of tools enables the systematization of a typology for settlement patterns and dwelling characteristics for each main group of immigrants that lives in the studied metropolitan area, the monitoring of respective evolution, and the comparison among different groups and different territorial spaces.

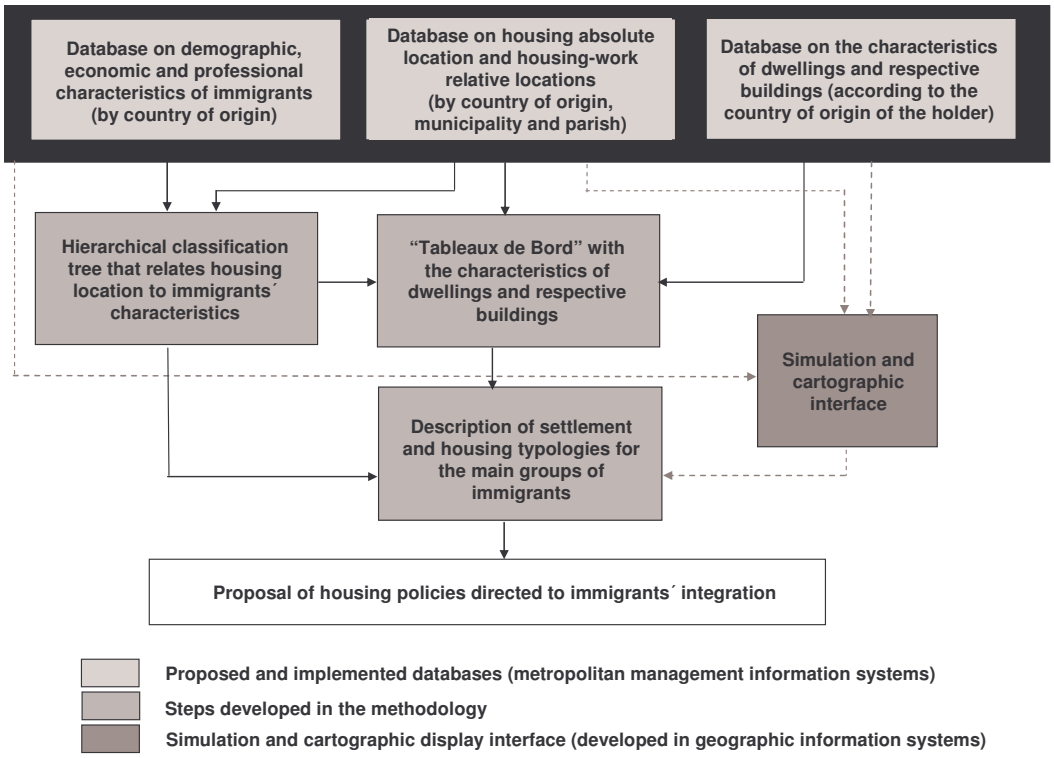

Figure 1. Outline of the pursued methodology (source: author).

These statistical, descriptive and cartographic insights into these settlement and housing patterns support the subsequent definition of public policies aimed at a better integration of immigrants into the metropolitan socio-economic and professional fabric.

3.2. Brief Description of the Oporto Metropolitan Area

The Oporto Metropolitan Area locates in the north of Portugal, and is made up by nine municipalities (Espinho, Gondomar, Maia, Matosinhos, Porto, Póvoa de Varzim, Valongo, Vila do Conde and Vila Nova de Gaia), and by a hundred and thirty parishes (Figure 2):

Data was collected from the population census, for each and all the individuals living in this metropolitan area (Portuguese National Statistics Institute (INE), 2001)[4]. The information refers to the following demographic, economic and professional variables: country of origin, housing location (municipality and parish), economic activity, professional group, and home-work relative location. Data concerning dwelling characteristics was further collected and systematized from the housing census, according to the country of origin of respective holder (INE, 2001). It concerns the following variables: dwelling's kind of building; building's type

[4] The main advantages that result from the use of this data source are: (i) data is collected exhaustively and systematically (at the parish level), and covers all the individuals that live in the area being studied (whether natives or immigrants); (ii) this information is reliable, as it is validated by a state organism; (iii) it supports the compared analysis of the variables along different moments, and among different territorial units and population groups. Its main disadvantages results from the fact that it is only updated every decade, and it ignores illegal immigrants and respective presence in parallel labor markets.

of use; kind of dwelling; form of dwelling's occupation; form of water supply; existence of electricity; existence and kind of heating; existence and kind of bathroom; existence of bath or shower; existence and kind of kitchen; existence and kind of acquisition or renting burdens. All these records were, then, grouped by country (or groups of countries) of origin (including Portuguese natives), at the parish level (within each municipality), thus feeding the metropolitan management information system.

Figure 2. Municipalities and parishes of the Oporto Metropolitan Area (source: Portuguese National Statistics Institute).

According to census data, in 2001 lived in the Oporto Metropolitan Area 1 208 026 Portuguese natives and 52 654 immigrants (about 4,2% of total population). The distribution of corresponding working population, according to the country or countries of origin, is as follows: 53% from Portuguese-speaking African countries; 19,9% from West European countries; 14,1% from other foreign countries (including 5,3% from Venezuela and 3,2% from South Africa); 11,1% from Brazil; and 1,9% from East Europe (mainly Ukraine and Russia) (Figure 3):

