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The Double-Negative Effect on the Earnings of Foreign-born Females in Canada*

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* This analysis is based on a Statistics Canada microdata tape, *Income (1983), Assets and Debts (1984) of Economic Families and Unattached Individuals*, which contains anonymous data. All computations on these microdata were prepared by the author.

Abstract

This paper investigates the potential 'double-negative effect' on the earnings of foreign-born married women in Canada. The double-negative effect is measured as the sum of the effects of gender and birthplace on earnings. This study observes that the difference in productivity-related characteristics explains a small proportion of the difference in earnings between a typical native-born male and a typical foreign-born female. Discrimination by gender, rather than by birthplace, is the main source of the earnings gap. About 63 to 70 percent of the difference in mean log earnings is attributed to gender discrimination, while the impact of birthplace is less than 15 percent. This paper argues that in the presence of the 'double-negative effect' on the earnings of female immigrants, the observed differences in earnings between the native-born male and the foreign-born female cannot be used as an argument against 'family class' immigration in Canada.

I. Introduction

This paper examines the possible 'double-negative effect' on the earnings of the foreign-born female in Canada. The difference in earnings between a native-born male and a foreign-born female arises from differences in native-immigrant characteristics within a gender group, differences in male-female characteristics within a birthplace group and the combined effect of discrimination, by both the gender and the birthplace, on earnings. This combined effect is referred as the 'double-negative effect'.

Previous studies in the field of economics of immigration primarily focused on the labour market performance of male immigrants.[1] An analysis of female immigrant earnings is important, not only to fill the gap in the literature, but also for its obvious policy implications. First, most female immigrants arrive in Canada as spouses or dependents via the 'family-class' immigration. Thus, they are not subject to a skills test and their skills may not be a suitable match for the Canadian labour market. Second, in recent years, female immigrants from countries with low labour force participation rates have increased significantly. Hence, it is important to examine whether the labour market outcomes of female immigrants differ from their native-born counterparts. In addition, human capital, a major asset of most female immigrants, may not be recognised at the early stage of their Canadian careers if their qualifications are received in a foreign country. Also, should overseas qualifications not be recognized, difficulties arise with labour market adjustment. Furthermore, female immigrants who lack human capital often compete for low-wage and business-cycle-sensitive occupations. Hence, the actual earnings of the foreign-born female may be less than their potential earnings, which suggests that observed returns on human capital cannot be used as an indicator of the quality (productivity) of female immigrants.

[1] Exceptions to this include some recent Canadian studies such as Beach and Worswick (1993) and Fagnan (1995). Beach and Worswick used 1973 Job Mobility Survey data while Fagnan employed 1971 and 1986 Census data to evaluate the earnings performance of female immigrants in Canada.

Several studies exist to explain the native-immigrant earnings differential in the case of male workers. Using 1971 and 1981 Canadian census data, Chiswick and Miller (1988) observe that a typical newly arrived immigrant earns 25 percent less than a comparable Canadian born person. An average male immigrant reaches the earnings of a comparable Canadian-born male within 22 years of residence in Canada.[2] Furthermore, the post-immigration experience has a greater effect on earnings than the pre-immigration experience. Borjas (1988) investigates the changes in the quality (productivity) of immigrants over the period 1971-81 for three major immigrant-demanding countries: Australia, Canada and the U.S.A. Using the 1971 and 1981 census data he observes that the assimilation process is slower than that indicated by the cross-sectional studies because of the presumed secular decline in the quality of immigrants over time.

Beach and Worswick (1993) examined the combined impact of gender and birthplace on earnings. The study used 1973 job mobility data to estimate earnings equations for native- and foreign-born women. The empirical results suggest that there exists no double-negative effect on female immigrant earnings for the population as a whole. However, there exists a significant double-negative effect on the earnings of highly educated immigrant women. The policy implications derived from the study should be interpreted with caution since the study is based on an old data set (1972). The historical data show a significant change in the composition of immigrants since 1972 due to changes in Canada's immigration policy. Since immigration from countries with low labour market participation of women has increased significantly in the last two decades, the findings of Beach and Worswick (1993) may not be applicable to the post-1972 cohort of immigrant women.

[2] Beujot and Rappak (1988) found that immigrant groups who arrived from Southeast Asia, Southern Europe, Oceania, the Caribbean, South and Central America, and West and East Asia were not able to reach the earnings of Canadian-born individuals even after 10 years of residence in Canada. The recent (1980s) vintage of immigrants faced adjustment difficulties in the labour market due to a lack of proficiency in English and poor educational attainment. Meng (1987) found a 'catch up period' of only 14 years using the 1973 labour mobility survey of Statistics Canada.

Baker and Benjamin (1995) evaluate the labour market performance of male immigrants in Canada using the data from three censuses (1971, 1981 and 1986). Applying the 'quasi-panel' technique of Borjas (1985), they conclude that the rate of immigrant earnings assimilation is very small or even negative. This conclusion is drawn from a sample of males of working age (16 to 64 years) with positive earnings and 40 weeks of labour market experience. Since annual earnings and the number of weeks worked is strongly correlated, the number of weeks variable might not be used as a sample selection criterion. It is well known that if a sample is selected based on a criterion that is closely related to the dependent variable, the resulting empirical analysis could be contaminated by sample-selection bias.

