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Item 10 – Household Projections

Household Projections and Welfare

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HOUSEHOLD PROJECTIONS AND WELFARE

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1. Introduction

The socio-demographic changes experienced by Italy in recent decades (AA.VV., 2011) – e.g. ageing, changes in the family structure - have had a profound effect on both the labour market and the welfare system.

More specifically, like many other countries, Italy is experiencing an ageing process, so that in the next twenty years, there will be a dramatic increase in the number of persons aged 65 and over (+34%). According to available estimates (Istat, 2011) there will be nearly 16 million of them by 2030, a significant number of whom will be oldest-old (3 million aged 85 and over).

Official statistics (Indagini Multiscopo) indicate that multi-dwellings are more and more rare (only 1.2% of households), since elderly people are more likely to live alone than in the past. Suffice it to say that according to the Census of 1971, 9% of men and 22% of women aged 65 and over were living alone, while at the Census of 2001, these percentages were 13.7% and 37% respectively. Furthermore, according to recent Italian household projections (Blangiardo et al., 2012), by 2030 there will be more than 4.5 million people aged 65 and over who will be living alone, which is equivalent to 7.7% of the total population. From a family perspective, this means that nearly one household in five will consist of an elderly person living alone.

Leaving aside other implications of these changes in the family set-up, the cause of this trend is also to be found in the continuing difference in male and female survival levels (by 2030, men will have a life expectancy of 82.2 years, compared to 87.5 for women) which will obviously add to the increasing number of elderly people living alone. There is likely to be an accompanying increase in the need for nursing home and care assistance.

Another important change which has had a significant impact on the welfare system is the increase in female activity rates, causing a reduction in the number of housewives, and a consequent need for domestic work and care services to be carried out by paid workers (Parreñas, 2001) since state-funded services for elderly people and children are scarce and expensive. As a direct consequence, therefore, the demand for child carers and in particular, for caregivers for the elderly, seems bound to increase significantly in the future.

Moreover, as is well-known, home caregivers are more and more often recruited from among immigrants, due to the lack of supply among the younger Italian generations (e.g. Fullin and Vercelloni, 2009; Zanfrini, 2011; Ambrosini, 2001). According to recent estimates (Censis and

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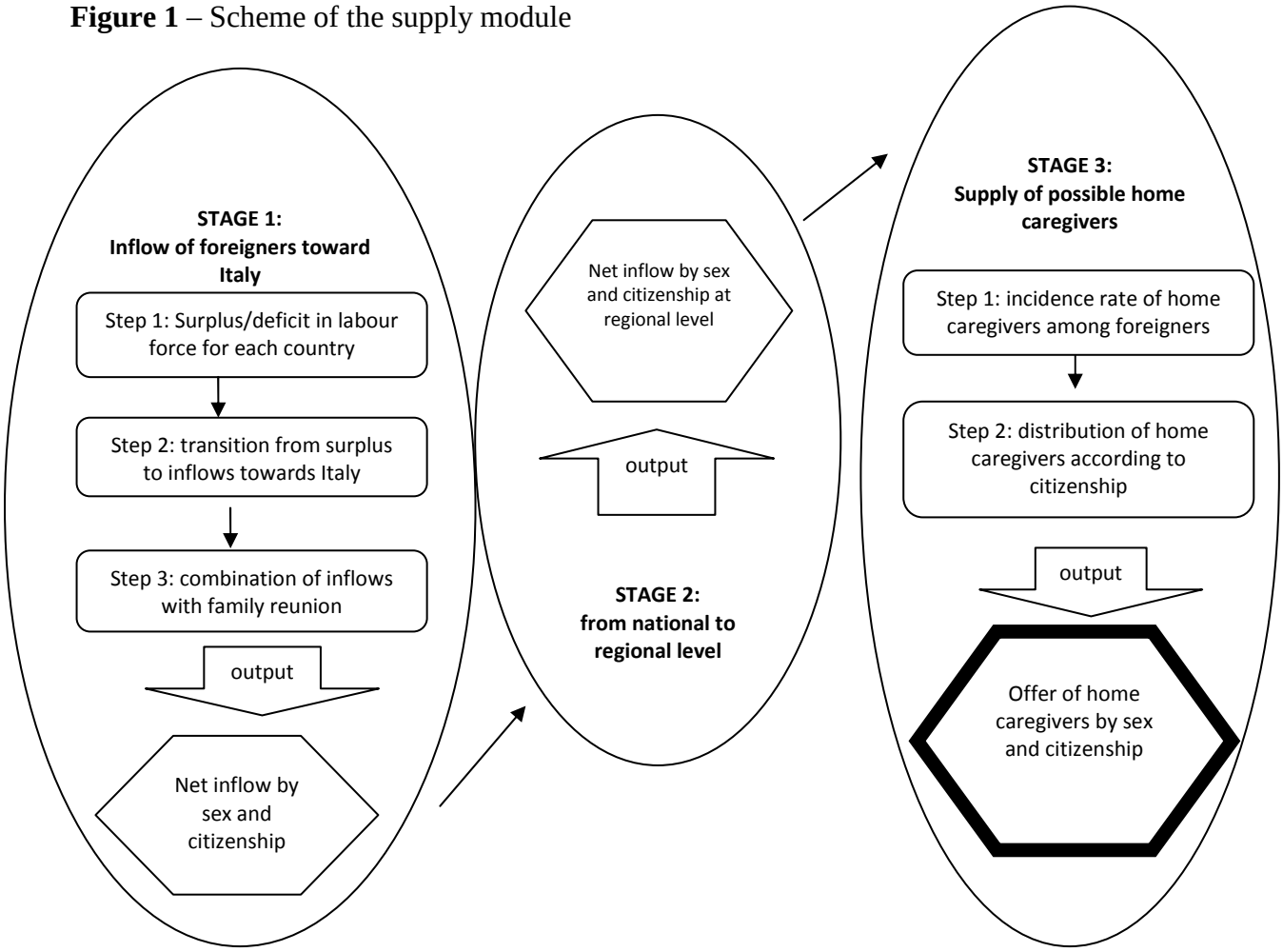
Ismu, 2013), only 22.7% of domestic workers are Italian, the majority being foreigners. However, some indications of change have been noticed, especially in the South: due to the negative effects of the economic crisis on the Italian labour market, the percentage of Italian women among home caregivers is gradually increasing.