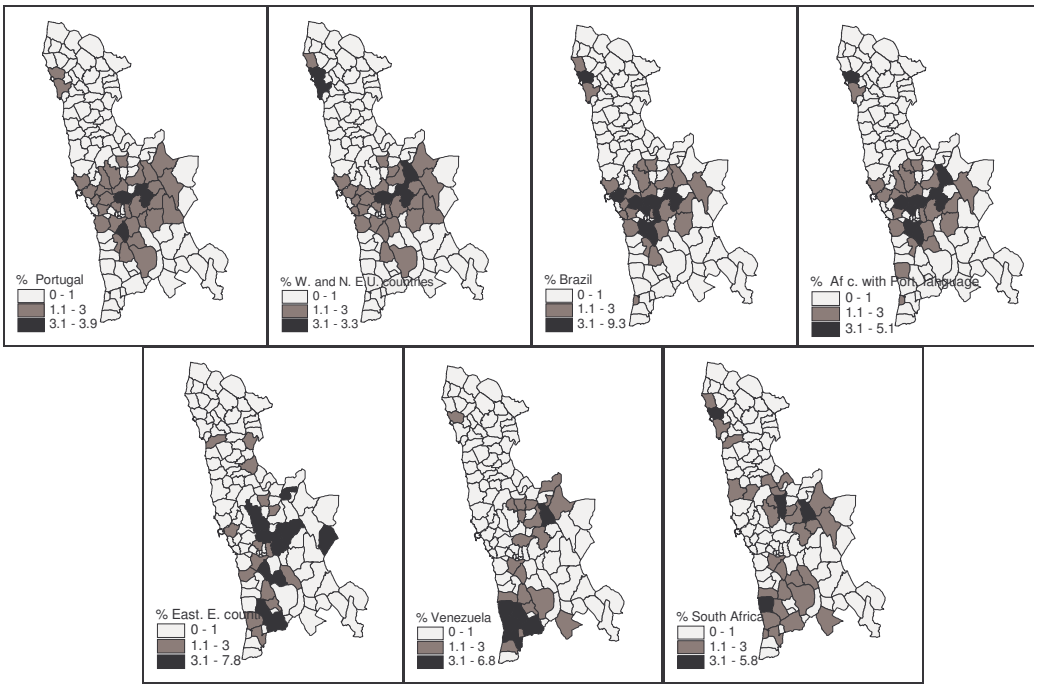

Figure 3. Distribution of the different groups of immigrants in the Oporto Metropolitan Area (in percentage) (source: Portuguese National Statistics Institute).

The distribution of the studied groups being studied by education levels is as follows (Figure 4):

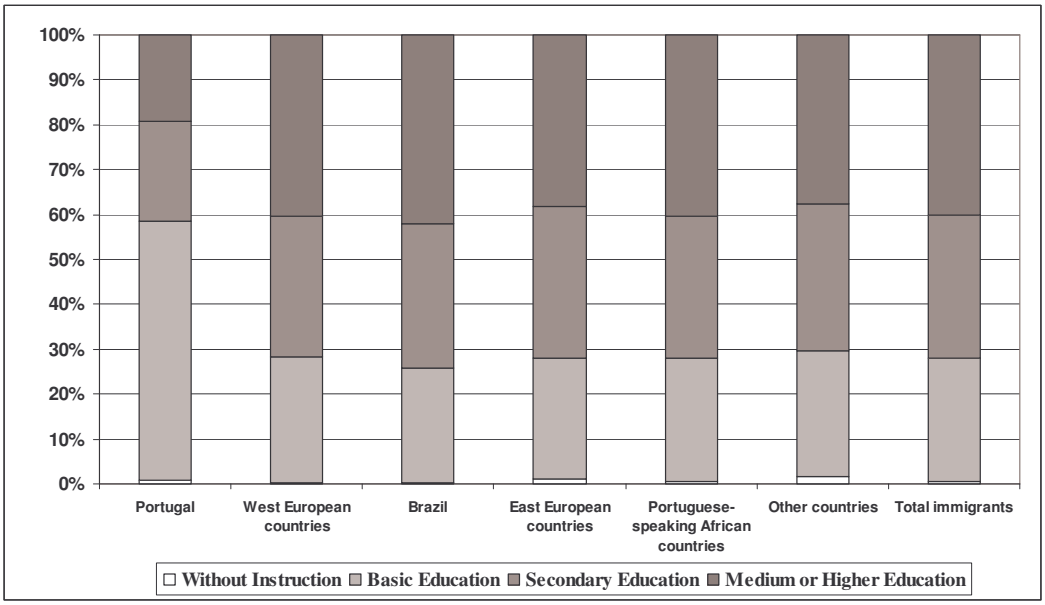

Figure 4. Distribution of the different groups of immigrants in the Oporto Metropolitan Area according to education levels (in percentage) (source: Portuguese National Statistics Institute).

The corresponding distributions according to the sector of economic activity and to the professional group are pointed out in next charts (Figure 5):

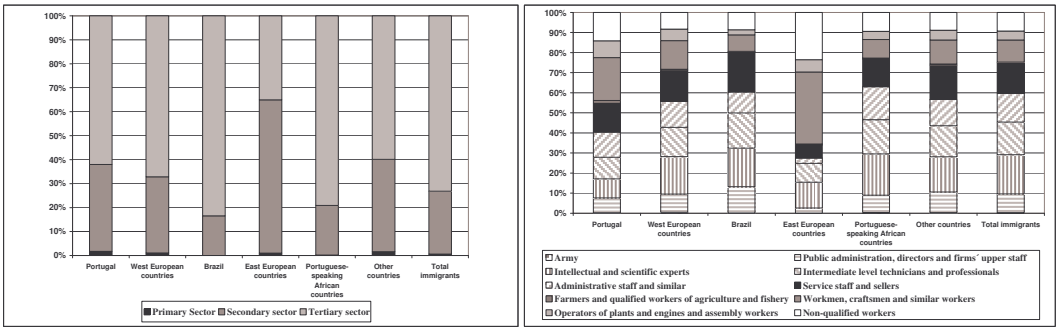

Figure 5. Distribution of the different groups of immigrants in the Oporto Metropolitan Area according to the sector of economic activity and to the professional group, respectively (in percentage) (source: Portuguese National Statistics Institute).

