

Human Capital Attainments of Refugee and Non-Refugee Intake Class Workers in Canada: An Analysis of Ethnic Cross-Classifications¹

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ABSTRACT

This paper used selected male and female ethnic cross-classifications drawn from a special table from the 2016 census of Canada to explore the similarities and differences in human capital attainments (HCAs) among workers who entered Canada as refugee and non-refugee immigrant intake classes. A total of 1,313 ethnic cross-classifications corresponding to male and female workers aged 25-54 and who reported some employment income in 2015 were used as data sources. Five human capital attainment indicators tapping the average educational degrees completed and median employment incomes were used as a basis for the comparison of intake class groups. The purpose of the analysis was to isolate the domains underlying the variation in the indicators and see how gender, ethnicity, immigrant intake class and period of arrival were related to these domains. Principal Component Analysis (PCA) and k-means clustering were used as multivariate techniques of analysis to explore the data and identify deficits and surpluses of human capital. Two basic domains explained most of the variation present both in the male and female ethnic cross classification data. Although those workers who arrived as economic class members ranked at top levels of attainment there were also significant variations observed across genders, intake classes, arrival cohorts and ethnic origins. Regardless of their period of arrival, refugee and family class men and women as well as workers of non-European ethnic origins appeared as the most disadvantaged in terms of human capital attainments. The income generation process appeared to be intake class-specific and varied according to the mix in stocks of university, trade and non-university post-secondary degrees in the groups. The analysis suggests that the immigrant selection process has created significant stratifications within the Canadian labour force and that the latter may have impacts on the immigrant integration process by creating groups more economically more vulnerable than others.

1.0. INTRODUCTION

In 2016, Canada resettled a historical number of refugees, welcoming over 46,000 individuals and completing its commitment to resettle 25,000 Syrian refugees by the end of February that year.² Government-sponsored and privately sponsored refugees such as the Syrian ones are resettled in Canada through a series of programs with the goal of providing refuge from persecution and integrating them more readily into the Canadian labour market.

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² Source: <https://www.canada.ca/en/immigration-refugees-citizenship/services/refugees/canada-role/timeline.html>

Other types of refugees like asylum seekers apply for refugee status within Canada and are assessed on criteria based on international standards.

Canada's labour force is growing with steady inflows of refugees, family and economic class of immigrants.³ After decades of steady inflows of both refugee and non-refugee intake class members, one central research question pertains to the present standing in terms of the human capital attainments of refugee and non-refugee intake class workers. The concept of human capital attainments comprises all human outputs closely linked to workers' investments in knowledge, skills, education, and abilities (Garavan et al., 2001; Youndt et al., 2004.). Both educational and income types of attainments are regarded as important indicators of the worker's position in the labour market and in the wider social ladder (Bastiaenssen, 2009, Mulligan & Sala-i-Martin (1995). According to human capital theory, individuals who have the highest human capital endowments are among the best suited for competitive labour markets and are those who experience more successful economic integration (Becker, 1993). Conversely, individuals with lower levels of endowments will have the greatest difficulties, will be unable to compete and will be less likely to secure suitable employment.

Past research in Canada has consistently shown that refugee workers rank at the lowest levels in terms of human capital endowments (Silvus. 2016; 2016; Lamba. 2008, 2003; Yu, Oulette & Warmingon 2007). Refugees enter the labour market in a disadvantaged position, resulting not only from the immigrant selection process itself but also from the numerous challenges they face such as discrimination, devaluation of educational credentials, government dependency and limited financial resources (Endicott, 2017). Many studies have found that the lower human capital in refugees (including also some family class segments) has been also linked to negative outcomes such as inability to find jobs, experiencing longer spells of unemployment and "flatter" earnings trajectories over time (Wanner, 2003; Devoretz, et. al., 2004; CIC, 2007; Connor, 2010; Shields et al. 2010; Yu et. al, 2014; Mata and Pendakur, 2016).

An important present social policy concern is that refugee workers' deficits in human capital attainments may accumulate over time and decrease the likelihoods of successful resettlement and economic integration. In this light, there are three central research questions that appear relevant to understand if this is the case or not. For instance, what is the present standing of refugees in the major domains of human capital attainments compared to other admission intake classes such as the family and the economic ones? Does this standing vary according to gender, ethnic origins and periods of arrival? Are there any visible patterns of clustering occurring in terms of human capital deficits and surpluses? The recent 2016 Census of Canada has collected important data on both the administrative characteristics of entry into Canada and a variety of diversity-related characteristics of immigrants and non-immigrant workers. Using five HCA indicators calculated for selected male and female ethnic cross-classifications drawn from the 2016 Census of Canada, the purpose of this paper is to address these three research questions by: 1) exploring the nature of the major human capital attainment domains underlying the classification

³ In contrast to refugees, the economic intake class category, which comprises groups such as skilled workers and business immigrants, is selected via a point system, which assigns scores based on level of education, work experience. With regards to the family class, immigrants with immediate family members are required to have a sponsor (typically a family member) who has agreed to provide financial support.

data; 2) determining how refugee and non-refugee workers were positioned in these major domains; 3) investigate how similar or dissimilar groups were in their human capital attainment characteristics; and, 4) detect clustering patterns according to the workers positions in the major axes of attainment. The thrust of this analysis is, essentially, exploratory in nature. However, it hopes to produce valuable background information for undertaking more comprehensive studies using micro-data focusing on the inequalities present in the immigrant diversity present in the Canadian workforce.

2.0. DATA, INDICATORS AND METHODS

Selected ethnic cross-classifications were drawn from special tables of the 2016 Census of Canada and used to undertake the research explorations. Cross-classifications containing summary demographic and administrative information on workers of core working ages (aged 25-54 years old) who received some employment income during 2015. Educational indicators referred to the highest educational degree (certificate) attained by the workers. An initial sample of 1,717 ethnic classifications (234 ethnic origins) combining gender (2=males and females), immigrant intake class categories (3= refugee, family and economic) and period of arrival cohorts (4= 1980-1990, 1991-2000, 2001-2010 and 2011-2016) were chosen for analysis. Classifications regarding Canadian-born workers and immigrants arriving before 1980 and Canadian-born workers were also included for comparative purposes. A minimum count of 500 observations per cross-classification was deemed the most appropriate to obtain reliable estimates for the human capital attainment indicators resulting in a final count of 1,312 ethnic cross-classifications of workers being selected (661 male records and 651 female records) for the analysis. These represented about 19.6 million workers reporting single and multiple ethnic origins in 2016. A total of 195 records were available for those who entered as refugee class representing about 323.9 thousand workers. The corresponding numbers for economic and family intake class classifications were 436 and 342 (representing 1.6 million and 906.8 thousand workers respectively).