Most Canadian studies in this area have ignored the sample-selection bias resulting from individuals' choices between paid employment and unemployment. The observed distribution of earnings is generated by individuals' self-selection decisions. The OLS estimator in this context will yield biased parameter estimates of the earnings equation because of the exclusion of individuals with zero employment income. This type of selectivity-bias is crucial when investigating the double-negative effect on female immigrant earnings because the extent of the selectivity-bias may be correlated with birthplace. Fagnan (1995) attempts to correct the sample-selection bias using the *Heckit* procedure. Her study is based on the Census data, which do not contain information on family assets or debts. Unlike previous Canadian research, this paper uses Statistics Canada microdata tape *Income (1983), Assets and Debts (1984) of Economic Families and Unattached Individuals,* which provides information on both the asset and the labour market characteristics of individuals. This data set allows us to investigate the effect of family assets/debts on the individual's labour market participation decision. Furthermore, by decomposing earnings differential into two parts (one part due to productivity-related characteristics and the other due to discrimination), this paper examines the quality (productivity) of female immigrants *vis-à-vis* native-born males.

II. The Analytical Framework

Theoretical Considerations

Human-capital theory is used to partly explain native-immigrant earnings differentials. A vast majority of adult immigrants enter Canada after the completion of their formal education.[3] Nevertheless, they invest a large proportion of their existing human capital to accumulate further human capital which is *specific* to the Canadian labour market. Thus, it would be expected that an immigrant's earnings profile would remain below the profile of a Canadian-born person at the early stage of the post-migration life cycle. Since the high rate of country-specific human capital accumulation raises future earnings, it is conceivable that after the initial settlement period the immigrant earnings profile may converge or even surpass the earnings profile of an average native-born worker.

Another possible explanation of the earnings differential by birthplace can be found in the screening hypothesis, which states that earnings may depend on characteristics that are unrelated to productivity. Education may have little or no role in enhancing the productivity of workers (Spence 1973). Nonetheless, firms view degrees and diplomas as signals of superior ability and productivity. In a world of limited availability of information, employers use educational attainment as a low-cost screening device. The screening hypothesis can be generalised to include other convenient screening devices such as birthplace and gender. If employers believe that immigrants have a smaller endowment of human capital specific to the Canadian labour market and are therefore less productive on average, then birth status may serve as a low-cost screening device. Consequently, immigrants whose productivity characteristics are above average will be subjected to statistical discrimination. Thus, the screening

[3] The median age of immigrants at entry was 26.7 years in 1985 (Foot, 1986).

hypothesis suggests that the earnings-determination process for an immigrant might differ from that of a Canadian-born person, and it justifies the estimation of the birthplace-specific earnings equation.

The Empirical Model

In order to address the problem of sample-selection bias, the following model of earnings is used:

$$(1) \quad I_j = Z_j \alpha + e_j$$

$$(2) \quad \ln Y_j^* = X_j \beta + u_j$$

$$(3) \quad \ln Y_j = \ln Y_j^* \quad \text{if } I_j > 0$$
$$= 0 \quad \text{if } I_j \leq 0$$

where I_j represents net benefit from paid employment (PE);[4] $\ln Y_j^*$ is the natural logarithm of potential annual earnings which is observable only when $I_j > 0$; Z_j and X_j are vectors of exogenous variables; α and β are coefficient vectors of sample-selection and earnings equations respectively; individuals are indexed by j. The error terms, e_j and u_j, have joint log normal distribution and they are distributed independently and identically with mean 0, variances $\sigma_e^2 = 1$ (a normalising assumption) and σ_u^2, and covariance $\rho.\sigma_u$. An individual participates in the paid-employment sector, when $I_j > 0$ and does not participate when $I_j \leq 0$. In equation (2) the deterministic component, $X_j\beta$ represents the expected log of annual earnings while the stochastic term u_j captures the effects of unobserved characteristics such as motivation, ethnic capital and ability on earnings, and measurement errors in observed earnings. The elements of X_j are chosen on the basis of the standard human-capital theory (Mincer, 1974). The vector of observable variables Z_j include three variables (presence of young children in the family, non-labour

[4] Net benefit is the difference between offered wage and reservation wage.

income and family debt) which are excluded from the vector X_j.[5] Since net benefit I_j is unobservable, the selection equation (1) is approximated by using a dichotomous variable D_j defined as:

$$(4) \qquad D_j = 1 \quad \text{if} \quad I_j > 0$$
$$= 0 \quad \text{if} \quad I_j \leq 0$$

The earnings equation and the sample selection equation are estimated simultaneously applying the maximum likelihood estimator. This procedure yields more efficient estimates of the parameters than the two-stage procedure. The likelihood function for the model can be written as:

$$(5) \qquad L = \prod_{j \in \Omega} P(I_j > 0)\, f(\ln Y_j | I_j > 0) \prod_{j \in \Omega'} P(I_j \leq 0)$$

where Ω and Ω' represent the sub-samples of workers and non-workers respectively; $f(\ln Y_j | I_j > 0)$ is the density function for log of annual earnings conditional on the positive net benefit of paid employment.