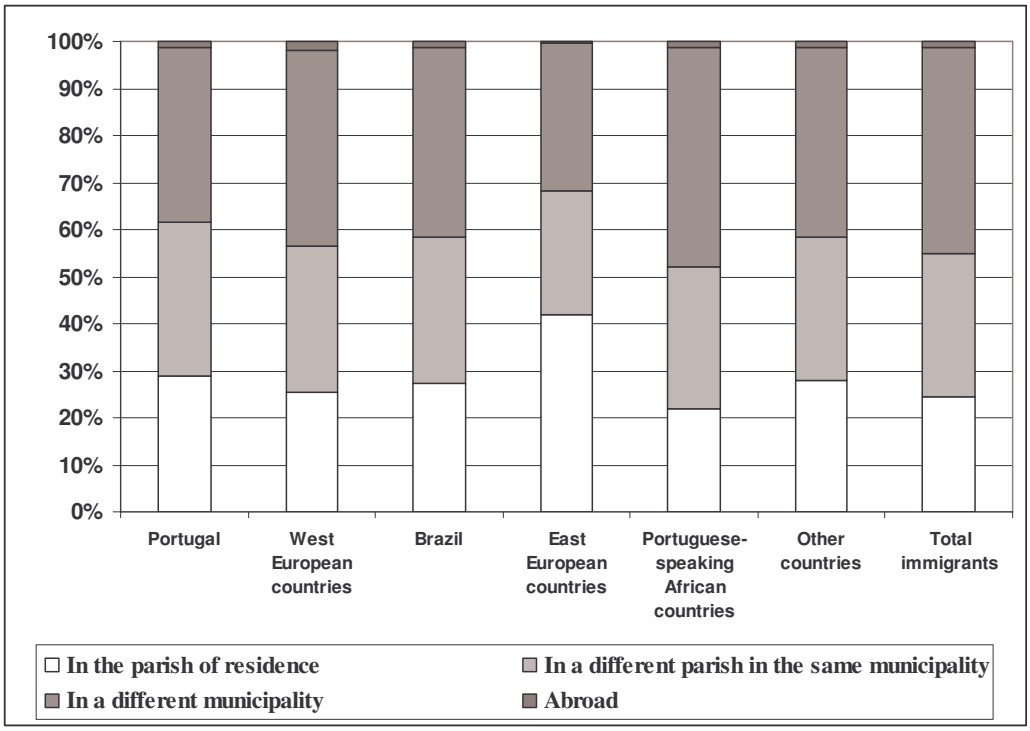

Figure 6. Distribution of the different groups of immigrants in the Oporto Metropolitan Area according to the relation between housing and work locations (in percentage) (source: Portuguese National Statistics Institute).

It can be noticed that the percentage of immigrants that belong to upper professional groups[5] is substantially higher than the corresponding percentage of natives (28,8 per cent versus 16,9 per cent, respectively).

The comparative analysis of housing and working places in the Oporto Metropolitan Area (Figure 6) shows that, on average, the percentage of working immigrants that live and work in the same parish is lower than natives´ (24,4% versus 29%), and the same holds for those that work in a distinct parish within the same municipality (30,5% versus 32,6%), whereas Portuguese natives that work in a different municipality amount to 37,1% and immigrants to 43,8%. East European immigrants are those that exhibit the highest percentage of working posts in the same parish where they live (41,8%). Also 27,8% of total immigrants from other foreign countries and 27,2% of Brazilians live and work in the same parish. It is, again, important to stress that 46,5% of Portuguese-speaking African immigrants live and work in distinct municipalities.

The distribution of housing acquisition or renting burdens is substantially different between immigrants and natives, and among the different groups of immigrants (Figure 7):

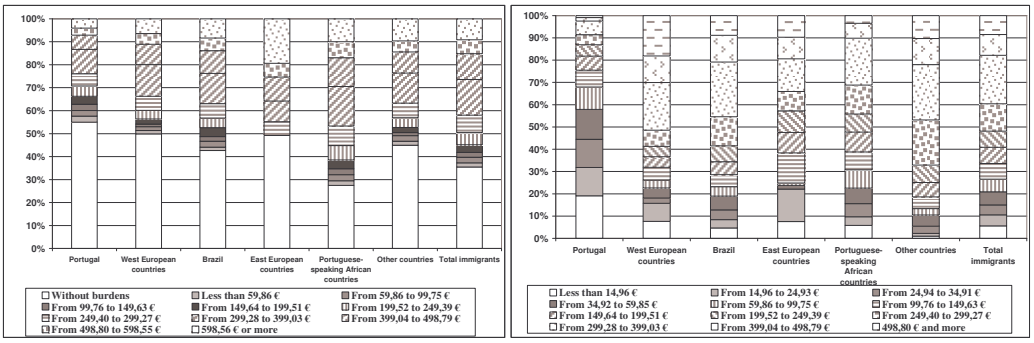

Figure 7. Distribution of the different groups of immigrants in the Oporto Metropolitan Area according to the existence and levels of acquisition burdens, and to renting burdens, respectively (in percentage) (source: Portuguese National Statistics Institute).

3.3. Obtained Results

The application of the proposed methodology to the Oporto Metropolitan Area lead to the following hierarchical classification tree that identifies the housing locations (municipalities) of the different groups of immigrants, according to their demographic, economic and professional features[6] (Figure 8):

The first partition criterion founds on the professional group: it divides immigrants between those that pertain to upper professional groups (public administrators, directors and firms´ upper staff; and intellectual and scientific experts), and the remainder.

Then applies the criterion based on the country of origin. As can be seen, immigrants from Europe and from Portuguese-speaking African countries mainly live in Porto municipality. Immigrants from other foreign countries belonging to upper professional groups

[5] In the current research the upper professional groups include public administrators, directors and firms´ upper staff, and intellectual and scientific experts.

[6] Software Matlab was used for this purpose.

split as follows: those from South Africa locate in Maia municipality, those from the United States of America, Canada and Colombia mainly settle in Vila Nova de Gaia municipality, and those from Venezuela, Brazil and Asian countries in Porto municipality.