Five human capital attainment indicators were used for this analysis and calculated for each classification:

- A1: the average % of high school degrees attained
- A2: the average % of trade degrees attained ,
- A3: the average % of non-university trade degrees attained,
- A4: the average % of university trade degrees attained,
- A5: the median employment income received from different sources in 2015 (in \$ thousands).⁴

To avoid collinearity-related issues⁵, workers reporting no high school degrees were excluded from the sample. All five indicators were calculated for ethnic cross-classifications pertaining to workers of various immigration intake classes⁶.

⁴ Employment Income is defined as all wages, salaries and commissions from paid employment and net self-employment income from farm or non-farm unincorporated business and/or professional practice during the reference period. Median incomes of individuals are calculated for those with income (positive or negative)..

⁵ Multicollinearity refers to the occurrence of high intercorrelations among independent or dependent variables in a multivariate analysis setting.

⁶ The immigrant intake classes were defined in the 2016 Census as the name of the immigration program or group of programs under which an

The multivariate analysis used a combination of Principal Components Analysis (PCA) and k-means cluster analysis methods. This particular sequential analytical approach successfully accomplished the desired goals of data exploration, data reduction and clustering of groups into meaningful aggregates (see Ding and He, 2004). Male and female cross-classifications were analyzed separately as the presumed HCA domains were expected to be different for these groups. PCA is a statistical technique which builds a sequence of uncorrelated (orthogonal) and linear combinations called components. This was used to identify the main domains or dimensions present in the data (Everitt and Dunn, 2001). The PCA bi-plot was particularly useful in examining groups by looking at their coordinate positions in a plane. Factor scores calculated from the two major domains and were later used in a k-means clustering procedure. The latter algorithm separated groups in terms of deficits and surpluses of human capital into k number of clusters through assignments and re-assignments on the basis of the shortest distance between the data unit and the centroid of the cluster (Saldkin and Ransmussen, 2010).

4.0. FINDINGS

4.1. Descriptive Findings

Table 1 displays information on the five HCA indicators by the male and female classifications of the sample broken down by the reported ethnic origins and immigrant intake categories. The first data pattern found was that of a gender divide between male and female classifications in terms of their average employment earnings (\$47.5 thousand to \$33.9 thousand). Earning gaps within the female classifications were less visible compared to the male ones. Earnings of workers reporting non-European ethnic origin classifications were relatively lower than those of Canadian, British, French (CBF) and European groups. Both family and refugee classifications ranked at the bottom of the earning hierarchy in male and female classifications. Among male classifications, those pertaining Canadian-born and immigrants arriving before 1980 as well as the economic intake class occupied top positions while among females the highest earners were those of the economic intake class. An *educational divide* was also observable contrasting classifications regarding family and refugee intake classes versus the rest of workers. Among male classifications, the average number of male workers with only high school degrees among family and refugee classes was as high as 41% and 48% respectively. The corresponding figures for females were 32% and 37%. On the other side of the educational spectrum, the average number of classifications pertaining to the economic class and had university degrees reached 58% - higher even than that of the Canadian-born and immigrants arriving to Canada before 1980 (44% and 34% respectively). Trade degrees were more noticeable within the male classifications compared to the female ones while non-university types of degrees were more frequently observed in the female classifications. The data also revealed that the presence of university degrees in the family and refugee intake class classifications among male and female workers was lower compared to other groups (27% and 20% among males; 35% and 25% among females) .⁷

immigrant has been granted for the first time the right to live in Canada permanently by immigration authorities. Principal applicants and dependents were both counted in the independent classes with corresponding ratios of 1.32/1 in the male classifications and .49/1 in the female ones. Ethnic origin here refers to the ethnic or cultural origins of the person's ancestors, which is usually more distant than a grandparent. It should be noted that the ethnic origins reported in the paper include both single and multiple origins. In the cross-classifications, workers were divided into two ethnic origin groups: CBF (Canadian, British or French) and Non-European ones.

⁷ To examine the net effects of gender, ethnicity, immigrant intake category as well as period of arrival on the five HCA indicators across

Table 1: HCA indicators Ethnic Cross Classifications by Gender, Immigrant Status and Immigrant Intake Groups

Cross-Classifications	A1: Average % HS Degrees	A2: Average % Trade Degrees	A3: Average % Non-Univ. Degrees	A4: Average % University degrees	A5: Median Emp. Income (\$ Thous.)
<u>Males Classifications (N=661)</u>					
All Males	30%	9%	22%	38%	\$47.5
CBF and European Ethnicity	26.3%	11.1%	23.5%	39.0%	\$56.2
Non-European Ethnicity	32.8%	8.3%	20.8%	38.0%	\$42.1
Canadian-Born	20%	5%	31%	44%	\$39.6
Foreign-Born <1980	29%	10%	26%	34%	\$65.8
Economic Intake Class	15%	7%	19%	58%	\$51.9
Family Intake Class	41%	11%	21%	27%	\$39.7
Refugee Intake Class	48%	10%	22%	20%	\$36.1
<u>Females Classifications (N=651)</u>					
All Females	24%	5%	27%	44%	\$33.9
CBF and European Ethnicity	20.4%	4.7%	28.4%	46.5%	\$38.4
Non-European Ethnicity	25.6%	5.9%	26.2%	42.3%	\$31.2
Canadian-Born	20%	5%	31%	44%	\$39.6
Foreign-Born <1980	18%	5%	31%	44%	\$39.6
Economic Intake Class	23%	5%	32%	40%	\$49.6
Family Intake Class	32%	6%	27%	35%	\$27.3
Refugee Intake Class	37%	8%	30%	25%	\$27.8

Source: Special Tables, 2016 Census of Canada

4.2. Domains of HCA Indicators

The next analytical step involved applying PCA analysis to the HCA inter-correlations present in the male and female ethnic classification data in order to extract their principal components. Table 2 shows the correlation matrices for the HCA indicators corresponding to the male and female classifications as well as the principal components extracted from the two correlation matrices. Correlations between HCA indicators suggest that there was a strong positive correlation between employment income and the percentage of university degrees in the male classifications compared to the female ones ($r=+.26$ and $+.14$ respectively). There was, however, a stronger correlation of employment income with non-university degrees in the female classifications ($r=+.34$) compared to the male ones ($r=+.23$). The possession of a trades degree was found to be uncorrelated ($r=.06$, $p>.05$) with income in the male case while it was found to be negative in the female case ($r=-.18$).