III. Empirical issues and the data

A. *The empirical specification*

The earnings equation is based on the standard Mincerian human capital model; however, the sample-selection equation differs from the specification found in the traditional literature. For the identification of the model the researchers often include the 'non-labour income' of the family in the selection equation. However, non-labour income alone might not adequately capture the effects of family assets or debts on a family member's decision to work in the paid-employment sector. A preliminary investigation of the data suggests that the participation rates (in the paid-employment sector) are higher for individuals belonging

[5] An alternative identification condition for this model would be cov(e,u)= 0

to families with greater debt burdens. Hence, the selection equation includes total family debt as a regressor.[6] The specific forms of the selection-equation and the earnings-equation are:

$$
\begin{aligned}
I_j = {} & a_0 + a_1 AGE_j + a_2 AGE_j^2 + a_3 UNIV_j + a_4 PSEC_j + a_5 SEC_j \\
& + a_6 CHIL6_j + a_7 NLI_j + a_8 DEBT_j + a_9 ATLN_j \\
& + a_{10} PQ_j + a_{11} PRA_j + a_{12} BC_j + a_{13} URBAN_j + e_j
\end{aligned} \tag{6}
$$

$$
\begin{aligned}
\ln Y_j = {} & b_0 + b_1 AGE_j + b_2 AGE_j^2 + b_3 UNIV_j + b_4 PSEC_j + b_5 SEC_j \\
& + b_6 \ln WKS_j + b_7 FUL_j + b_8 ATLN_j + b_9 PQ_j + b_{10} PRA_j \\
& + b_{11} BC_j + b_{12} URBAN_j + u_j
\end{aligned} \tag{7}
$$

Variable definitions are provided in Table 1. As noted before, the earnings equation is based on the human capital model (Mincer, 1974), which presumes that earnings is a function of the number of years of schooling, the number of years of post-schooling experience in the labour market, experience squared (to capture diminishing returns to experience) and the number of weeks worked - a proxy for labour supply.

Since the cross-sectional data set used in this study does not provide the work history of an individual, age is used as a proxy for the experience variable. Different levels of educational attainment are represented by a set of dummy variables. The qualitative dimension of education and experience is ignored due to lack of data. Since the dependent variable is annual earnings rather than hourly wage, two control variables are included in the earnings function. These are the 'log of the number of weeks worked' and a 'dummy variable for full-time work'.[7] A set of regional dummies representing the place of

[6] Since the effect of family assets was found to be statistically insignificant in our initial specification, this variable was dropped from the model.

[7] Meng (1987) and Chiswick and Miller (1988) also included the 'log of the number weeks worked' as an explanatory variable following the lead of Mincer (1974). DeSilva (1992) used the log of the average weekly earnings as the dependent variable, which implicitly assumes a unit elasticity of annual earnings with respect to the number of weeks worked.

residence in Canada is also included in the earnings equation to capture regional differences in the labour market structure.

Table 1

Variable Definitions

Name	Definitions
lnY	Natural logarithm of annual earnings
AGE	Age given in years
Dummy Variables for Educational Attainment	
UNIV	University degree
PSEC	Some post-secondary
SEC	9 to 13 years of schooling
Omitted category	Less than or equal to 8 years of schooling
Control variables for labour supply:	
lnWKS	Natural logarithm of the number of weeks worked in a year
FUL	Dummy variable for full-time work
Dummy Variables for Family Characteristics and Place of Residence	
CHILD6	Presence of children in the family six or less years of age
ATLN	Primary residence in Atlantic region
PQ	Primary residence in Quebec
PRA	Primary residence in prairie provinces
BC	Primary residence in British Columbia
Omitted Category	Primary residence in Ontario
Dummy Variable for Urban residence	
URBAN	Resident of an urban centre with a population greater than 30,000
Omitted category	Resident of a rural area or a small urban centre with a population less than or equal to 30,000
NLI	Non-labour income excluding government transfer payments
DEBT	Total family debt i.e., sum of mortgage debt, consumer debt, and amounts outstanding on loans from institutions, and persons outside the family unit.
Dummy variables for the arrival periods	
IMG46	Immigrated before 1946
IMG66	Immigrated between 1966 and 1946
IMG71	Immigrated between 1971 and 1967
IMG76	Immigrated between 1976 and 1972
IMG81	Immigrated between 1981 and 1977
IMG84	Immigrated between 1984 and 1982

A large number of immigrants originated from countries with education and labour market systems very different from those of Canada. Hence, a set of dummy variables representing different arrival periods was added to our sample selection and earnings equations to capture the impact of Canada-specific labour market experience.

B. *Decomposition Methodology*

The magnitude of the double-negative effect on female immigrant earnings is estimated by applying the Oaxaca decomposition method. The difference in the mean log of earnings between native-born (N) males and foreign-born (I) females is written as:

$$\ln \bar{Y}_m^N - \ln \bar{Y}_f^I = [\ln \bar{Y}_m^N - \ln \bar{Y}_m^I] + [\ln \bar{Y}_m^I - \ln \bar{Y}_f^I]$$

Using equation (2), this expression can be rewritten as:

$$\ln \bar{Y}_m^N - \ln \bar{Y}_f^I = [\beta_m^N(\bar{X}_m^N - \bar{X}_m^I) + \bar{X}_m^I(\beta_m^N - \beta_m^I)] + [\beta_m^I(\bar{X}_m^I - \bar{X}_f^I) + \bar{X}_f^I(\beta_m^I - \beta_f^I)] \quad (8)$$

where m and f are notations for the male and female; the bar indicates the mean value of the variable. The overall earnings differential between a typical native-born male and a typical foreign-born female is attributed to (a) differences in native-immigrant endowments within a gender group, $\beta_m^N(\bar{X}_m^N - \bar{X}_m^I)$; (b) differences in native-immigrant parameters within a gender group, $\bar{X}_m^I(\beta_m^N - \beta_m^I)$; (c) differences in male-female endowments within a birthplace group, $\beta_m^I(\bar{X}_m^I - \bar{X}_f^I)$; and (d) differences in male-female parameters within a birthplace group, $\bar{X}_f^I(\beta_m^I - \beta_f^I)$. The magnitude of the double-negative effect is the sum of components (b) and (d). An alternative specification for the overall earnings gap is:

$$\ln \bar{Y}_m^N - \ln \bar{Y}_f^I = [\ln \bar{Y}_f^N - \ln \bar{Y}_f^I] + [\ln \bar{Y}_m^N - \ln \bar{Y}_f^N]$$

or

(9) $$\ln \bar{Y}_m^N - \ln \bar{Y}_f^I = [\beta_f^N(\bar{X}_f^N - \bar{X}_f^I) + \bar{X}_f^I(\beta_f^N - \beta_f^I)] + [\beta_m^N(\bar{X}_m^N - \bar{X}_f^N) + \bar{X}_f^N(\beta_m^N - \beta_f^N)]$$

The magnitude of the double-negative effect, according to formula (9), is $\bar{X}_f^I(\beta_f^N - \beta_f^I) + \bar{X}_f^N(\beta_m^N - \beta_f^N)$. Both formulae (8) and (9) are applied to yield a range of estimates for the extent of double-negative effects on female immigrant earnings.

C. *The data*

The empirical analysis is based on a Statistics Canada microdata tape entitled *Income (1983), Assets and Debts (1984) of Economic Families and Unattached Individuals.* A unique feature of this data file is that it contains information on assets and debts in addition to labour market characteristics. Hence, the data allow us to investigate the effect of family debt on the individual's probability of participation in the paid-employment sector. The tape provides data on the economic and demographic characteristics of 14,029 families. For a married couple, the tape supplies characteristics of both husband and wife, while for all other families the survey contains a record of family heads. Initially, a sample of 8,877 married couples is selected by excluding three types of family from the data set. The excluding family types are: (i) special family units, (ii) unattached individuals and (iii) other families.[8]

Further, we excluded the self-employed from the sample because their earnings included the returns on non-human capital and entrepreneurial skills. In modeling earnings of male immigrants in Australia, Tran-Nam and Nevil (1988) also excluded the self-employed from the sample. Borjas (1986

[8] The first category includes 72 extremely wealthy families. To protect the identity of these families, their age and other economic-demographic characteristics have been suppressed in the sample, which prevents us from conducting any empirical analysis of their earnings. A significant proportion of the second and third type of families is headed by elderly women, perhaps widows whose earnings profiles are expected to be structurally different from the married females with husbands present. The families under the title "other families" includes the following types of households - 'brother and sister living in the same dwelling' or 'grandparent living with grandson or grand daughter' in the same house. The heads of these families are not necessarily the principal earners. For the "other families" category, we only have data for the economic-demographic characteristics of heads of households Indeed, these families are expected to dissolve through marriage of younger members and the death of its older members (grandparents). Hence, profiles of earnings for the 'male-headed families with wife present' is expected to differ significantly from the 'unattached' and 'other families'. Thus the study is restricted to focus on married couples

and Kidd (1992) confront the problem by estimating a separate earnings equation for the self-employed.[9] However, the specification of the earnings equation for the self employed is identical to those with paid employment. The main shortcoming of this modeling technique is the omission of the effects of the household's portfolio of non-human resources and entrepreneurial skills on the earnings of the self-employed. Furthermore, self-employed persons may be more motivated and less risk-averse than those employed in the wage and salary sector. Thus, we argue that self-employed workers belong to a separate population and the exclusion of this group from the sample is not likely to cause sample-selection bias.

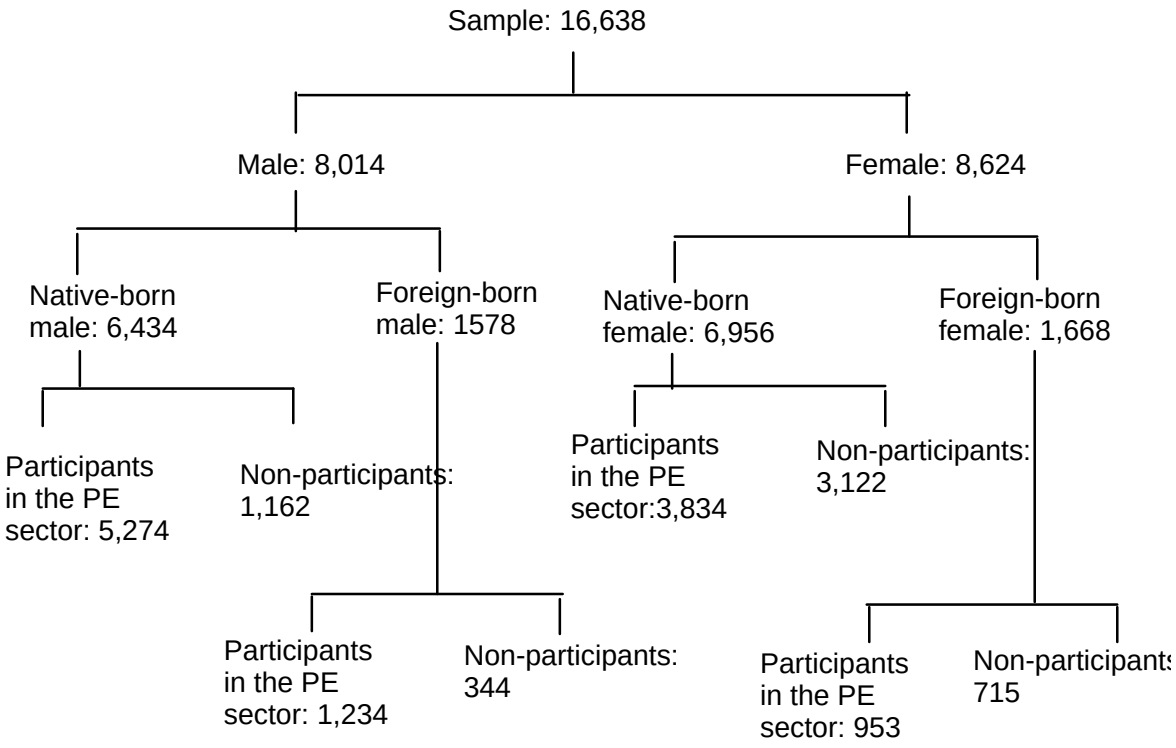
Heckman's argument on selectivity-bias may not be applicable in this context because paid-employed and self-employed workers do not belong to the same 'population'. As argued earlier, the earnings generation process of the self-employed is different from that of the paid-employed, which implies the former group belong to a different population. Hence, the exclusion of the self-employed from the sample might be a better strategy than applying a wrong model to explain their earnings.