As far as immigrants belonging to other professional groups are concerned, they can be split between those from France, Holland, Germany and Italy, and the remainder. The former that work in agriculture, fishery and transforming industries mainly live in Póvoa de Varzim municipality; and those that work in the remaining economic activities preferably live in Gaia municipality. Those from the other European countries mainly live in Porto municipality, except those from Russia and Ukraine that live in Gaia municipality. Immigrants from Angola and Mozambique generally locate in Gaia municipality, except those that carry out domestic services or work in international institutions that mainly live in Porto municipality. Immigrants from South Africa working in farming and industry particularly settle in Gaia municipality, whereas those that work in the tertiary sector prefer Maia municipality. Brazilian immigrants, by their turn, privilege living in Porto and Gaia municipalities. In what concerns immigrants from Venezuela, those that work in agriculture, fishery, industry, construction and trade mainly live in Gaia municipality, and those that carry out other tertiary activities have their houses preferably located in Maia municipality.

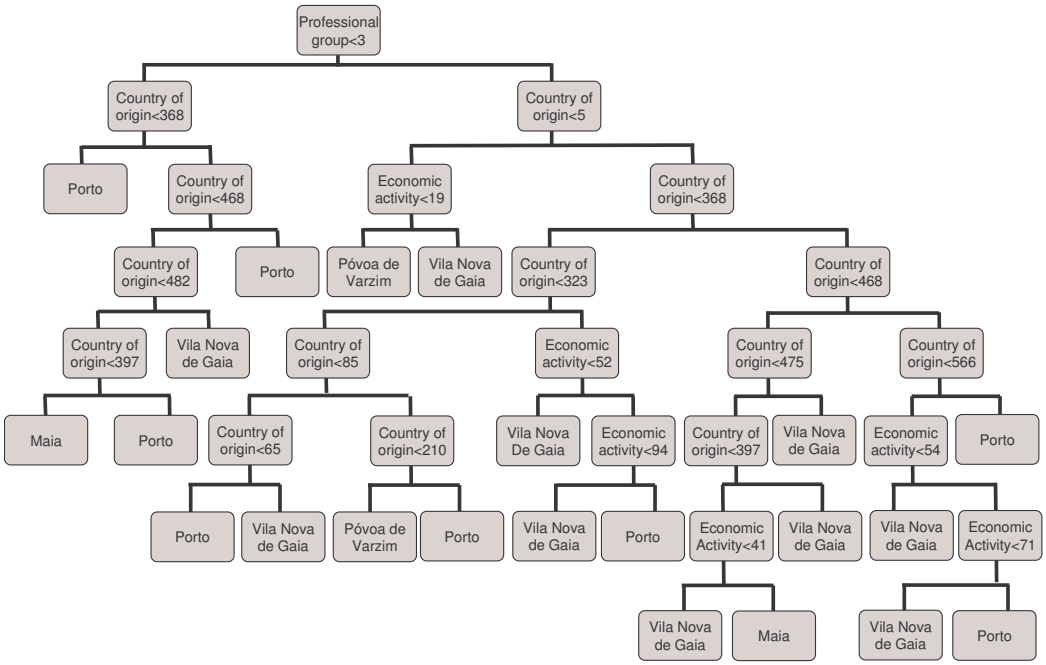

Figure 8. Hierarchical classification tree that relates immigrants´ municipalities of residence in the Oporto Metropolitan Area to respective demographic, economic and professional characteristics (source: author).

Table 1. "Tableaux de bord" for the housing variables of the different groups of immigrants that live in the Oporto Metropolitan Area (source: Portuguese National Statistics Institute).