PCA analysis extracted two major components from each of the two correlation matrices respectively. All the four major components displayed an eigenvalue or latent root greater than 1. As a whole, they accounted for more than half of the variation in the two sets (about 78.1 % for male classifications and 75.5% for the female ones). The first

classifications, OLS regressions were used to predict each of the indicators. The R^2 values for the for the predictions ranged from .23 (A2) to .66 (A5). Regression coefficients suggest that the largest negative effects of predicting obtaining university degrees in the classifications were memberships in the family and refugee intake classes (compared to the economic class) while the largest positive ones referred to a more recent arrival period to Canada. Results with regards to median employment income revealed also large negative effects occurred when workers reported a non-European ethnicity and having arrived more recently to Canada.

component (C1) in the male sample tapped a domain related to *earning power and university degree stocks* (higher positive loadings on A4 and A5, negative or negligible on A1, A2 and A3) while the second one (C2) related to *trade and non-university degree stocks* (higher positive on A2 and A3, negative or negligible on the others). In the case of female classifications, these two major domains were found to be similar in nature but situated in reverse order.

Table 2: Indicators inter-correlations and extracted PCA Components , Male and Female Ethnic Cross Classifications 2016

HCA Indicators	A1:Average % HS Degrees	A2: Average % Trade Degrees	A3: Average % Non-Univ. Degrees	A4: Average % University degrees	A5: Median Emp. Income (\$ Thous.)
Male Classifications					
A1:% HS Degrees	1.00	.20**	-0.00	-.87**	-.43**
A2:% Trades Degrees	.20**	1.00	.43**	-.56**	.06ns
A3: % Non-Univ. degrees	-0.00	.43**	1.00	-.42**	.23**
A4: % University degrees	-0.87	-.56**	-.42**	1.00	.26**
A5: Median Emp. Income (\$)	-.43**	0.06	.23**	.26**	1.00
Varimax Rotated Component Loadings					
C1+ (48.2% of var.)	-0.85	-0.59	-0.40	0.98	0.47
C2+ (29.9% of var.)	-0.41	0.57	0.76	-0.01	0.65
Female Classifications					
A1:% HS Degrees	1.00	.19**	.08*	-.83**	-.34**
A2:% Trades Degrees	.19**	1.00	.28**	-.52**	-.18**
A3: % Non-Univ. degrees	.08*	.28**	1.00	-.57**	.34**
A4: % University degrees	-.83**	-.51**	-.57**	1.00	.14**
A5: Median Emp. Income (\$)	-.34**	-.18**	.34**	.14**	1.00
Varimax Rotated Component Loadings					
C1+ (46.9% of var.)	-0.34	0.44	0.62	-0.03	0.19
C2+ (28.6% of var.)	-0.51	-0.42	-0.35	0.64	0.27

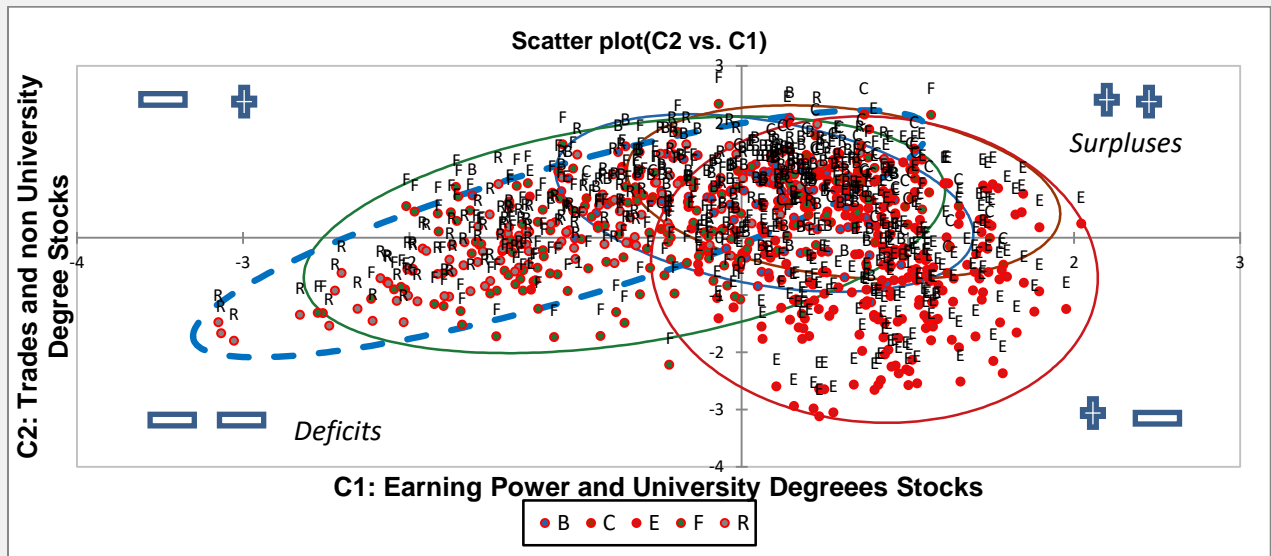
Symbols: +=Component eigenvalues greater than 1, ns=non-significant correlation coefficient, **= correlation significant at the 0.01 level, *=correlation significant at the 0.05 level

Based on the PCA analysis, component scores⁸ (C1 and C2) were calculated for each of the male and female classifications. Graphs 1 and 2 present the scatterplots of factor scores for the economic, family, refugee, immigrants before 1980 and the Canadian-born cross-classifications on the principal axes of C1 and C2 for male and female classifications respectively. Factor scores corresponding to the male and female classifications were plotted on four quadrants (+ -, + +, - + and - -) corresponding to approximate surpluses and deficits observed in terms of human capital endowments. Confidence ellipses (95% level) for refugee classifications are also presented in the dashed ones of graphs 1 and 2. Under the normality assumption, 95% of cases fall inside the ellipse spanned by the two major domains underlying HCA indicators. For both males and female classifications, the confidence ellipses for refugee classifications (shown in dashed lines) partly overlapped with those of non-refugee groups and did not

⁸ Component scores (sometimes called factor scores) are numerical values that indicate the group's relative spacing or standing on a component or factor. They have a standard normal distribution scaling (i.e. standard deviation units) where positive and negative numbers reflect measure the groups' positions above or below a mean of 0 (average).