After excluding the self-employed, a sample size of 16,638 married persons is obtained for empirical analysis. Further classification of the sample by gender, birthplace and labour market status is given in Figure 1. Sample characteristics of workers in the paid-employment sector are presented in Table 2. The data reveal that the mean earnings differ significantly by gender, not by birthplace.

[9] Kidd (1991) and Heckman's two-stage procedure for estimating separate earnings equations for the self-employed and paid-employed.

Figure 1

Taxonomy of the sample



Note: PE represents paid employment.

Table 2

Characteristics of the Paid-Employment Sector

Variable	Native-born female		Foreign-born female	
	Mean	Standard Deviation	Mean	Standard Deviation
Earnings (Y)	11,602	9,162	11,762	8,825
ln (Y)	8.8587	1.2561	8.9851	1.0680
AGE	37.308	11.497	41.456	11.491
UNIV	0.1095		0.1059	
PSEC	0.2436		0.1993	
SEC	0.5545		0.4753	
LNWKS	3.4688	0.9198	3.5364	0.8486
FUL	0.6716		0.7177	
CHILD6	0.2796		0.2476	
ATLN	0.1724		0.0272	
PQ	0.2287		0.1322	
PRA	0.2480		0.1878	
BC	0.0910		0.1469	
URBAN	0.6098		0.8772	
NLI	610.35	1448.1	659.99	2672.5
DEBT	19,062.0	24,614	19,550.0	28,458
IMG46			0.0672	
IMG66			0.4700	
IMG71			0.1574	
IMG76			0.1731	
IMG81			0.1091	
IMG84			0.0230	
Sample size	3,834		953	

Variable	Native-born male		Foreign-born male	
	Mean	Standard Deviation	Mean	Standard Deviation
Earnings (Y)	24,641	14,788	24,497	14,485
ln (Y)	9.8519	0.8968	9.8737	0.8248
AGE	41.000	12.214	45.145	11.807
UNIV	0.1408		0.1742	
PSEC	0.1996		0.2285	
SEC	0.4838		0.3654	
LNWKS	3.7077	0.6110	3.7495	0.5727
FUL	0.9533		0.9675	
CHILD6	0.3086		0.2658	
ATLN	0.1899		0.0259	
PQ	0.2595		0.1264	
PRA	0.2097		0.1815	
BC	0.0866		0.1442	
URBAN	0.6154		0.8679	

Continued from Table 2

NLI	1,332.0	4,739.0	1,447.9	4,286.6
DEBT	17,271.0	22,721	18,631.0	16,929.0
IMG46			0.0640	
IMG66			0.4878	
IMG71			0.1580	
IMG76			0.1677	
IMG81			0.1004	
IMG84			0.0218	
Sample size	5,274		1,234	

Data source: *Income (1983), Assets and Debts (1984) of Economic Families and Unattached Individuals*, Statistics Canada.

IV. Empirical Results

Results for Gender-Specific Probit and Earnings Equations

The probit model is estimated for the full sample while the earnings equation is estimated for a sample of individuals with positive earnings. The results of the gender-specific probit equation are given in the Appendix (Table A1). The probit results show that an individual's likelihood of participation in the paid-employment sector increases with age in the early stage of the life cycle but decreases with age after passing a threshold age. The probability of participation in the paid-employment sector significantly increases with the level of education. Educational attainment has a more pronounced impact on the probability of participation of female workers than that of male workers. The presence of young children in the family significantly reduces the likelihood of female participation but insignificantly affects the participation decisions of the male. The coefficient for the non-labour income variable obtains a theoretically expected negative sign in both the male and female equations. However, the coefficient is insignificant in the latter case, which reflects that leisure is neither an inferior nor a normal good for females. Family debt positively and significantly affects the probability of participation in the paid-employment sector for both males and females, which is a novel finding in the context of the Canadian literature. The coefficients for regional dummies and urbanisation are self-explanatory. With respect to the effect of post-immigration experience, it is observed that a typical newly arrived female (male)

immigrant catches up with the labour market participation probability of a typical native-born female (male) within two (thirteen) years of settlement in Canada. This result is compatible with the phenomenon that the foreign-born female has a lower reservation wage than the foreign-born male. In addition, this finding seems to indicate a family investment strategy where wives work in the wage and salary sector at the early stage of their settlement in Canada in order to finance both household consumption and investment in their husbands' human capital accumulation.