	Portugal	West European countries	Brazil	East European countries	Portuguese-speaking African countries	Other countries	Total immigrants
KIND OF BUILDING							
Classic	99,6	99,8	100,0	97,6	99,7	99,8	99,7
Non-classic	0,4	0,2	0,0	2,4	0,3	0,2	0,3
KIND OF BUILDING´S OCCUPANCY							
Exclusively residential	84,1	75	72,3	72,7	75,2	74,8	74,8
Principally residential	15,6	24,3	27,3	27	24,4	24,7	24,8
Principally non-residential	0,3	0,7	0,4	0,3	0,4	0,5	0,4
KIND OF DWELLING							
Classic	99,2	99,7	99,8	95,2	99,6	99,6	99,6
Shanty	0,2	0,1	0,0	0,8	0,1	0,0	0,1
Rudimentary	0,1	0,0	0,0	0,0	0,0	0,0	0,0
Movable	0,0	0,0	0,0	1,2	0,0	0,0	0,0
Improvised	0,4	0,1	0,2	2,4	0,2	0,3	0,2
Elsewhere	0,1	0,1	0,0	0,4	0,1	0,1	0,1
DWELLING´S FORM OF OCCUPANCY							
Owner	65,7	63,6	60,1	28,5	71,7	71,0	68,0
Tenant	30,3	27,5	34,7	59,5	24,1	22,3	26,4
Sub-Tenant	0,7	0,9	0,7	2,6	0,6	0,7	0,7
Other forms	3,3	8,0	4,5	9,4	3,6	6,0	4,9
SYSTEM OF WATER SUPPLY							
Public network	86,4	91,6	95,3	82,6	95,9	91,9	94,4
Private network	12,5	8,0	4,6	15,8	3,9	8,1	5,4
In the building	0,5	0,2	0,0	0,8	0,1	0,0	0,1
Other forms	0,6	0,2	0,1	0,8	0,1	0,0	0,1
EXISTENCE OF ELECTRICITY							
With electricity	99,9	99,9	100,0	99,6	99,9	100,0	99,9
Without electricity	0,1	0,1	0,0	0,4	0,1	0,0	0,1
EXISTENCE AND KIND OF HEATING							
Central heating	6,7	14,5	13,7	8,5	14,1	17,0	14,3
Fireplace	15,2	17,5	14,6	7,7	16,6	18,6	16,6
Fixed apparatus	5,1	4,4	5,6	4,0	4,5	4,6	4,7
Mobile apparatus	43,2	46,5	48,0	40,9	47,3	42,6	46,6
Without heating	29,8	17,1	18,1	38,9	17,5	17,2	17,8
EXISTENCE AND KIND OF TOILET							
With flushed toilet in the dwelling	93,5	97,2	97,5	90,7	97,6	98,4	97,5
Without flushed toilet in the dwelling	2,2	0,8	0,7	2,4	0,6	0,3	0,6
Toilet outside the dwelling but inside the building	3,3	1,7	1,7	4,9	1,5	1,2	1,6
Without toilet	1,0	0,3	0,1	2,0	0,3	0,1	0,3
EXISTENCE OF BATH OR SHOWER							
With bath or shower	94,0	98,4	98,2	92,7	98,9	99,4	98,7
Without bath or shower	6,0	1,6	1,8	7,3	1,1	0,6	1,3
EXISTENCE AND KIND OF KITCHEN							
Kitchen smaller than 4m^2	24,8	15,6	19,6	25,8	16,5	15,0	16,7
Kitchen larger than 4m^2	73,2	80,4	77,0	67,1	80,8	83,0	80,3
With Kitchnette	1,7	3,9	3,1	3,8	2,5	2,0	2,8
Without Kitchen	0,3	0,1	0,3	3,3	0,2	0,0	0,2
EXISTENCE OF ACQUISITION BURDENS AND BURDENS ACCORDING TO RESPECTIVE BRACKETS							
Without burdens	55,0	49,9	42,8	49,2	27,4	45,0	35,6
Less than 59,86 €	2,7	1,5	1,5	0,0	2,1	1,7	1,8
From 59,86 to 99,75 €	2,4	1,6	2,5	0,0	2,7	2,5	2,4
From 99,76 to 149,63 €	2,6	1,1	2,0	0,0	2,5	1,3	2,1
From 149,64 to 199,51 €	3,5	2,2	3,8	0,0	3,9	2,2	3,3
From 199,52 to 249,39 €	4,4	3,8	4,2	0,0	6,3	4,2	5,3
From 249,40 to 299,27 €	5,4	6,2	6,2	6,0	8,5	6,4	7,5
From 299,28 to 399,03 €	10,6	13,7	13,2	9,0	17,1	13,1	15,6
From 399,04 to 498,79 €	6,2	8,9	9,9	10,4	12,6	9,2	11,2
From 498,80 to 598,55 €	3,1	4,7	5,5	6,0	6,9	4,8	6,1
598,56 € or more	4,1	6,4	8,4	19,4	10,0	9,6	9,1
RENTING BURDENS ACCORDING TO RESPECTIVE BRACKETS							
Less than 14,96 €	19,1	7,6	4,7	7,6	5,8	1,0	5,6
From 14,96 to 24,93 €	12,7	8,1	3,7	14,6	3,9	1,2	4,9
From 24,94 to 34,91 €	12,6	2,4	4,4	0,0	5,9	3,2	4,4
From 34,92 to 59,85 €	13,5	4,5	6,2	1,6	7,0	5,1	5,9
From 59,86 to 99,75 €	10	3,5	4,2	1,1	8,2	2,8	5,7
From 99,76 to 149,63 €	7,6	5,8	5,4	13,5	8,0	5,3	7,0
From 149,64 to 199,51 €	6,3	4,8	5,8	9,2	8,9	6,5	7,2
From 199,52 to 249,39 €	5,1	4,7	7,2	9,7	8,1	7,9	7,2
From 249,40 to 299,27 €	4,5	7,3	13,1	8,6	13,0	20,2	12,4
From 299,28 to 399,03 €	6,1	21,3	24,4	14,7	21,0	24,8	21,9
From 399,04 to 498,79 €	1,6	11,9	12,0	9,7	6,7	11,7	9,3
498,80 € and more	0,9	18,1	8,9	9,7	3,5	10,3	8,5

The proposed set of "tableaux de bord" systematizes the housing characteristics (and their distribution among respective specific classes) in the Oporto Metropolitan Area (according to the country of origin of the holder) (Table 1)[7].

The distribution of immigrants by kind of building resembles natives´. Immigrants from Brazil, West Europe and other foreign countries are the ones that occupy non-classic buildings in least percentages. On the contrary, immigrants from East European countries occupy non-classical buildings in the highest percentage (substantially higher than other immigrants´).

In what concerns buildings´ occupancy, some differences emerge between natives and immigrants. So the latter settle in exclusively residential buildings in lower percentages than the former, and the opposite holds for principally residential buildings. Immigrants from Portuguese-speaking African countries and from West Europe mostly inhabit exclusively residential buildings. Immigrants from Brazil and East Europe, by their turn, show the highest percentage of occupation of principally residential buildings. Finally, West European immigrants, followed by those from other foreign countries, occupy principally non-residential buildings in higher percentages.

The distribution of immigrants among the different kinds of dwellings is very similar to natives´. However, it is important to stress that East European immigrants occupy shanty, movable, and improvised dwellings in substantially higher percentages than their homologous natives.

Immigrants show a higher proportion of dwelling owners and a lower proportion of tenants than natives. Ownership is hold in higher percentages and tenancy in lower percentages by Portuguese-speaking African immigrants and other foreign immigrants. East European immigrants occupy dwellings in very different forms from the remainder, as they live in rented dwellings more than twice than in their own dwellings. They also diverge in sub-tenancy and other forms of dwelling occupancy.

The percentage of dwellings occupied by immigrants provided with water from the public network is higher than natives´, and they generally hold lower percentages in the remaining forms of water supply. The dwellings of Portuguese-speaking immigrants (from Africa or Brazil) are the ones better supplied by the public network, whereas the dwellings of East European immigrants are better supplied from private networks, from the building or from other forms.

Almost all dwellings are provided with electricity, despite East European immigrants´ are slightly worse in this respect.

Immigrants´ dwellings are quite better provided by heating than natives´, what is mainly assured by mobile apparatus (similar to what happens with Portuguese-natives, despite in higher percentages). Immigrants from East Europe are clearly at a disadvantage, as 38,9 per cent of their dwellings are not provided with any type of heating (what represents more than twice the percentage of dwellings of their homologous from other countries).