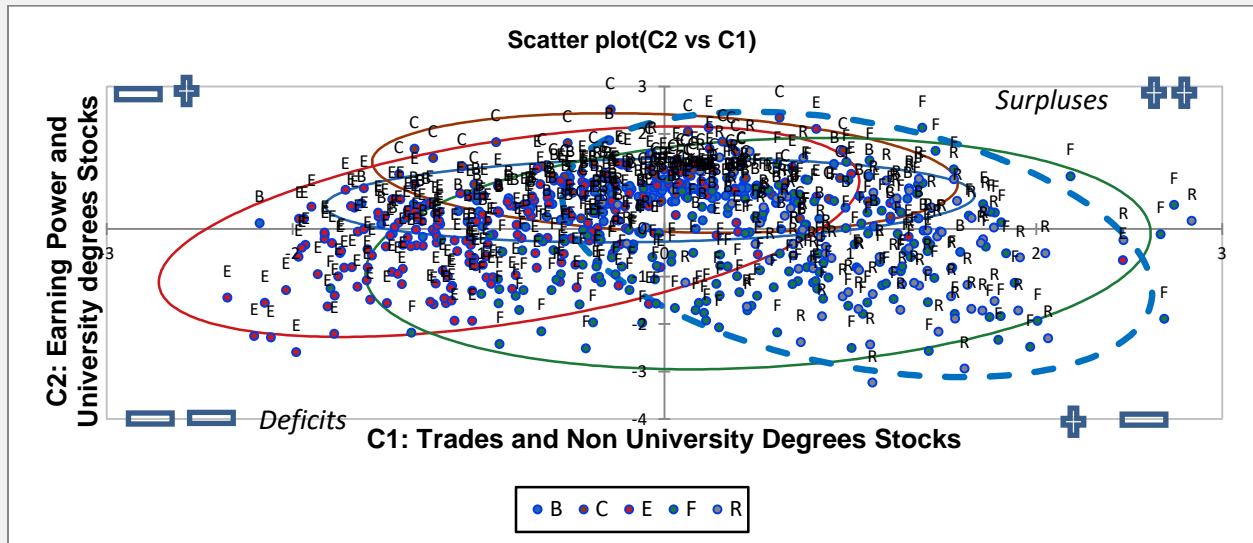
constitute a distinct cluster of workers. However, inspection of the refugee group ellipse for the male classifications reveals a greater concentration of cases in the (- -) quadrant of lower attainments compared to non-refugee groups. In the female case, both the refugee and family ellipses reveal concentrations of workers in the (- +) quadrant suggesting higher levels of trades and university degree stocks for these groups, confirming the results of the preliminary phase of data explorations.

Graph 1: 95 % Confidence Ellipses of immigrant intake groups in PCA space, male classifications, Canada 2016



Symbols: B=Immigrants 1980 or before, C=Canadian-born, E=Economic intake class, F=family intake class, R=refugee intake class.

Graph 2: 95 % Confidence Ellipses of immigrant intake groups in PCA space, Female Classifications, Canada 2016



Symbols: B=Immigrants 1980 or before, C=Canadian-born, E=Economic intake class, F=family intake class, R=refugee intake class.

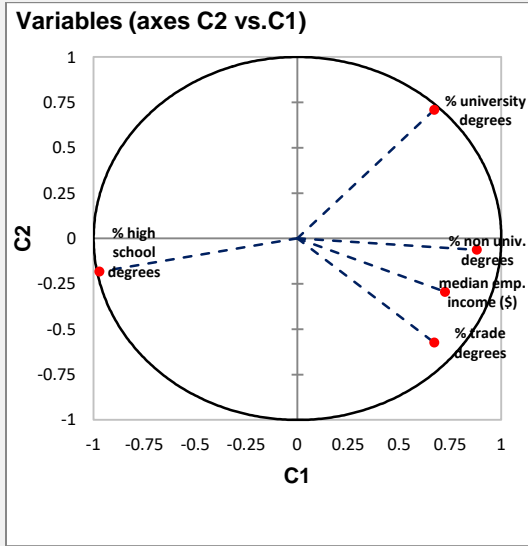
4.3. Income Generation Patterns

One important research question regarding HCA indicators pertains to the income generation pattern and its links to particular stocks of post-secondary degrees. This research exploration was carried out by examining the correlation circles within the context of undertaking PCA analysis. Correlation circles in PCA analysis are projections of indicators in the principal components' space. Graphs 3 and 4 display the correlation circles in PCA space for male and female refugee, family and economic intake class classifications as well as for those referring to immigrants arriving to Canada in 1980 or before.

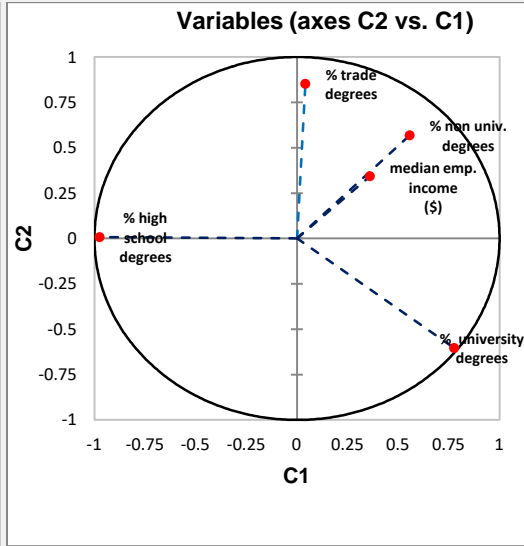
In all male and female circles, there was a negative association of the income vector to the possession of only high school diplomas (i.e. almost orthogonal or situated at 180° degree angles between them). Inspection of the male correlation circles revealed that, among refugees, the income generation process is closely linked to the possession of both non-university and university type of degrees (shorter angles to the median employment vector). In the case of the family class, the vector of non-university degrees was found almost collinear to the income one, suggesting that the latter one was highly correlated to the stock of these type of degrees. In the case of the economic class, the linkage appears to be more closely linked to non-university and trade degrees than university ones while among those who arrived in 1980 or before, income appears to be highly dependent on university types of degree stocks. In the case of refugee, family and economic class females, non-university degree stocks play a prominent role in income generation, in sharp contrast to females arriving in 1980 or before where income generation appears as almost exclusively dependent on university degree stocks.

Graph A1: Correlation circles in PCA space, Male Ethnic Cross-classifications by Intake class, Canada 2016