Table 3 depicts the maximum likelihood estimates of gender-specific earnings equations. The coefficients of age and age-squared suggest that the earnings profile of a typical male reaches its peak at age 47 years, while a female reaches the peak of her earnings profile at age 51 years. Educational attainment, the log of the number of weeks worked and the dummy variable for full-time work - all have significant positive effects on earnings. The coefficients of the dummy variables for the arrival periods capture the effect of Canada-specific labour market experience. A female (male) immigrant reaches the earnings of a native-born female (male) with comparable labour market characteristics after thirteen (eighteen) years of settlement in Canada. The expected observed annual wage can be expressed as $\ln \bar{Y} = \bar{X}b + r s_u l$ where, $\bar{X}b$ represents the offered wage, i.e., the market value of the characteristics of an average wage earner; r measures the correlation between the sample-selection equation residuals and the earnings-equation residuals; s_u is the standard error of the earnings equation; and l is the implied inverse Mill's ratio. Thus, $r s_u l$ measures the deviation of the observed wage from the offered wage. A positive r indicates that individuals who are included in the paid-employment sector had higher wage offers than those excluded, while a negative r implies the opposite case. The estimated r is positive in the male equation but negative in the female equation, which implies that females (males) employed in the paid-employment sector had lower (higher) wage offers than females (males) with comparable productivity-related characteristics in the unemployment sector.

Table 3
Maximum likelihood estimates of earnings equations
(dependent variable is log of annual earnings)

Variable	Male		Female	
	Coefficient	t-ratio	Coefficient	t-ratio
Constant	4.2395	40.709	4.5339	22.429
AGE	0.07828	15.402	0.036568	4.697
AGESQ	-0.0008344	-13.249	-0.0003618	-3.576
UNIV	0.49757	17.794	0.74321	12.004
PSEC	0.26966	11.360	0.44505	8.558
SEC	0.12866	6.460	0.21173	4.880
LNWKS	0.87642	113.907	0.78155	77.223
FUL	0.49697	20.757	0.67741	25.430
ATLN	-0.19752	-8.023	-0.075667	-1.767
PQ	-0.07021	-3.143	0.058035	1.516
PRA	0.062978	2.969	0.081087	2.511
BC	0.081554	3.104	0.15113	3.696
URB	0.067813	4.080	0.14599	5.278
IMG46	0.034038	0.604	0.12884	1.774
IMG66	-0.044638	-1.543	0.03793	0.837
IMG71	-0.17057	-3.365	0.052427	0.708
IMG76	-0.20193	-4.726	-0.12132	-1.523
IMG81	-0.36175	-7.663	-0.11556	-0.910
IMG84	-0.59118	-5.266	-0.20797	-0.794
s_u	0.57023	153.935	0.79653	83.719
r	0.15113	1.956	-0.18358	-1.776
Log-Likelihood	-7610.0		-10474	
Sample size	6,508		4,787	

Notes: s_u = estimated standard deviation of the earnings-equation residuals; r = estimated correlation between the residuals of the sample-selection equation and the earnings equation.

Double-negative Effect on Earnings

In order to estimate the combined effects of birthplace and gender on earnings, the probit and earnings equations are estimated by both birthplace and gender. The probit results are presented in the Appendix (see Table A2). The maximum likelihood estimates of earnings equations are presented in Table 4. The

age-earnings profile reaches its peak at age 48 for a Canadian-born male, age 46 for a foreign-born male, age 55 for a Canadian-born female and age 41 for a foreign-born female. The coefficients of age and age-squared differ significantly by birthplace for males (signifying unequal rates of return on post-schooling experience), however, they do not vary by birthplace for females.

Table 4
Maximum likelihood estimates of birthplace-specific earnings equations
(dependent variable is log of annual earnings)

Variable	Native-born female		Foreign-born female		Native-born male		Foreign-born male	
	Coefficient	t-ratio	Coefficient	t-ratio	Coefficient	t-ratio	Coefficient	t-ratio
Constant	4.5130	19.988	5.1759	9.342	4.2665	33.969	5.1165	18.116
AGE	0.033085	3.870	0.03808	1.788	0.077497	13.355	0.035034	2.661
AGESQ	-0.000301	-2.701	-0.0004613	-1.755	-0.0008039	-11.450	-0.0003842	-2.398
UNIV	0.71995	9.318	0.77114	7.880	0.50061	15.563	0.45325	8.466
PSEC	0.43961	6.898	0.42158	4.662	0.28081	10.673	0.19644	3.992
SEC	0.19637	3.642	0.22954	3.267	0.13488	6.116	0.08498	1.916
LNWKS	0.79806	69.105	0.70291	33.160	0.86437	98.789	0.91421	51.987
FUL	0.69231	22.826	0.63577	10.899	0.48835	18.425	0.54499	8.391
ATLN	-0.07721	-1.643	0.15766	0.862	-0.18059	-6.986	-0.13144	-1.243
PQ	0.0719	1.671	0.00001	0.000	-0.04656	-1.872	-0.14836	-2.903
PRA	0.08799	2.372	0.032876	0.495	0.075373	3.101	0.021077	0.483
BC	0.16817	3.378	0.11441	1.684	0.12056	3.822	0.00614	0.129
URB	0.15106	4.945	0.09340	1.229	0.069132	3.817	0.04889	1.099
IMG66			-0.12284	-1.458			-0.04146	-0.608
IMG71			-0.15284	-1.400			-0.17303	-2.134
IMG76			-0.34293	-2.983			-0.21282	-2.666
IMG81			-0.32620	-2.237			-0.40903	-4.931
IMG84			-0.46455	-1.973			-0.62378	-4.969
σ_u	0.81174	74.557	0.72231	38.125	0.57628	212.927	0.53142	56.269
ρ	-0.19372	-1.724	-0.13641	-0.499	-0.055485	-0.683	0.15301	0.708
Log-Likelihood	-8473.6		-1966.6		-6180.9		-1388.2	
Sample size	3,834		953		5,274		1,234	