Immigrants are, also, better supplied with flushed toilets, bath and shower in their bathrooms than the proper natives. This indicator also shows that immigrants from East Europe are the ones that present the higher relative percentages of toilets outside the dwelling

[7] The table herein presented sums up the results for the whole metropolitan area. However, the overall research carried out has systematized into the set of "tableaux de bord" the values of the variables by country of origin and by parish.

but inside the building, toilets inside the dwelling but without flush, and dwellings not provided with toilet, bath or shower.

Most immigrants´ dwellings are provided with a kitchen larger than 4 m^2, like Portuguese natives´, despite the relative percentage in the former is larger than in the later. The percentage of immigrants´ dwellings with kitchens smaller than 4m^2 is lower than natives´. East European immigrants´ dwellings show the highest relative percentages of kitchenettes and absence of kitchens.

Portuguese natives without acquisition burdens amount to 55%, what substantially surpasses immigrants´ (35,6%). The higher percentage of dwellings without burdens belongs to European immigrants (almost 50 per cent of total dwellings). Dwelling burdens are higher for immigrants than natives for monthly values of 199,5 euros or more, and their relative percentages increase with brackets (except for the two upper brackets). It is also important to point out that, until 250 euros/month, East European immigrants don't hold acquisition burdens, and they only hold burdens from this value up, reaching almost 20 per cent in the bracket of 598,6 euros/month or more. Immigrants from West Europe, Brazil and other foreign countries present a distribution of burdens that resemble one another. Portuguese-speaking African immigrants hold a more balanced distribution among all the brackets, but the ones that range between 299,3 and 498,8 euros/month mark off from the remainder. All the other groups of immigrants also tend to hold higher burdens within these brackets.

The percentage of renting burdens generally decreases with rent values for Portuguese natives. However, immigrants´ renting burdens generally increase with brackets, being particularly significant monthly rents that range from 249,4 to 399,0 euros. This is especially noticeable as far as immigrants from Europe, Brazil and other foreign countries are concerned. East Europe immigrants further hold higher renting burdens in the first and second renting brackets.

The crossed analysis of the results obtained from the hierarchical classification trees and from the housing characteristics systematized in the "tableaux de bord" leads to the conclusion that systematic differences in settlement and housing patterns arise among the different groups of immigrants that live in the Oporto Metropolitan Area. As a result they can be systematized into the following corresponding typologies (Table 2):

Table 2. Settlement and housing patterns of the different groups of immigrants that live in the Oporto Metropolitan Area (source: author).

Pattern	Settlement characteristics	Housing characteristics
1	Immigrants with high professional status do not seem to be spatially segregated, whichever is their country of origin.	Their housing characteristics resemble natives´.
2	West European and Portuguese-speaking immigrants (from Africa and Brazil) are better integrated in territory than other groups (whether considering the general population or those in upper professional groups)	Their spatial distribution and their dwellings´ characteristics are very similar to natives´.

Table 2. (continued).

Pattern	Settlement characteristics	Housing characteristics
3	West European immigrants generally spread throughout the whole metropolitan area, in locations featured by high environmental quality.	They mainly occupy classical exclusively-residential buildings; This group (together with immigrants from East Europe) presents the highest percentages of dwellings without acquisition burdens; Their renting burdens (together with immigrants from Brazil and other foreign countries) are the highest in the upper brackets.
4	Brazilians mostly settle in the metropolitan core and suburban area, as well as along the suburban coast.	The percentages of occupation of principally residential buildings by Brazilians are higher than by other population groups. In rented dwellings, they predominantly pay rents that range from 250 to 400 euros/month.
5	Portuguese-speaking African immigrants mainly settle in the suburban area, and usually live and work in distinct municipalities.	The kinds of dwellings and buildings, as well as buildings´ occupancy, are very similar to natives´; This group (together with immigrants from other foreign countries) exhibit the highest percentage of owners and the lowest percentage of tenants; Their dwellings are provided with water from public networks in higher percentages than other immigrants´; They hold the higher percentages of acquisition burdens, which are balanced among all the brackets (as natives´), despite the brackets between 300 and 500 euros monthly stand out; This group's renting burdens generally increase with rents till 400 euros/month, and substantially decrease from then on.
6	East European immigrants exhibit fragmented and dispersed settlement patterns, although the territorial distribution of their upper professional groups is more continuous than their general population's. These patterns reflect more precarious housing conditions with absolutely different characteristics from the remaining population groups.	They exhibit the highest percentages of non-classic buildings´ occupation (such as improvised, movable and shanty dwellings); They mainly occupy rented dwellings, opposite to what happens with the remaining population groups; Most of their dwellings are supplied with water from public networks, despite in lower percentages than the remaining population groups´; A high percentage of their dwellings is not provided with any kind of heating; Their dwellings are the worst served with toilet, bath and/or shower devices; Their percentage of dwellings without kitchen or with kitchenette is higher than the remainders´; They hold higher percentages of dwellings without acquisition burdens at all, and without acquisition burdens in the five lowest brackets than the remainder; However, they hold renting burdens higher than the remainder in the first and second renting brackets.
7	Immigrants from Venezuela and South Africa exhibit strongly polarized settlement behaviours (particularly in Maia and Vila Nova de Gaia municipalities), where their population density is rather high.	Their percentage of non-classic buildings´ occupation is the lowest (together with Brazilians and West European immigrants); They represent the highest percentage of dwelling owners, and the lowest percentage of tenants (together with Portuguese-speaking African immigrants); Their distribution of housing acquisition burdens approaches that of West European and Brazilian immigrants´; They hold the highest renting burdens in the four higher brackets (from 250 euros/month up), together with immigrants from West Europe and Brazil.

3.4. Discussion of Results: Analysis of the Proposed Settlement and Housing Typologies for the Main Groups of Immigrants

These settlement and housing patterns are now interpreted and discussed in the light of their relevant explanatory reasons – identified in the theoretical section -, and based on the housing characteristics of the different groups of immigrants.