Given this social-demographic background, this paper aims at presenting an original method for estimating, on the one hand, the extra demand for caregivers of the elderly and similar professions (care provided to disabled or non-autonomous people) on the part of Italian households due to demographic changes, and on the other , the possible supply of migrants[5]. The estimates integrate official statistics and data from *ad hoc* surveys. Furthermore, by comparing the supply and demand of home caregivers, some interesting considerations and helpful recommendations arise which may be useful to policy-makers for planning purposes.

The rest of the paper is as follows: section 2 describes the method used to estimate supply, while the estimate of demand is presented in section 3. Section 4 contains the conclusions.

Figure 1 – Scheme of the supply module



[5]The model was set up as part of a study carried out by Censis and Ismu Foundation on behalf of the Ministry of Labour and Social Policy, which aimed to estimate supply and demand for home care in the next thirty years in the following Italian regions: Campania, Calabria, Puglia and Sicily. More details are available on the website of the Ministry of Labour and Social Policy.

2. The supply of foreign caregivers

Estimates of the additional supply have been obtained on the basis of the hypothesis that the latter will coincide with the availability of manpower for the care sector that will be generated by annual inflows towards Italy.

The procedure consists of three stages:

1) the estimation of inflows of foreign population towards Italy, by sex and citizenship, on a five-year basis (2010-2014, 2015-2019… 2030-2034);
2) the estimation of specific regional inflows, on the basis of the national level and according to the regional trends of the latest official projections (Istat, 2011);
3) the transformation of such flows into regional supply of home caregivers.

Although this procedure aims at estimating the potential supply of foreign home caregivers, the intermediate output produced at each stage also provides useful information for planning purposes.

2.1 Stage 1: estimation of inflow of foreign population towards Italy

Given the great variety of foreign citizenships living in Italy, only thirty countries were selected, corresponding to nearly 90% of the overall foreign population in the Population Register as of January 1st, 2011. More specifically, twenty countries were selected according to their ranking in inflows towards Italy,[6] plus ten from among the main countries with the highest percentage of workers in the family-care sector[7].

This stage, as shown in figure 1, was composed of three steps which are described below.

Step 1: Surplus/deficit in labour force

For any country, a surplus or deficit in the labour force indicates the need either to reduce the number of jobs or create a fresh supply of workers. Otherwise, if there are no changes in the national economy, migration outflows/inflows will be required to offset the demographic imbalance. Therefore, according to the hypothesis of invariance of the potential employment of local labour markets, the surplus in active population in the sending countries towards Italy can be considered as a push factor for estimating future labour force flows from abroad.