The results on educational attainment are consistent with human-capital theory. Using the omitted education level, i.e., 'less than grade nine education' as the benchmark, we compute gross returns for various levels of education. Table 5 presents the results. The gross return on education varies significantly by gender, not by birthplace. The gross rate of return on a university degree is 116 percent for a typical foreign-born female and 105 percent for a typical native-born female. A typical native-born male university graduate earns 65 percent more than a school 'drop-out' belonging to the same group. A male immigrant with a university degree earns only 57 percent more than a school 'drop-out'.

The dummy variables for period of immigrant arrival captures both the cohort and assimilation effects. The former measures the difference in quality (earnings-power) across immigrant cohorts while the latter measures the impact of post-immigration labour market experience on earnings. Since this paper is based on a single cross section, no attempt is made to isolate the assimilation effect from the cohort effect. The results suggests that the mean earnings of the post-1967 cohorts of female immigrants remain below the mean earnings of female immigrants who arrived in Canada in 1967 or before.

The decomposition of differences in the mean log earnings is depicted in Table 6. The results are based on formulae (8) and (9), estimated means of the variables, and estimated coefficients as given in Table 4. Note that the sample-selection term, $\rho\sigma_u\lambda$, is taken into account to estimate each component of the earnings gap. The difference in the mean log earnings between native-born males and foreign-born females is 0.8668, which is decomposed into four components. The first component reveals that female (male) immigrants have an earnings advantage of 16 percent (17.5 percent) over the Canadian-born because of their greater endowments of observed characteristics. The second component suggests that discrimination against immigrants is present; however, the extent of discrimination accounts for 15 percent for males and 1.5 percent for females. The difference in male-female endowments within the foreign-born (native-born) group contributes 39 percent (44 percent) to the overall gap in the mean log

earnings. The last component reveals that gender discrimination is the main source of the difference in the mean log earnings between native-born males and foreign-born females. The double-negative effect is computed as the sum of the magnitudes of gender discrimination and birthplace discrimination. The last row of Table 6 indicates that the magnitude of the double-negative effect lies between 71 to 79 percent.

V. Summary and Conclusions

This paper estimates the double-negative effect on the earnings of female immigrants in Canada. Using a Tobit model of earnings on a sample of 16,638 married persons extracted from the Statistics Canada microdata tape, *Income (1983), Assets and Debts (1984) of Economic Families and Unattached Individuals*, this study derives the following key results. Contrary to the general belief, labour market assimilation occurs at a faster rate for foreign-born females than for foreign-born males. A typical female (male) immigrant catches up with the earnings of a typical native-born female (male) within thirteen (eighteen) years of settlement in Canada. This result is based on the assumption that the quality, i.e., the earnings-enhancing characteristics, are the same for all immigrant cohorts. This is a reasonable assumption in the context of Canada because Fagnan (1995), using multiple cross-sections (1971 and 1986 Canadian Censuses) and the Borjas' technique of isolating the assimilation effect from the cohort effect, find that both the male and the female immigrant catch up to the earnings of their Canadian counterparts within twelve years of settlement in Canada. This paper complements the findings of Fagnan but contradicts the results of Beach and Worswick (1993). Based on 1972 data, the latter study observes that foreign-born females experience an initial earnings advantage over native-born females but no further assimilation occurs over their Canadian life-cycles.

Sample-selection bias is observed in the case of gender-specific earnings equations. When earnings equations are estimated by both the gender and the birthplace, we observe that selectivity bias is present only in the case of native-born females. Finally, this paper observes that the magnitude of the double-negative effect on female earnings is very large. About 71 to 79 percent of the differences in the mean log earnings between native-born males and foreign-born females is attributed to the combined impact of gender and birthplace on earnings. In the presence of the double-negative effect, actual earnings of native-born males are higher than their true or potential earnings. This means that married female immigrants, who arrived in Canada mainly under the 'family reunification class' of immigration, indirectly subsidise the earnings of native-born males. Furthermore, in the presence of the 'double-negative effect' on earnings, the observed differences in earnings between the native-born male and the foreign-born female cannot be used as an argument against 'family class' immigration in Canada. Thus, the present study rejects the claim that female immigrants pose an economic burden on the native-born population in general.