Pattern 1 – Immigrants with high professional status do not seem to be spatially segregated, whichever is their country of origin - As expected, the socio-spatial differentiation shows that the metropolitan core and the urban centers (where most firms and services locate) exert a strong attraction on high-qualified immigrants. As immigrants from the Oporto Metropolitan Area exhibit professional levels higher than natives´, the labor opportunities, the intervention of immigrants´ welcome and guiding networks, the proper pre-settled labor agreements, and their tendency to join together their ethnic-cultural communities tend to guide them to more labor-demanding areas (whether in the core of the metropolitan area or in the coastal areas that link up the main urban centers). The hierarchical classification tree shows that the spatial distribution that results from the attraction exerted by these territorial dynamics on upper-professional immigrants prevails over the characteristics of respective population groups (Rebelo, 2010a).

Pattern 2 – West European and Portuguese-speaking immigrants (from Africa and Brazil) are better integrated in territory than other groups (whether considering the general population or those in upper professional groups). Their territorial distributions resemble natives´, and the same holds in relation to the characteristics of their dwellings - Considering that 19,9% of immigrants in this metropolitan area came from West Europe, and 64,1% from Portuguese-speaking countries, and that respective territorial distribution (as well as the corresponding distribution of their upper-professional groups) nearly reproduce natives´, their presence exerts an important social and economic impact. Their academic backgrounds and professional skills, their strong presence in the metropolitan urban centers and in the suburban area, favored by their continuous spatial diffusion, has increased their exposure[8] to natives. The successful integration of Portuguese-speaking immigrants in the urban and suburban economic fabric further results from their longstanding migratory experience; their cultural and linguistic share with natives; the intervention of immigrants´ welcome and guiding networks and state organisms; the multiculturalist perspective they are looked at; the importance they attach to family and friendship ties; the excess housing provision; and the housing filtering processes (especially in the urban centers and in the suburban area). The successful integration of immigrants from West European countries have also been fostered by their share of European culture, historical heritage and living conditions with Portuguese natives.

The suburbanization processes – that reflect urban dynamics and housing markets´ characteristics, strengthened by the fact that most of these immigrants work for somebody else – are deciding factors in their settlements, neighborhoods and social and professional networks. This tradition of suburban location has attracted new generations of immigrants that have progressively entered the suburban socio-economic fabric, together with the

[8] Exposure refers to the potential degree of contact or possibility of interaction, between members of the minority and majority groups within a certain geographical area (Massey and Denton, 1988).

emergence of good professional opportunities that have fostered their socio-economic and professional ascent.

Pattern 3 – West European immigrants generally spread throughout the whole metropolitan area, in locations featured by high environmental quality - From the analysis of the hierarchical classification tree and of census data (and respective cartographic display), it can be concluded that these immigrants privilege housing locations in areas where urban morphologies and building typologies are sparser, throughout the whole metropolitan area.

These patterns of residential location are, to a certain extent, shaped by the rehabilitation policies currently pursued by the older municipalities in this territory. These policies triggered gentrification processes that guided more affluent families whether to more central locations or to privileged seaside locations, regardless of their ethnic-cultural origins. In fact, these immigrants generally hold a purchasing power higher than the remainder, what confers on them a stronger capability to access home loans or the renting market, or even to support higher housing burdens and home-work commuting expenses. So they prefer more expensive dwellings in residential areas with higher socio-economic status and environmental quality.

But another reason still remains that guides these immigrants to more sparsely settlement locations. As more dispersed territorial areas show a strong demand for skilled labor (especially in health and high-technological fields) natives usually can't respond to (due to their most central metropolitan locations), the integration of high-skilled immigrants is fostered by the proper populations (as it fulfills their real needs). These employments support higher professional attainment levels that conform to their academic and professional profiles, their entrepreneurship, and their proper motivations.

Patterns 4 – Brazilians mostly settle in the metropolitan core and suburban area, as well as along the suburban coast - The hierarchical classification tree shows that Brazilians predominantly locate in the municipalities of Porto and Vila Nova de Gaia, regardless of their professional group. The analysis of census data (and respective cartographic display) further stresses their favored location – in a concentrated pattern – in the most populous parishes and/or in parishes along the coast. This justifies their high dense urban and suburban locations.

Their settlements strongly reflect their own inherent features (they attach great value to family and friendship ties), and their integration success mainly results from their cultural and linguistic approach to natives. Besides, as approximately 83,4% of these immigrants work in the tertiary sector (trade and services) they prefer metropolitan central locations, what justifies both their choice of exclusively residential or mixed-used buildings, and the high renting burdens they support (indeed dwellings prices and rents are higher in more central and littoral locations, what partially prevents them from the acquisition of their own homes). However, these areas are featured by ancient non-rehabilitated spaces, with cheaper prices, and quality levels beneath those in Porto and Póvoa de Varzim littoral spaces (that attract West European immigrants that can afford them).

Pattern 5 – Portuguese-speaking African immigrants mainly settle in the suburban area, and usually live and work in distinct municipalities - The hierarchical classification tree shows that immigrants from Portuguese-speaking African countries that belong to upper professional groups mainly locate in the municipality of Porto, whereas those that belong to the remaining professional groups predominantly live in the municipalities of Vila Nova de Gaia and Porto too. Commuting assumes the higher relevance in this group of immigrants, as can be noticed from the analysis of their home and work relative locations.