Thus, firstly, the surplus or deficit in the labour force, $SD^{C}(t, t+4)$, was estimated for each of the thirty selected countries. Entries into and exits from the labour force were calculated on the basis of the population, $P^{C}_{x,x+4}(t)$, - by sex, age class and country[8] - and the increase (positive or negative) in the activity rates (AR) between two consecutive age group[9] with $x = 10,20, \dots, 60$, $t = 2010,2015, \dots, 2030$ separately for each country, as follows:

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[6] According to the citizenship distribution of foreigners resident in Italy as of January 1st, 2011 (Istat).
[7] This information has been derived from *PerLa* Survey (Ismu, Censis and Iprs, 2010).
[8] Medium variant of world projection (UN, 2010).
[9] Activity rates are available in the database of the ILO: http://laborsta.ilo.org/ orhttp://www.ilo.org/ilostat .

$$SD^c(t,t+4) = \sum_{x=10}^{60} [P_{x,x+4}(t) \cdot (AR_{x+5,x+9}(t,t+4) - AR_{x,x+4}(t,t+4))] \quad [1],$$

where AR(t,t+4) is the average annual activity rate from t to t+4,

Table 1 *– Surplus/deficit in labour force (thousands) 2010-2034*

Countries	Five-year period				
	2010-14	2015-19	2020-24	2025-29	2030-34
	Male and Female				
Rumania	141	-84	-212	-282	-283
Albania	108	78	43	19	7
Morocco	1,300	1,130	973	821	737
China	33,703	10,906	-4,442	-11,021	-21,030
Ukraine	92	-390	-487	-423	-370
Philippines	6,142	6,373	6,146	6,106	5,924
Moldova	48	10	-10	-10	-2
India	59,431	56,418	52,446	49,015	44,297
Poland	-5	-385	-488	-412	-450
Tunisia	330	227	154	122	93
Peru	1,860	1,784	1,642	1,444	1,214
Ecuador	841	818	757	680	584
Egypt	3,451	3,254	3,231	3,181	2,931
Macedonia	28	7	-9	-19	-27
Bangladesh	10,167	9,684	8,217	6,554	4,976
Sri Lanka	532	438	448	420	314
Senegal	1,133	1,289	1,451	1,553	1,622
Pakistan	10,062	9,752	9,702	9,616	9,263
Nigeria	9,792	11,280	12,870	14,580	16,373
SMK (Serbia-Montenegro-Kosovo)	58	3	-27	-46	-86
Russia	-154	-2,057	-1,783	-719	-531
Dominican Republic	534	497	462	421	369
Somalia	586	677	778	891	1,032
Georgia	117	43	-14	-34	-32
Belarus	19	-116	-133	-83	-67
Bulgaria	-62	-112	-121	-105	-112
Brazil	8,149	7,226	5,220	3,233	1,783
Cuba	119	-7	-159	-276	-279
Bolivia	738	768	766	757	744
Slovakia	31	-36	-67	-74	-99

Source: processing on UN and ILO data

According to our outcomes (Table 1), overall, the selected countries will show a decreasing surplus in the labour force from over 149 million to just under 69 million. Nevertheless, there are some peculiarities: one group of countries (i.e. China, Rumania, Slovakia and Ukraine), which have

usually had a surplus in the labour force, will move into deficit within a short period of time (5-10 years), while Nigeria, Somalia and Senegal will continue to increase their high surplus in the labour force. Thus, within twenty years, India, Nigeria, Philippines, Pakistan, Bangladesh, Egypt, Senegal, Brazil, Peru and Somalia will show the highest surplus of labour force. This surplus might also constitute a push factor towards Italy.

Step 2: transition from the surplus to the possible inflow towards Italy

The surplus estimated above may be considered as the possible outflow for work reasons from sending areas. By definition, countries with a deficit in their labour force have no outflow of migrant workers. Among those with a positive surplus during the interval t, t+4, we proceeded to estimate the amount of inflows towards Italy by citizenship and sex. In order to do so, we first estimated a coefficient of attraction towards Italy, as a ratio of the growth in the resident foreign population with citizenship *c*, registered in Italy during the period 2006-2010 (source: Istat), and the surplus in the corresponding country of origin in the same period; a surplus determined using the same procedure described above. Hence, by applying these coefficients of attraction to the expected future surplus[10], we estimated the entire working inflows towards Italy by citizenship and sex, $IW^c(t, t+4)$.

As a result of this procedure, we obtained the first rough estimates of future inflows, grouped by sex and citizenship on a five-year basis, due to the possible surplus in labour force in the main sending countries or in those countries which have the highest percentage of workers in Italy in the care sector.

Step 3: revision of previous estimates taking into account the labour force and family reunions

Taking into account that inflows are generally made up of both workers and partners or offspring of the first family member emigrating, we revised the estimations produced at step 2. As regards working flows, we applied a set of coefficients, $k^c(t, t+4)$, - by sex and citizenship - to the previous estimations, $IW^c(t, t+4)$. These coefficients represent the quota of work permits out of the number of work and family permits issued in the period 2006-2010 (Istat). We hypothesised a turnover between the quota of inflows for family and work reasons: a high immigration ratio of workers will then be followed by a lower inflow for work reasons and conversely by a higher inflow for family reunions. Hence, coefficients are estimated on the basis of a recursive procedure and therefore the percentage of the next period is a function of the previous one:

$$k^c(t+5, t+9) = \frac{k^c(t, t+4) + 0.5}{2}, \text{where } t = 2010, 2015, \ldots, 2025 \quad [2]$$

In order to estimate the additional family reunion flows, the complementary values of such coefficients $,[1 - k^c(t, t+4)]$, are applied to the increase in the resident population registered in the previous quinquennial.