Table 5:

Gross Return on Education by Gender and Birthplace*
(in percentage)

Educational Attainment	Native-born female	Foreign-born female	Native-born male	Foreign-born male
University Degrees	10.5.43	116.22	65.00	57.34
Some Post Secondary Education (diploma, training certificates)	55.20	52.43	32.42	21.71
Secondary Education (greater than or equal to 9 years of schooling)	21.70	25.8	14.43	8.87

*The reference group is 'less than or equal to 8 years of schooling' i.e., high school dropouts. The gross return on a university degree is defined as: $R = (\frac{Y_u - Y_s}{Y_s})100$ where Y_u and Y_s are annual earnings (conditional on all but the education attainment variable) of a university graduate and a school dropout respectively. An estimate of R is derived as: $\hat{R} = [e^{(\beta_u)} - 1]100$ where β_u is the estimated coefficient of the dummy variable for university education in the earnings equation.

Source: Table 4.

Table 6
Decomposition of the earnings gap between native-born male, and foreign-born females

	Decomposition based on equation 8	Decomposition based on equation 9
Difference in mean log earnings	0.8668	0.8668
Difference in mean log earnings attributed to:		
(a) differences in native-immigrant endowments	-0.1515 (-17.47)	-0.1393 (-16.07)
(b) differences in native-immigrant parameters	0.1296 (14.95)	0.01230 (1.50)
(c) differences in male-female endowments	0.3372 (38.90)	0.3834 (44.22)
(d) differences in male-female parameters	0.5515 (63.62)	0.6099 (70.35)
Estimate of the double-negative effect on the earnings of foreign-born females: (b) + (d)	0.6811 (78.57)	0.6229 (71.85)

*The number in each parenthese is the percentage contribution of each component to the difference in mean log earnings between native-born males and foreign-born females.

Source: Tables 2 and 4

Appendix

Table A1
Probit estimates of the sample selection rule
(Dependent variable: D_j=1 if the individual works in the wage and salary sector, otherwise D_j =0)

Variable	Male		Female	
	Coefficient	t-ratio	Coefficient	t-ratio
Constant	-0.94799	-3.501	0.19835	1.021
AGE	0.14787	14.009	0.030836	3.699
AGESQ	-0.0020575	-19.840	-0.0008225	-9.033
UNIV	0.57158	6.539	0.75912	11.080
PSEC	0.43795	5.732	0.57622	11.404
SEC	0.19414	3.658	0.33144	8.012
CHILD6	-0.10029	-1.489	-0.68596	-16.398
NLI/10000	-0.26624	-11.621	-0.0079678	-0.151
DEBT/100000	0.96199	6.898	0.31049	5.468
ATLN	-0.24583	-3.300	-0.11611	-2.333
PQ	-0.10587	-1.691	-0.14039	-3.249
PRA	0.17968	2.626	0.13987	3.162
BC	-0.15110	-1.884	0.013509	0.246
URB	0.015473	0.295	0.14467	4.251
IMG46	0.12190	0.894	0.11516	1.107
IMG66	0.13788	1.714	0.17658	3.316
IMG71	-0.11573	-0.807	0.16992	1.842
IMG76	-0.35433	-2.739	0.14271	1.579
IMG81	-0.15161	-0.869	0.32570	2.851
IMG84	-1.3598	-6.763	-0.42809	-2.190
Number of participants	6,508		4,787	
Number of non-participants	1,506		3,837	
Participation rate (percent)	81.2		55.5	

Table A2
Probit estimates of birthplace-specific sample selection rule
(Dependent variable: D_j=1 if the individual works in the wage and salary sector, otherwise D_j =0)

Variable	Native-born female		Foreign-born female		Native-born male		Foreign-born male	
	Coefficient	t-ratio	Coefficient	t-ratio	Coefficient	t-ratio	Coefficient	t-ratio
Constant	0.22609	1.076	-0.36133	-0.649	-1.0092	-3.346	-1.0261	-1.386
AGE	0.026555	2.939	0.060527	2.622	0.14510	12.278	0.17172	6.261
AGESQ	-0.0007764	-7.811	-0.0011048	-4.532	-0.0020232	-17.327	-0.0023066	-8.790
UNIV	0.87893	11.063	0.44104	3.114	0.62533	6.106	0.45295	2.392
PSEC	0.67731	11.587	0.26974	2.573	0.45605	5.102	0.36723	2.384
SEC	0.39621	8.225	0.20114	2.390	0.22337	3.811	0.08233	0.634
CHILD6	-0.68597	-14.818	-0.68874	-6.864	-0.047954	-0.622	-0.33917	-2.285
NLI/10000	-0.016136	-0.272	-0.0091027	-0.078	-0.24256	-9.486	-0.42598	-5.610
DEBT/10000	0.033873	4.731	0.024177	2.309	0.12124	7.321	0.048428	1.710
ATLN	-0.10570	-1.989	-0.10368	-0.453	-0.18260	-2.283	-0.37934	-1.031
PQ	-0.14204	-2.925	-0.022315	-0.214	-0.037653	-0.538	-0.27910	-1.725
PRA	0.16864	3.366	0.030734	0.312	0.27756	3.488	-0.080988	-0.542
BC	0.0059973	0.091	0.051555	0.507	-0.10556	-1.058	-0.23487	-1.650
URB	0.12164	3.339	0.26824	2.696	0.010043	0.179	0.020559	0.135
IMG66			0.025552	0.202			-0.055332	-0.317
IMG71			0.082421	0.522			-0.27212	-1.132
IMG76			0.078747	0.492			-0.42035	-1.746
IMG81			0.27187	1.582			-0.13464	-0.482
IMG84			-0.46081	-1.905			-1.4686	-4.962
Number of participants	3,834		953		5,274		1,234	
Number of non-participants	3,122		715		1,162		344	
Participation rate (percent)	55.12		5,7.13		81.95		78.20	

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