Physical and socio-economic integration processes are strongly modeled by the suburban provision of dwellings, and by the operation of housing markets (including the conditions to access home acquisition or renting). Thus, the prevailing location patterns of Portuguese-speaking African communities in the urban centers and suburban area, the fact that most of these immigrants work in the tertiary sector (79,1%), and the existence of a well-organized efficient metropolitan transport system, as well as sociological and cultural factors, support longer home-work distances and, thus, higher mobility levels. On the one hand, their cultural imagination and their longstanding staying perspectives in host-territories master their preference for home acquisition (indeed Portuguese-speaking African immigrants are the population group with a lower percentage of dwellings without acquisition burdens), despite they can't afford too expensive dwellings. So they choose suburban locations where dwellings conform to their financial possessions, even if that requires higher transportation expenses. On the other hand, and according to the data systematized in the "tableaux de bord", the balanced distribution of burdens among all the acquisition brackets show that these immigrants seem to access home loans under conditions that resemble natives´. This is mainly due to the fact that they manage to fulfill the warranties requested by banks, as they easily resort to family and friends to stand surety for them.

Pattern 6 – East European immigrants exhibit fragmented and dispersed settlement patterns, although the territorial distribution of their upper professional groups is more continuous than that of their general population's. These patterns reflect more precarious housing conditions with absolutely different characteristics from the remaining population groups - The hierarchical classification tree shows that East European immigrants that belong to upper professional groups mainly live in Porto municipality, whereas those that belong to the remaining professional groups distribute across Porto, Vila Nova de Gaia and Póvoa de Varzim municipalities. It can be further noticed, from census data and corresponding cartographic displays, that these immigrants exhibit a fragmented territorial distribution.

The factors that better explain the settlement patterns of these immigrants, as well as their home-work relative locations are: their inherent characteristics, the motivations underlying their migratory flows, the intervention of immigrants´ welcome and guiding networks, and the characteristics of the housing markets. Their migratory flows are the most recent in this metropolitan area. However, as their networks are more restrict than the remainder, and their language and customs are substantially different from natives´, they initially face harder hindrances to integration. This is strengthened by their tendency to isolation, expressed through their fragmentation and territorial diffusion, what renders even harder their integration processes. Additionally, as these immigrants have a prominent urban profile, they favor location in the urban centers and suburban areas, despite their fragmented patterns. As far as labor conditions are concerned, they are less demanding than the remaining groups of immigrants, as they mainly pursue financial goals. Besides, as they usually don't keep their families near them, and long for shorter staying perspectives, they tend to choose work locations nearby home (as their behaviors are strongly shaped by their work).

Despite they usually hold high academic levels and professional skills, their characteristics, motivations and behaviors generally restrict their access to urban facilities and to socio-economic and professional networks, and, therefore, their integration processes are much longer and complex. However, the formal recognition of their academic and professional qualifications has played an important role in these processes, and has fostered the connection between the specific labor metropolitan needs and their skilled abilities.

As far as housing markets are concerned, the metropolitan growth that took place during the later two decades (together with municipal re-housing policies) lead to processes of invasion/succession in land uses, where higher mobile social classes have progressively moved into the suburban area, letting behind some vacant dwellings in central areas (usually rather degraded dwellings). These processes are strongly modeled by the characteristics of the local economies, and depend on the territorial concentration/dispersion of capital, and on the efficiency of the transportation system. As these immigrants´ claims on quality are usually low, they have often resorted to old and degraded buildings, with longstanding renting agreements, what reflects spatial filtering processes. So they have often benefited (even on a provisional basis) from vacant dwellings, and their succession in dwelling occupation has been mainly guided by their search for locations nearby their work. This is often the solution they found, considering their income restrictions, and the hindrances they face to home acquisition (in fact, non-western non-Portuguese-speaking immigrants have been strongly harmed to access home loans, because they can hardly find someone who stand surety for them). That is why their housing conditions are completely distinct from the remaining groups of immigrants´.

Pattern 7 – Immigrants from Venezuela and South Africa exhibit strongly polarized settlement behaviors (especially in Maia and Vila Nova de Gaia municipalities), where their population density is rather high - Immigrants from Venezuela and South Africa that belong to upper professional groups preferably locate in the municipalities of Porto (the former) and Vila Nova de Gaia (the latter). Their remaining professional groups favor the municipalities of Vila Nova de Gaia and Maia. Besides, the territorial distribution of these immigrants presents a strong concentration in the parishes of these municipalities that border on the hinterland metropolitan area. The analysis of data reveals that most of these immigrants live and work in distinct municipalities. Besides, the hierarchical classification tree shows several decision levels where the country of origin is a determining variable. This stresses the fact that the intrinsic characteristics of these immigrants (namely their sociability) overlap economic and professional reasons on their location decisions, and on their settlement patterns.

This perception points out their preference for locations in the neighborhoods of their pre-settled ethnic-cultural communities, within territorially dispersed morphologies. Taking into account their Latin imagination, they favor single-family home typologies, or land plots where to build up according to their financial possessions, located on the metropolitan suburban borders. These urban morphologies and building typologies are sparser than in the metropolitan core and in the suburban area. However, the high concentration levels of these groups of immigrants in the suburban border decrease their exposure to natives, what may reduce their socio-economic and professional mobility, and make harder their integration processes and access to opportunities.

4. CONCLUSIONS

Considering the increasing importance of immigrants for demographic and socio-economic sustainability, the current methodological proposal supports the formulation of housing policies targeted to different groups of immigrants, thus favoring their integration (as

it describes their settlement patterns, their underlying demographic, economic and professional characteristics, and corresponding housing typologies).

This methodology may be applied to different metropolitan and urban realities, and along different moments (as long as the upstream management information system is duly updated), thus monitoring the evolution of settlement patterns and housing typologies along time. The simulation and cartographic interfaces further enables the test of alternative policies, provided that variables underlying immigrants´ settlement patterns change their values, or considering different alternative housing scenarios, followed by the analysis of their predictable impacts upon settlement patterns (fitting new hierarchical classification trees, and taking into account the variables underlying them). Finally, it supports the harmonization of housing policies targeted to immigrants, within the scope of different institutional and legal frameworks.

Some possible concrete interventions may direct to improving immigrants access to home loans or to the renting market; increasing the accessibility of residential areas to the main employment, trade and services centers; provision of public spaces, urban equipment and transports; and promotion of the involvement of economic agents, non-governmental agencies and the general population in urban planning and management processes.

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