Hence, the net inflows, $I^c(t, t+4)$, are calculated as follows:

[10]Properly adjusted in each period to take into account the variability and different trends between countries.

$$I^c(t,t+4) = IW^c(t,t+4) * k^c(t,t+4) + IF^c(t,t+4) \qquad [3]$$

Where:

$$t = 2015, 2020, \dots, 2030 \text{ and } IF^c(t,t+4) = \left[P(1.1.t) - P(1.1.t-5)\right] * \left[1 - k^c(t,t+4)\right]$$

In order to calculate the population stock at the end of any period, the flows were eventually adjusted taking into account natural increase (births and deaths) and acquisitions of citizenship.

Output of stage 1

At the end of the first stage of the estimation process, we obtained the number of foreigners residing in Italy as of January 1st, 2011, 2015, 2020, 2025, 2030 and 2035 by sex and citizenship. These outcomes can be calculated using two different population targets: the first regards persons with foreign citizenship at time t (target A population), while the second considers the target A population plus all the individuals who will have become Italians since 2011 (target B population). The latter group may represent the maximum estimate, and the difference is basically due to the number of foreigners who might acquire Italian citizenship over the next two decades.

According to population target A, as of January 1st, 2035, there will be 9.6 million foreigners resident in Italy, of whom 8.5 million from the 30 selected countries. If the foreigners who might acquire Italian citizenship are also considered, there should be nearly three more million residents. The acquisition of Italian citizenship should affect more men than women, and the effects of this should be evident within 15-20 years and should influence the number of the residents with Rumanian, Ukrainian, Polish or Bulgarian citizenship.

Overall, net inflows (workers and family reunions) will decrease markedly due to reductions in the surplus in the labour force that will come about in the main sending countries. The decreasing trend should be extremely rapid, with annual net inflows halving within twenty years. More specifically, inflows from Eastern Europe should run out quickly, while those from the Philippines, India, Ecuador, Pakistan and Egypt should remain constant and the number of emigrants from Senegal, Nigeria and Somalia should actually increase. The main effect of these changes will be a completely different distribution of the citizenship of the new emigrates. Whereas nowadays, 25% of net inflow towards Italy is from Rumania, 10% from Albania and Morocco, 5% from China and 4% from India, Ukraine and Moldova, in twenty years' time the main sending country will be Morocco (with 16% of inflows) followed by India (10%), Albania (9%), Philippines (8%), Senegal (7%) and Rumania only 5%. As a consequence, the composition of the resident population should be slightly modified.

Table 2 *– Net inflows (workers and family reunions) according to country of origin. Mean annual figure 2011-2034 (thousands).*

Country	Five-year period				
	2011-14	2015-19	2020-24	2025-29	2030-34
	Male and Female				
Rumania	79.4	34.3	18.7	11.0	7.1

Albania	32.8	26.3	20.2	15.3	12.3
Morocco	33.1	30.8	27.9	24.7	22.2
China	16.5	13.5	8.4	5.3	3.8
Ukraine	12.8	8.0	4.2	2.3	1.4
Philippines	11.3	11.8	11.8	11.7	11.6
Moldova	13.0	9.6	5.1	2.7	1.9
India	13.9	15.2	14.9	14.3	13.4
Poland	7.6	4.0	2.5	1.7	1.4
Tunisia	6.2	5.8	4.6	3.8	3.2
Peru	8.3	7.9	7.0	6.3	5.5
Ecuador	6.6	6.7	6.6	6.2	5.6
Egypt	7.2	6.8	6.3	6.1	5.7
Macedonia	6.2	3.8	2.5	1.8	1.5
Bangladesh	7.1	5.5	4.3	3.4	2.7
Sri Lanka	6.6	5.6	5.0	4.5	3.9
Senegal	6.5	7.6	8.5	9.2	9.7
Pakistan	6.6	7.1	6.9	6.7	6.5
Nigeria	4.2	4.1	4.3	4.6	5.1
Serbia-Montenegro-Kosovo	4.7	3.9	2.9	2.4	2.1
Russia	2.3	1.6	1.0	0.7	0.6
Dominican Republic	1.8	1.5	1.3	1.2	1.1
Somalia	0.7	0.7	0.9	1.0	1.1
Georgia	1.4	1.8	0.9	0.5	0.2
Belarus	0.6	0.4	0.2	0.1	0.1
Bulgaria	3.8	1.7	1.0	0.6	0.4
Brazil	3.8	3.3	2.7	2.1	1.6
Cuba	1.3	1.0	0.6	0.5	0.4
Bolivia	1.6	1.6	1.4	1.3	1.3
Slovakia	0.8	0.4	0.3	0.2	0.1
Total 30 countries	*308.8*	*232.4*	*182.7*	*152.2*	*133.5*
Other countries	48.2	36.3	28.5	23.7	20.8
All countries	*357.0*	*268.7*	*211.2*	*175.9*	*154.2*