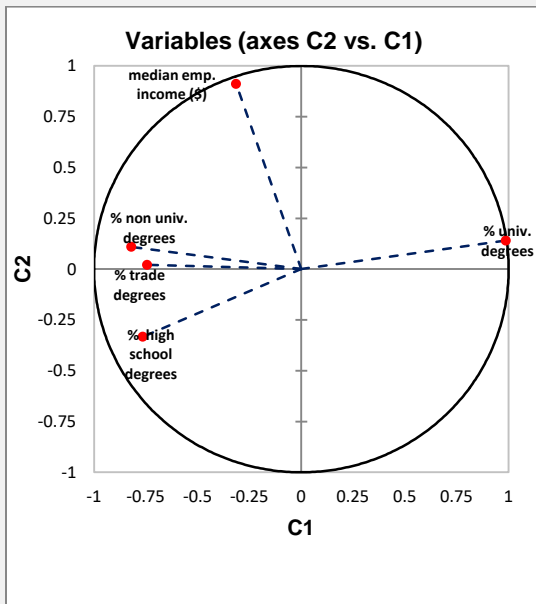
Male: Refugee Intake Class



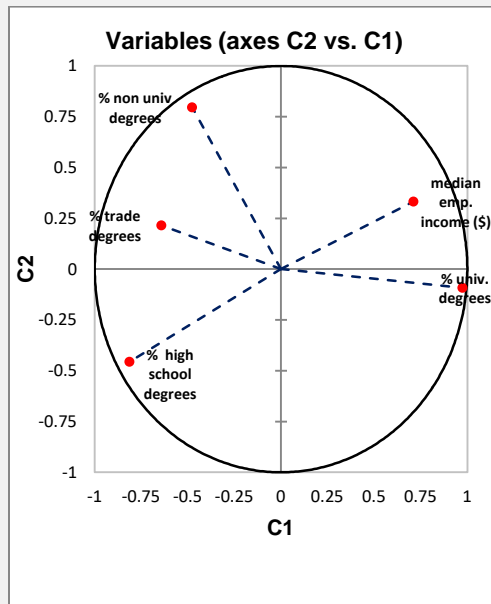
Male: Family Intake Class



Male: Economic Intake Class



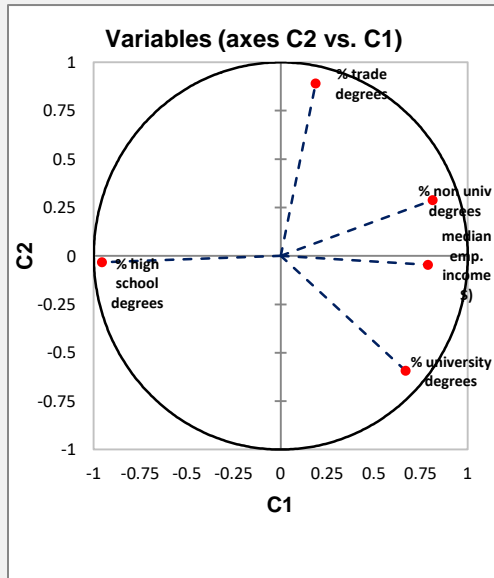
Male: Immigrants Before 1980



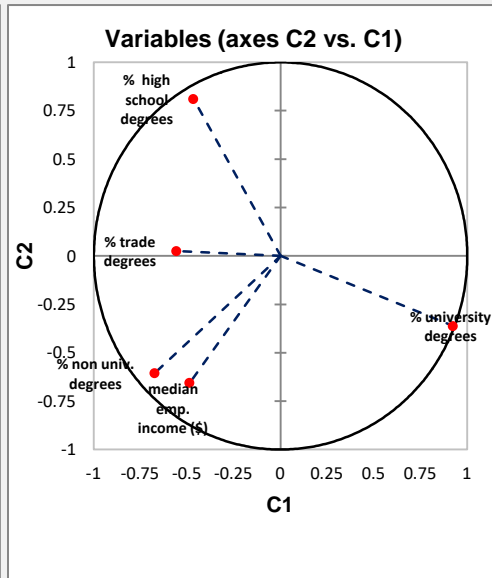
Note: In the correlation circles of bi-plots, the length of indicators reflect the variances of the corresponding measuring variable, and the angles between them indicate the size of their correlations, with small angles corresponding to high correlations.

Graph 4: Correlation circles in PCA space, Female Ethnic Cross-classifications by Intake Class, Canada 2016

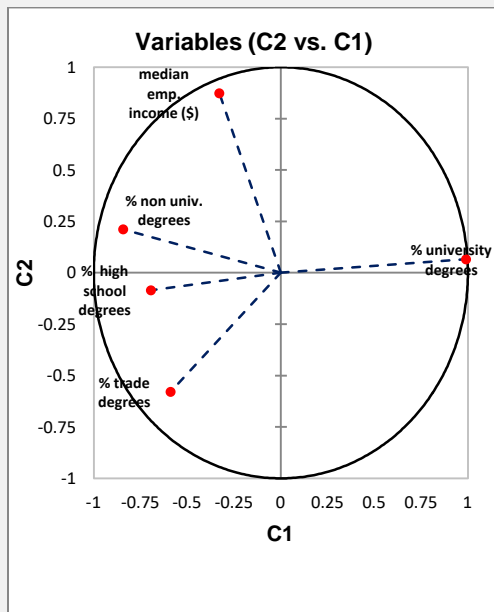
Female: Refugee Intake Class



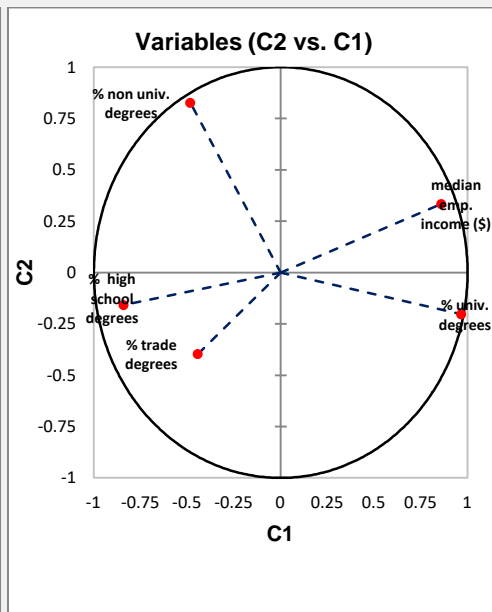
Female: Family Intake Class



Female: Economic Intake Class



Female Immigrants: Before 1980



Note: In the correlation circles of bi-plots, the length of indicators reflects the variances of the corresponding measuring variable, and the angles between them indicate the size of their correlations, with small angles corresponding to high correlations.

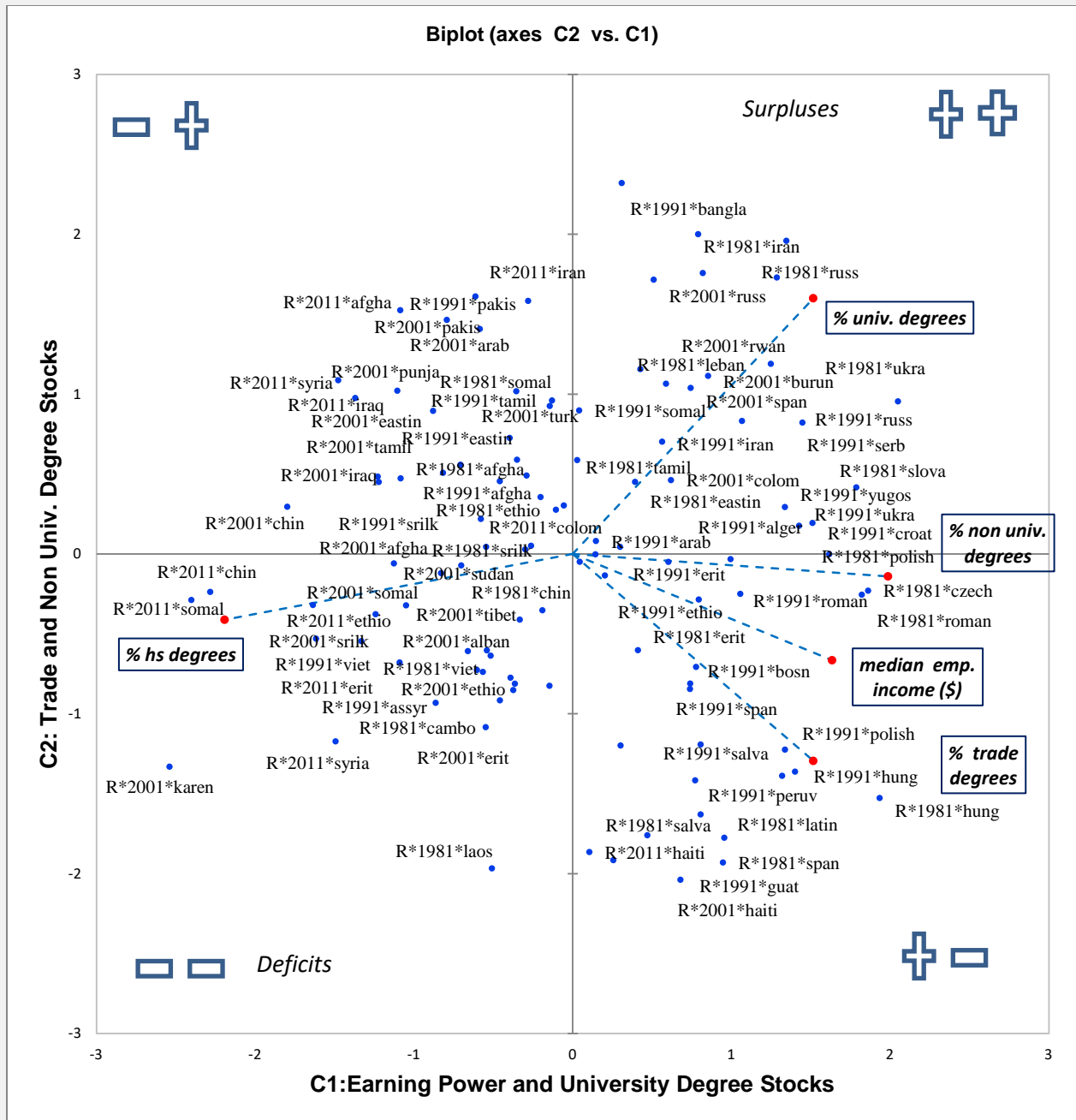
4.4. Refugee Workers in Component Space

PCA bi-plots⁹ corresponding to the male and female refugee groups in the principal component space are presented in graphs 5 and 6. Bi-plots reflect here the associations between indicators and their domains as well as the similarities and differences of groups in terms of deficits and surpluses of human capital attainments. Of particular interest for the analysis was to find the position of groups in the deficits and surpluses quadrants (- -) and (++) as these represent polarizations in terms of these attainments. .

In the male case, various refugee groups occupied positions in the deficit quadrant most notably "outliers" such as refugee intake workers reporting Korean origins arriving in Canada between 2001-2010, Laotian refugees arriving between 1981-1990, Eritreans arriving between 2001-2010 and Syrians arriving between 2011-2016. Also workers reporting Chinese and Somalian ethnic backgrounds arriving more recently between 2011-2016 appear notably in the deficit quadrant (- -). With respect to the quadrant of HCA surpluses (++), while refugee intake workers of Bangladeshi and Iranian origins arriving in the 1991-2000 and 1981-1990 periods respectively appeared as the most university educated, a cluster of workers of Eastern European workers of different periods of arrival was found closely bunched around the non-university and trade vectors (e.g. reporting origins such as Russian, Serbian, Polish, Croatian, Slovak, etc.). The latter reveals some polarizations occurring between refugees of European and non-European descent in terms of human capital attainments. In the female case, with the exception of one outlier (Haitian workers arriving in 2011 who had the highest earning power and university degree stocks), classification cases appear more bunched near the centre of the plane suggesting a higher degree of homogeneity across groups. However, noticeable in the deficit quadrant (- -) were workers reporting Karen, Syrian, Iraqi, Pakistani and Sri Lankan ethnic origins of various periods of arrival. These workers shared in common a shortage of post-secondary degrees and earning power in 2015. Again, like in the male case, several Eastern European refugee intake workers appeared to cluster around the vectors of employment incomes in or below the surpluses quadrant (+ +).

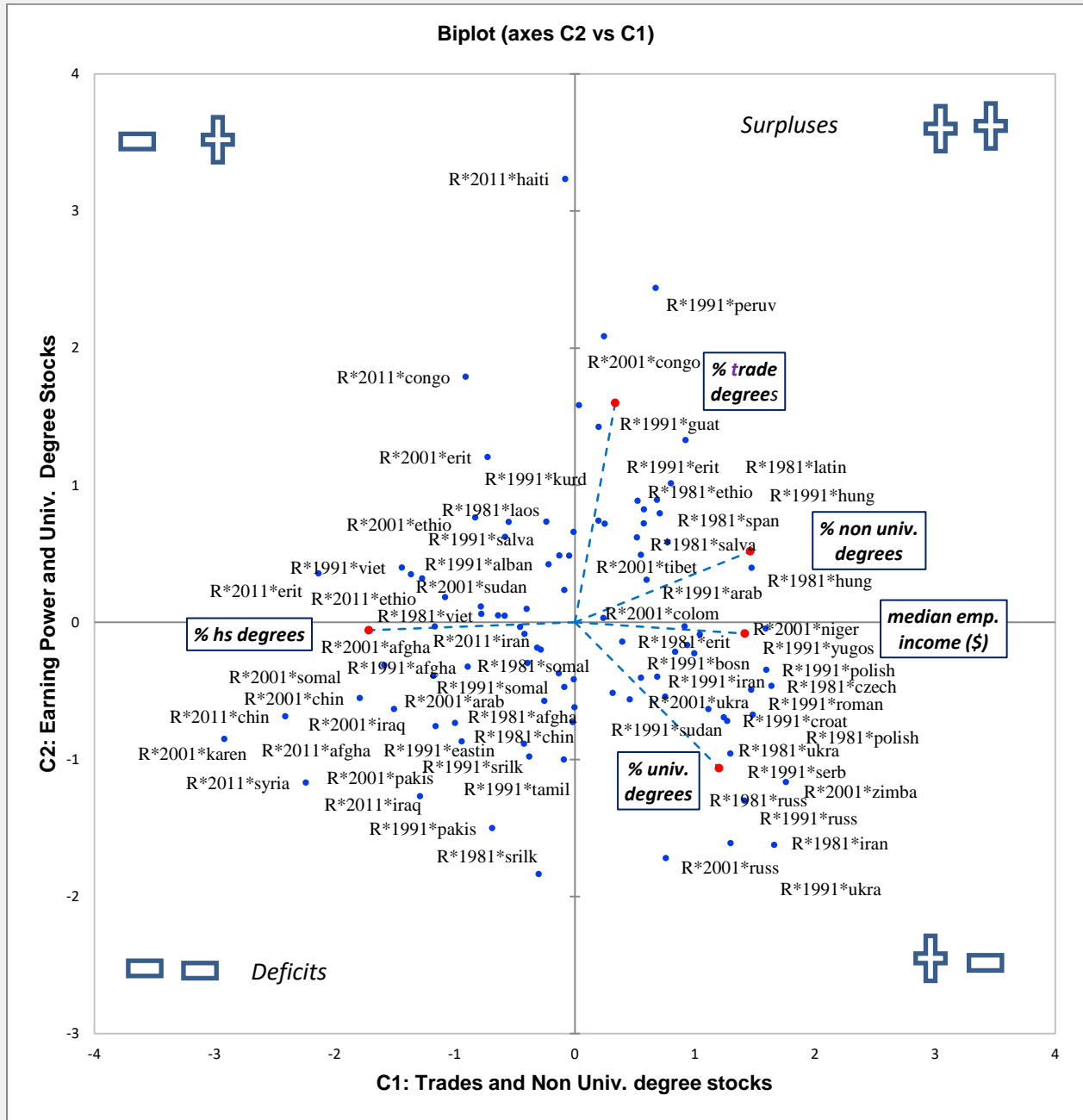
⁹ PCA bi-plots are graphs where vectors representing indicators are presented as points in principal component space. The bi-plot of the second component on the first component (which represent the major sources of variation in the data) is particularly useful as it displays the correlations of variables in terms of various indicator vectors of different magnitudes, directions and positions. In the bi-plot, the length of indicators reflect the variances of the corresponding measuring variable, and the angles between them indicate the size of their correlations, with small angles corresponding to high correlations. The relative positions of the data points corresponding to the groups indicate their similarities and differences in component space. The closer or farther position of the points relative to the lines measure a greater or lesser magnitude in terms of the attribute being measured.