Source: own elaboration

2.2 Stage 2: transition from the national level to sub-national level

For planning purposes, the sub-national level is essential. We therefore need a procedure which enables us to distribute the overall estimate at the sub-national level. Regional inflows are computed by taking national inflows and applying to them the probability of reaching region r conditional on being of citizenship c on a five-year basis, $\Pr(r \mid c)$. This probability is computed as follows:

$$\Pr(r \mid c) = (\Pr(r) \cdot \Pr(c \mid r)) / (\Pr(c)) \quad [4]$$

Since

$$\Pr(r \cap c) = \Pr(c) \cdot \Pr(r \mid c) = \Pr(r) \cdot \Pr(c \mid r)$$

Where $\Pr(r)$ can be approximated by the ratio between the increase of foreigners resident in region r and the overall increase estimated according to Istat data; $\Pr(c \mid r)$ by the distribution

according to citizenship of foreigners resident in region r and $Pr(c)$ by the incidence of inflows from country c on the overall amount of inflows. As input, we therefore need both the estimates of inflows of foreign population at the national level by sex and citizenship, $I^c(t, t+4)$ - see above (step 1) - and the foreign population projected by Istat as of January 1st in the years 2011-2035 by region, sex and citizenship.

Output of stage 2

As a result of this stage, we obtained the number of foreigners residing in each Italian region as of January 1st 2011, 2015, 2020, 2025, 2030 and 2035, by sex and citizenship. These estimates are distinguished according to the two different target populations (A and B) defined previously. As usual, the target B group may be considered as the maximum regional amount.

Table 3 *– Net inflows by area of residence. Mean annual figure: 2011-2034 (thousands).*

Area	Five-year period				
	2011-14	2015-19	2020-24	2025-29	2030-34
	Male and Female				
North West	125.0	100.9	83.3	71.4	63.4
North East	88.9	68.4	53.1	43.9	38.9
Centre	94.5	67.4	51.9	42.8	37.2
South and Islands	48.5	32.0	23.0	17.9	14.8
Total	357.0	268.7	211.2	175.9	154.2

Source: own elaboration

2.3 Stage 3: transition from inflows to supply of home caregivers

In order to estimate the home caregiver offer (HC) by sex and citizenship on a five-year basis at the regional level, we applied the probability of being a home caregiver conditional on having citizenship c to the regional inflows of each specific nationality (by sex) i.e.:

$$[HC]^{\uparrow}c = I^{\uparrow}c\,(t, t+4) \cdot Pr(HC|\,c) \qquad [5]$$

Where the last factor can be obtained as follows:

$$Pr(HC|\,c) = (Pr\,[(c|HC) \cdot]\;\; Pr(HC))/Pr(c) \qquad [6]$$

Since, applying the formula of Bayes, the joint probability of having citizenship c and being a home caregiver is estimated as follows:

$$Pr(c \cap HC) = Pr(c|HC) \cdot Pr(HC) = Pr(c) \cdot Pr(HC|c).$$

Thus for each of the three terms of [6], the most suitable and updated source was identified as *ad hoc* surveys on migrants living in Italy.

First, the probability of coming from country c as the ratio between estimations of net regional inflows of foreign population (absolute values) by sex and citizenship obtained as an output of the previous stage $I^c(t, t+4)$ and the total inflow (separately for each sex):

$$Pr(c) = \frac{I^{c}(t, t+4)}{\Sigma_c I^c(t, t+4)} \qquad [7]$$

Second, the quota of each nationality among home caregivers $Pr(c|HC)$(for any sex):

$$Pr(c|HC) = \frac{HC^c(2012)}{HC(2012)} \qquad [8]$$

This information was obtained from the outcomes of a specific survey conducted by Censis and Ismu during 2012 ("sample of workers" 2012).

Third, the incidence rate of home caregivers among the foreign population $Pr(HC)$:

$$Pr(HC) = \frac{HC(2009-2010)}{P(2009-2010)} \qquad [9].$$

The latter was identified on the basis of the results of recent surveys carried out in Italy. More specifically, the following two surveys were considered: *PerLa Survey*, carried out during 2009 by Ismu, Censis and Iprs, aiming at describing the professional trajectories of migrants (Ismu, Censis and Iprs, 2010), and the *Integration Indexes Survey*, conducted during 2009 by Ismu, aiming at estimating the level of integration of migrants living in Italy (Cesareo and Blangiardo, 2009).

Output of stage 3

As a result of this third stage of the estimation process, we obtained the supply of foreign home caregivers on a five-year basis by sex, region and citizenship. As for stage 1, these estimates can be distinguished according to the two different target populations (A and B), previously defined, and target B group may be considered, once again, as the maximum amount.

Table 4 *–Supply of home caregivers at the national level by country of origin. Mean annual figure: 2011-2034*

Country	Five-year period				
	2011-14	2015-19	2020-24	2025-29	2030-34
	Male and Female				
Rumania	19,283	10,574	7,179	5,260	4,175
Albania	3,582	2,973	2,352	1,877	1,605
Morocco	5,923	5,941	5,686	5,319	4,998
China					
	2,103	1,915	1,389	1,095	934

Ukraine	7,312	5,089	2,966	1,880	1,318
Philippines	6,079	6,312	6,368	6,407	6,413
Moldova	6,788	5,531	3,377	2,232	1,621
India	2,269	2,559	2,641	2,680	2,620
Poland	3,212	1,870	1,277	968	806
Tunisia	1,432	1,520	1,233	1,042	916
Peru	4,372	4,539	4,328	4,075	3,766
Ecuador	1,842	1,946	1,961	1,898	1,780
Egypt	501	469	461	457	441
Macedonia	3,005	2,204	1,621	1,306	1,133
Bangladesh	711	619	545	481	420
Sri Lanka	1,730	1,564	1,451	1,369	1,236
Senegal	957	1,121	1,270	1,418	1,530
Pakistan	678	828	915	1,012	1,032
Nigeria	1,416	1,488	1,626	1,803	2,006
Serbia-Montenegro-Kosovo	2,075	1,926	1,588	1,410	1,316
Russia	1,420	1,034	676	496	405
Dominican Republic	564	499	447	412	384
Somalia	161	169	200	225	251
Georgia	616	801	425	238	143
Belarus	400	254	151	99	72
Bulgaria	1,384	682	438	308	239
Brazil	2,095	1,797	1,449	1,126	857
Cuba	140	113	78	60	51
Bolivia	743	763	695	664	649
Slovakia	202	127	81	58	46
Total 30 countries	82,996	67,227	54,873	47,675	43,163
Other countries	13,321	10,561	8,566	7,329	6,546
All countries	96,316	77,788	63,439	55,003	49,709

Source: own elaboration

Table 5 *–Supply of home caregivers at national level by area of residence. Mean annual figure, years: 2011-2034 (thousands)*

Macro area	Five-year period				
	2011-14	2015-19	2020-24	2025-29	2030-34
	Male and Female				
North West	33.5	28.3	24.0	21.3	19.5
North East	22.8	18.3	14.4	12.3	11.2
Centre	24.5	19.5	16.1	14.1	12.7
South and Islands	15.6	11.7	8.9	7.4	6.4

Italy	96.3	77.8	63.4	55.0	49.7

Source: own elaboration

3. Family demand for caregivers

As regards demand for home caregivers on the part of families, the estimate process is based, on the one hand, on the number and the characteristics of the population potentially in need of care and on the other, on the characteristics of home caregivers. A household perspective must be adopted, since personal care is closely connected with the living arrangements of elderly people and of disabled or non-autonomous adults.

We hypothesize that the number of home caregiver users by age[11], type of living arrangement[12], sex and region, $D^{h}_{x,x+9}$ (x= 65, 75, 85+), may be calculated as a function of the numbers of elderly people in the population by age and type of living arrangement, $E^{h}_{x,x+9}$, and the probability of need in the services of a caregiver(E^U) conditional on being aged $x, x+9$ and in the living arrangement type h, $\Pr(E^U \mid x, x+9 \,\&\, h)$, as follows:

$$D^{h}_{x,x+9} = E^{h}_{x,x+9} \cdot \Pr(E^U \mid x, x+9 \,\&\, h) \quad [10]$$

According to the formula of Bayes:

$$\Pr(x, x+9 \,\&\, h \cap E_{\downarrow}{}^{\uparrow}U) = \Pr(E_{\downarrow}{}^{\uparrow}U) \cdot \Pr(x, x+9 \,\&\, h \mid E_{\downarrow}{}^{\uparrow}U) = \Pr(x, x+9 \,\&\, h) \cdot \Pr(E^U \mid x, x+9 \,\&\, h) \quad [11]$$

thus

$$\Pr(E_{\downarrow}{}^{\uparrow}U \mid x, x+9 \,\&\, h) = (\Pr(E_{\downarrow}{}^{\uparrow}U) \cdot \Pr(x, x+9 \,\&\, h \mid E_{\downarrow}{}^{\uparrow}U)) / \Pr[(x, x+9 \,\&\, h)] \quad [12]$$

If we indicate $(\Pr(x, x+9 \,\&\, h \mid E_{\downarrow}{}^{\uparrow}U)) / \Pr[(x, x+9 \,\&\, h)]$ as $p_{x,x+9\,\&h}$ and $\Pr(E^U)$ as p^U, that is the rate of caregivers among the whole elderly population:

$$\Pr(E^U \mid x, x+9 \,\&\, h) = p^U \cdot p_{x,x+9\,\&h} \quad [13]$$

$$D^{h}_{x,x+9} = E^{h}_{x,x+9} \cdot p^U \cdot p_{x,x+9\,\&h} \quad [14]$$

Hence, the overall additional demand from elderly members in the household, D, can be estimated as the sum of [14]

$$D = \sum_{x,h} D^{h}_{x,x+9} \quad [15]$$

The result of equation [15] is adjusted *a posteriori* in order to take into account the number of users of home caregivers among people aged under 65 (disabled and non-autonomous individuals).