Graph 5: Refugee Intake Classes Positions in PCA space, male classifications, Canada 2016



Symbols: R=Refugees, M=Males, F=Females, 1981=1981-1990 Arrival, 1991=1991-2000 Arrival, 2001=2001-2010 Arrival, 2011=2011-2016 Arrival, afgha=Afghan, alban=Albanian, arab=Arab, assyr=Assyrian, bangla=Bangladeshi, bosn=Bosnian, burm=Burmese, burun=Burundian, cambo=Cambodian (Khmer), canad=Canadian, chin=Chinese, colom=Colombian, congo=Congolese, croat=Croatian, czech=Czech, eastin=East Indian, erit=Eritrean, ethio=Ethiopian, guat=Guatemalan, haiti=Haitian, hung=Hungarian, iran=Iranian, iraq=Iraqi, ital=Italian, karen=Karen, kurd=Kurd, laos=Laotian, latin=Latin American, leban=Lebanese, mex=Mexican, nepal=Nepali, nicar=Nicaraguan, niger=Nigerian, pakis=Pakistani, peruv=Peruvian, polish=Polish, roman=Romanian, russ=Russian, rwan=Rwandan, salva=Salvadorean, serb=Serbian, slova=Slovak, somal=Somali, span=Spanish, srilk=Sri Lankan, sudan=Sudanese, syria=Syrian, tamil=Tamil, tibet=Tibetan, turk=Turk, ukra=Ukrainian, viet=Vietnamese, yugos=Yugoslavian, zimba=Zimbabwean

Graph 4: Refugee Intake Classes Positions in PCA space, female classifications, Canada 2016



Symbols: R=Refugees, M=Males, F=Females, 1981=1981-1990 Arrival, 1991=1991-2000 Arrival, 2001=2001-2010 Arrival, 2011=2011-2016 Arrival, afgha=Afghan, alban=Albanian, arab=Arab, assyr=Assyrian, bangla=Bangladeshi, bosn=Bosnian, burm=Burmese, burun=Burundian, cambo=Cambodian (Khmer), canad=Canadian, chin=Chinese, colom=Colombian, congo=Congolese, croat=Croatian, czech=Czech, eastin=East Indian, erit=Eritrean, ethio=Ethiopian, guat=Guatemalan, haiti=Haitian, hung=Hungarian, iran=Iranian, iraq=Iraqi, ital=Italian, karen=Karen, kurd=Kurd, laos=Laotian, latin=Latin American, leban=Lebanese, mex=Mexican, nepal=Nepali, nicar=Nicaraguan, niger=Nigerian, pakis=Pakistani, peruv=Peruvian, polish=Polish, roman=Romanian, russ=Russian, rwan=Rwandan, salva=Salvadorean, serb=Serbian, slova=Slovak, somal=Somali, span=Spanish, srilk=Sri Lankan, sudan=Sudanese, syria=Syrian, tamil=Tamil, tibet=Tibetan, turk=Turk, ukra=Ukrainian, viet=Vietnamese, yugos=Yugoslavian, zimba=Zimbabwean

4.5. Clusters of Human Capital Deficits and Surpluses

The last exploratory phase involved using the factor scores of the PCA analysis to cluster both refugee and non-refugee group classifications into distinguishable aggregates according to their HCA attributes. This was accomplished using a non-hierarchical clustering procedure: k-means clusters. Again, a separate analysis for male and female classifications was performed. Five solutions were carried out: k=3 to 7. The reduction of the Wilk's lambda statistic (proportion of within to between variance) was used as a criteria for determining for the number of clusters where a lower lambda ($\lambda < .05$) is always preferred. As the k=5 solution was the most parsimonious, this one was chosen for both the male and female classifications. To validate the optimal k=4 solutions, discriminant analyses was additionally undertaken (following Punj and Stewart, 1983). All of the four discriminant functions for the male and female group were found to be statistically significant using the X^2 statistic test ($\lambda = .04$ and $.03$ respectively, $p < .01$).

Table 3: k=5-Means clustering results, Male Ethnic Classifications, Canada 2016

	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	All Clusters
Males	Univ. degree stocks	Earning Power from Univ. degree stocks	HCA Deficits	HCA Surpluses	Non post-secondary degree stocks	All
<u>Ethnic Origins</u>						
CBF and Europe	14%	48%	8%	66%	26%	38%
Non-European	87%	52%	92%	34%	74%	62%
<u>Immigrant Intake Categories</u>						
Economic	93%	65%	1%	22%	5%	34%
Family	5%	10%	50%	14%	48%	24%
Refugee	0%	1%	49%	10%	29%	16%
Before 1980	2%	16%	0%	35%	16%	17%
Canadian Born	0%	8%	0%	19%	3%	8%
<u>Arrival Cohort</u>						
1980 or before	0%	8%	0%	19%	3%	8%
1981 to 1990	0%	13%	8%	18%	23%	14%
1991 to 2000	16%	18%	23%	19%	25%	20%
2001 to 2010	47%	26%	41%	6%	23%	25%
2011 to 2016	35%	19%	29%	3%	10%	16%
Other	2%	16%	0%	35%	16%	17%
Total	100%	100%	100%	100%	100%	100%
N classif.	89	147	84	187	155	662
Centroid*						
C1	0.80	0.78	-1.68	0.42	-0.79	0.00
C2	-1.67	-0.24	-0.80	1.01	0.40	0.00

*The centroid are the multivariate means of the principal component values of the points of data in the cluster.

Table 4: k-Means clustering results, Female Ethnic Classifications, Canada 2016

Females	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	All Clusters
	Earning power from Non Univ. Degrees	HCA Deficits	Trade degrees stocks	Earning power from Univ. degrees	Univ. Degree stocks	All
<u>Ethnic Origins</u>						
CBF and Europe	59%	12%	23%	43%	22%	38%
Non-European	41%	89%	77%	57%	78%	63%
<u>Immigrant Intake Categories</u>						
Economic	23%	0%	8%	59%	64%	32%
Family	13%	62%	41%	15%	36%	28%
Refugee	8%	38%	32%	1%	0%	14%
Before 1980	34%	0%	15%	21%	0%	18%
Canadian Born	21%	0%	4%	4%	0%	8%
<u>Arrival Cohort</u>						
1980 or before	21%	0%	4%	4%	0%	8%
1981 to 1990	19%	10%	24%	8%	0%	13%
1991 to 2000	21%	30%	33%	21%	8%	22%
2001 to 2010	5%	37%	19%	39%	34%	24%
2011 to 2016	1%	23%	5%	7%	59%	14%
Other	34%	0%	15%	21%	0%	18%
Total	100%	100%	100%	100%	100%	100%
N of classif.	202	87	111	159	92	651
Centroid*						
C1	0.11	.14	1.18	-0.96	-0.98	0.00
C2	0.98	-1.44	0.14	0.14	.22	0.00

*The centroids are the multivariate means of the principal component values of the points of data in the cluster.

Tables 3 and 4 present the composition of the five clusters by ethnic origins, immigrant intake class and period of arrival to Canada. Centroids corresponding to these clusters appear at the bottom of each table. With respect to the male classifications, as indicated by its centroid-related statistics, cluster 3 (N=84) contained cases typically characterized by HCA deficits. About that 92% of its members corresponded to classifications where workers reported a non-European ethnic origin with close to 100% *pertained family and refugee intake workers (50% and 49% respectively)*. About 41% of these referred to immigrants arriving between 2001 and 2010. Cluster 4, the HCA surpluses one (N=187), comprised a majority of European ethnic origin cases (66%). Canadian-born and immigrants arriving in Canada before 1980 comprised more than half (54%) of total classifications. Cluster 1 (N=89) comprised classifications where university degrees were the norm and was overwhelmingly made up of economic class intake work classifications (93%) and more recent arrivals to Canada. Cluster 2 (N=147) where university degree stocks were translated into earning power consisted also of classifications related to economic class members (65%) and was almost equally distributed between European and non-European ethnic groupings (48% to 52%). Finally, cluster 5 (N=155) contained classifications where non university degree stocks were more abundant. About 48% of cases pertained family class workers and 74% referred to workers reporting non-European ethnic origins.

The clustering results for female classifications were less clearly defined than for male classifications although

Cluster 2 (N=87) contained cases typically characterized by their HCA deficits. Here, *62% of classifications pertained to workers arriving to Canada through the family class and 38% through the refugee one*. Two thirds of Cluster 2 members comprised workers arriving between 1991 and 2010. Cluster 4 (N=159) where university degrees are translated into earning power, comprised a majority of economic class immigrants (59%) while 39% of cases contained female workers who arrived between 2001 and 2010. University degree stocks were the norm in Cluster 5 (N=92). Reflecting the immigration process of the last years in Canada, this particular cluster comprised a majority of recently arrived immigrants 2011-2016 (59%). Trade degree stocks were more frequently observed in Cluster 3 (N=111) where, like in Cluster 2, the presence of family and refugee intake worker records were also noticeable. Finally, classification records of the large Cluster 1 (N=202) where university degrees were translated into earning power, revealed that more than half of the cross-classification records pertained the Canadian-born and workers arriving to Canada before 1980 (21% and 34% respectively)

5.0. CONCLUSIONS

Deficits and surpluses of human capital have strong impacts in terms of the likelihoods of obtaining a more secure employment and the full utilization of skills and qualifications in the labour market. This exploratory analysis of male and female ethnic cross-classifications drawn from the 2016 Census of Canada allowed us to take a closer look at the human capital attainment standings of refugee and non-refugee workers in Canada. Notwithstanding the regular pitfalls of working with aggregated data, the analysis has revealed interesting associational patterns in the attributes of classifications pertaining to workers entering Canada as refugee and non-refugee workers.

Overall, the Canadian workforce may be seen as a highly stratified arrangement of workers according their gender, immigration related characteristics and ethnic origins. Two basic domains related to the earning power and the type of educational stocks constituted the axes of the stratification. There was a clear gender and ethnic divide in human capital related attributes which separated workers in terms of their human capital endowments. An examination of the income-educational stock linkages via Principal Components Analysis suggests that the income generation process was intake-class specific and that the positioning of groups in these axes did not necessarily depend on the time of their arrival to Canada. The possession of university degree stocks was found to be more closely linked to income generation for males compared to females. Cluster analysis found that, compared to economic class entrants, refugees as well as family intake classifications were more frequently found in disadvantaged positions across these human capital domains. Among males, these disadvantages were more visible in the case of groups of workers as the Karen, Laotian, Syrian, Chinese and Somalian. Among females, the more outstanding case pertains to the records of Sri Lankan, Pakistani, Syrian, Iraqi and Karen. Due to human capital deficits, these groups are expected to have the strongest "liabilities" with respect their economic integration prospects in the coming years.

One important policy concern regarding human capital attainments of refugee and non-refugee workers refers to the possible depreciation of human capital assets among refugee workers. Long periods of unemployment and the inability to accredit educational credentials in the host country, in particular, may make them more economically vulnerable by inserting themselves in precarious positions in the occupational hierarchy. The human capital profiles

of the most economically vulnerable groups need to be studied in order to get more insight into the factors that drive poor labour market and economic outcomes in metropolitan labour markets, and in turn, to better inform, design and carry out appropriate intervention programs. Studying these human capital profiles over time and monitoring progress with respect to relevant human capital indicators requires collecting adequate survey and census data on their socio-economic status and developing appropriate methodologies for its measurement.

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