[11] We consider three age groups: 65-74; 75-84 and 85+.

[12] We consider five types of living arrangements: single person, couple with children, couple without children, one-parent family and other family.

Hence to estimate the number of home caregivers demanded by the Italian households the following inputs are required:

first, the distribution of elderly people grouped by sex, age group (65-74; 75-84 and 85+) and living arrangements from 2011 to 2031, $\hat{E}^{h}_{x,x+9}(t, t+4)$. These estimates have recently been produced (Blangiardo et al., 2012), using a propensity method similar to that used by the Australian Bureau of Statistics (1999) and by Statistics New Zealand (2004). Briefly, this method assumes that each individual has one role in a family and household (living arrangement type) and that the proportion of population in each living arrangement type may be considered as the probability of belonging to each role, grouped by age and sex. Such proportions – available from the Indagine Multiscopo (Istat) – represent the living arrangement type rates (LATRs). Afterwards, the LATRs are applied to the future population distribution by age and sex (Istat, 2011). As a result, we obtain the distribution of the population by age, sex, region and living arrangement from which the number of families and households is derived;

second, the distribution by sex, age and living arrangements of elderly people aged 65 and over, $\hat{E}^{h}_{x,x+9}$, assisted by a home caregiver, according to the *ad hoc* survey conducted by Censis during 2012 on households assisted by home caregivers (Censis, 2013);

third, the number of home caregivers as of January 1st, 2011, employed by households with at least one person aged 65 and older (Censis estimates) which can be assumed as a proxy of the number of assisted elderly people.

Table 6– *Mean annual value of the additional demand for home caregivers in Italy by area of residence. (thousands): 2011-2030*

Area	Period				
	2011-14	2015-19	2020-24	2025-29	2030
	Minimum variant				
North West	7.1	5.2	6.1	5.0	4.5
North East	4.2	3.4	4.1	4.0	3.8
Centre	4.1	2.9	3.7	4.0	4.3
South and Islands	2.8	2.2	2.9	3.0	3.4
Italy	**18.2**	**13.7**	**16.8**	**15.9**	**16.0**
	Maximum variant				
North West	16.4	12.4	14.3	11.8	10.6
North East	8.5	6.8	8.4	8.2	7.7
Centre	9.0	6.5	8.2	8.8	9.6
South and Islands	6.6	5.1	7.0	7.2	8.3
Italy	**40.6**	**30.7**	**37.9**	**36.0**	**36.2**

Source: own elaboration

Two different variants of estimates were computed: the minimum and maximum one. In the former case, the demand for home caregivers is calculated considering only those workers active in the care sector, while in the latter, workers employed in the domestic and family sector are also included.

As shown in Table 6, the additional demand for caregivers due to the rise in numbers of elderly people over the next years will decrease in Italy. This trend is ascribable to the projected trend in

the North West where the loss should be very sizeable, while according to our estimates the Centre and the South and Islands regions should see a slight increase in demand.

Table 7- *Mean annual value of additional demand for home caregivers in Italy by sex, age and living arrangements of the caregiving user: 2011-2030.*

period	Male			Female			
	Single person 65+	other 65+	Other <65	Single person 65+	other 65+	Other <65	Total
	Minimum variant						
2011-2014	5,563	4,811	843	4,170	2,624	206	18,217
2015-2019	4,355	3,686	654	3,078	1,745	147	13,665
2020-2024	5,215	4,495	790	3,758	2,394	188	16,840
2025-2029	4,346	3,742	658	3,982	2,980	212	15,920
2030	3,913	3,427	598	4,187	3,595	237	15,958
	Maximum variant						
2011-2014	12,357	10,697	1,875	9,338	5,854	462	40,583
2015-2019	9,761	8,268	1,466	6,972	3,946	333	30,746
2020-2024	11,696	10,092	1,772	8,530	5,421	427	37,937
2025-2029	9,787	8,434	1,483	9,053	6,723	482	35,962
2030	8,868	7,783	1,357	9,556	8,087	540	36,189

Source: own elaboration

In the future, the extra demand for home caregivers will be expressed mainly by men, persons aged 65 and over and especially those living alone. According to the maximum variant, the surplus demand will fluctuate in line with the age structure of the population. On average, therefore, in each year until 2030 between 30 and 40 thousand domestic workers will be taking care of our elderly, disabled and non-autonomous people.

4. Conclusions

The model herewith proposed is an original procedure both from the methodological perspective and in terms of results. The methodology combines official statistics with data from *ad hoc* surveys conducted on migrants in recent years. Taking as our starting-point the surplus in the labour force that will exist in the main sending countries - making the reasonable hypothesis that in presence of a surplus, workers will emigrate to another country in search of employment- we estimate possible inflows towards Italy taking into account not only that people emigrate for work but also to rejoin their families. The estimation at the national level is distributed according to region and we then estimate the home caregiver supply by sex and nationality.

Furthermore, in order to appraise the demand, we consider the number of potential users of home caregivers, starting from the estimated changes concerning elderly people, combined with structural modifications on the basis of their household arrangements.

The outcomes constitute a helpful resource for planning purposes particularly as regards the regulation of inflows and their redistribution around the country.

According to our results, significant changes will take place in the next twenty years.

Firstly, due to demographic trends in the main sending countries, and in those with higher percentages of workers in the care sector, there will be changes in the composition of inflows towards Italy. Inflows from the current sending countries, both for work and family reasons, will decrease as a result of depletion in surpluses in the labour force, while inflows from central and southern Africa will increase.

Secondly, the inflows of home caregivers toward Italy will gradually decrease from nearly 100 thousand to less than 50 thousand.

Thirdly, the estimates suggest that the current supply of domestic workers who arrive in Italy each year from the Ukraine, Rumania, Moldova, the Philippines, Poland, Russia and Bulgaria, fully satisfies the demand for nearly 40 thousand domestic workers, while in twenty years' time the supply from these countries will cover less than 30% of demand. Hence, in order to satisfy the growing need for of family assistance, home caregivers will have to be recruited from other countries, especially from Africa.

References

AUSTRALIAN BUREAU OF STATISTICS, 1999, *Household and family Projections*, Australia 1996 to 2021, Australian Bureau of Statistics.

AMBROSINI M., 2001"The Role of Immigrants in the Italian Labour Market", *International Migration*, 39 (3):61-83.

AA. VV., 2011, *Il Cambiamento demografico, Rapporto proposta sul futuro dell'Italia*, Bari, Laterza.

BLANGIARDO G.C., **BARBIANO DI BELGIOJOSO** E., **BONOMI** P., 2012, *Le previsioni demografiche delle famiglie*, in Osservatorio Nazionale sulla Famiglia (eds.), Primo rapporto biennale, Vol. I - La condizione familiare in Italia: aspetti demografici, sociali e legislativi, Carocci.

CENSIS AND ISMU (EDITED BY) 2013, Elaborazione di un modello previsionale del fabbisogno di servizi assistenziali alla persona nel mercato del lavoro italiano con particolare riferimento alla popolazione straniera, Sintesi della ricerca, Roma, 14 maggio, http://www.integrazionemigranti.gov.it

CESAREO V., BLANGIARDO G.C. (edited by), 2009, Indici di integrazione, Un'indagine empirica nella realtà migratoria italiana, Milano: Franco Angeli.

FULLIN G. AND VERCELLONI V, 2009, "Dentro la trappola, percezioni e immagini del lavoro domestico e di cura nei percorsi delle donne immigrate", πόλις, XXIII(3): 425-461.

KEILMAN N., CHRISTIANSEN S., 2010, "Norwegian Elderly Less Likely to Live Alone in the Future", *European Journal of Population*, 26: 47-72.

ILO, http://laborsta,ilo,org/ and http://www,ilo,org/ilostat.

ISMU, CENSIS, IPRS (edited by) 2010, *Immigrazione e lavoro, Percorsi lavorativi, Centri per l'impiego politiche attive*, Quaderni Ismu 1/2010.

ISTAT, 2011, *Previsioni regionali della popolazione residente al 2065*, demo.istat.it.

MINISTERO DEL LAVORO E DELLE POLITICHE SOCIALI, 2012, *Modello per la stima di domanda e offerta del lavoro domestico*, Roma.

PARREÑAS R.S., 2001, *Servants of Globalization, Women, Migration, and Domestic Work*, Stanford University Press, Stanford, California.

STATISTICS NEW ZEALAND, 2004, *New Zealand Family and Household Projections, 2001 (based)-2021*, TeTariTatau, Statistics New Zealand.

UNITED NATIONS, 2011, *World Population Prospects, the 2010 Revision* http://esa.un,org/unpd/wpp/index.htm.

WILSON T., 2013, "The sequential propensity household projection model", *Demographic Research*, 28: 681-712.

ZANFRINI L., 2011, *Labour in The Sixteenth Italian Report on Migrations 2010*, McGraw-Hill, Milan.