The Gender Imbalance in Participation in Canadian Universities (1977-2005)

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Abstract

More females than males have been attending Canadian universities over the past decade and this gender imbalance in university participation has been increasing. We use the Linear Probability and Logit models to investigate the determinants of attending university and explore the reasons for the increasing gender imbalance. We find that, in gender-specific equations, the values of the coefficients attached to variables and the values of the variables themselves are both important in explaining the rising *level* of the university participation rate for women and men. The important variables include a time trend to capture the evolving societal norms, the dynamic influence of parental education, the earnings premium for a university degree, tuition fees and real income. The increasing *gap* between the female and male participation rates (15 percentage points by 2005) can be accounted for equally by differences in the coefficients in female and male participation equations and the widening gap in the university premium for women and men.

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1. Introduction

Females represent an increasingly large share of the student body attending university. For many developed countries, this trend started in the mid to late 1980s. Canadian universities have also experienced a dramatic change in the participation rate of females relative to males. Table 1 illustrates this trend by presenting the postsecondary (university and college[2]) participation ratio of young Canadians, aged 18-24, for selected years. The rates of college attendance for females and males have been relatively close to each other over this time period. The proportion of females that attended college was 0.14 in 1979 relative to 0.11 for males. These numbers diverged somewhat, beginning in the late 1980s, but ended up at 0.21 and 0.20 respectively in 2005. However, the trends for university participation by gender were very different. The participation rates of females and males were, at 0.12 and 0.10 respectively, nearly equal in 1979. But, by 2005, the university participation rate of females reached 0.41, an increase of 242%. The participation rate of males reached 0.26, an increase of 160%. Figure 1 illustrates the generally close trajectories followed by the two genders for college attendance (broken lines), as well as the diverging paths for university attendance (solid lines). Women now represent the majority of students at both college and university campuses. In Canada, for example, for the academic year 2000-2001, the enrolment of women at colleges and universities reached 59% of total enrolment (Canadian Information Center for International Credentials (2004)).

This study investigates the reasons for the unbalanced growth in university attendance in Canada over this period. We address several questions: (i) What are the main variables that determine attendance at university and do these variables evolve differently over time for women and men? (ii) Do these variables affect the participation decisions of women and men with different force (i.e. different coefficients)? (iii) Do gender-specific differences in variables or in coefficients account for the increasing divergence in the university participation rates of women and men?

We use the Statistics Canada Master Files for the Survey of Consumer Finances (SCF) and the

[2] In Canada, Community Colleges (colleges for short) are comparable to US junior colleges. Canadian colleges offer a number of diploma programs of shorter duration (generally one to two yeas) that are more professionally oriented than the academic degree programs (three to four years) offered by universities. Until recently, Canadian colleges could not offer degree programs.

Survey of Labour and Income Dynamics (SLID) to investigate the determinants of female and male university attendance over the period 1977 to 2005. We concentrate on university, rather than college, attendance because, as shown in Table 1 and Figure 1, it is with respect to the former that a major gender imbalance has emerged.

Although some recent research that attempts to explain the causes of the gender imbalance in attending university can be found for the US, only limited research has been carried out for Canada. Goldin, Katz and Kuziemko (2006) document the historical emergence of the US 'College Gender Gap' favoring women and consider reasons for it, both formally and informally. These authors (2006, p. 153) suspect 'two key factors' for a gap favoring women, namely the greater pecuniary returns from higher education for women than men and the greater effort costs involved for boys in preparing for and actually attending post-secondary education. Jacob (2002) explores the gender imbalance of postsecondary education attendance by using data from the US National Educational Longitudinal Survey for a nationally representative cohort of eight-graders in 1988 which was re-surveyed every two years until 1994. A number of variables, including non-cognitive ability and returns to higher education, are used in the context of the Linear Probability model to estimate separate participation equations for women and men and Oaxaca-Ransom (1994) decompositions suggest that differences in characteristics or variables (rather than coefficients or behavior) account for almost all of the observed college attendance gap for this cohort. Among the variables, Jacob (2002, p. 596) singles out the college premium and non-cognitive ability as important forces.

Our data set does not include information on non-cognitive abilities. This factor may well help explain why, at any particular point in time, women are more likely to be successful in entering a Canadian university. However, it would be surprising if the non-cognitive abilities of female and male children have diverged substantially over time. It is possible that, through broad societal changes in gender attitudes, the importance of schooling outcomes (and indirectly the gender-specific non-cognitive abilities that influence them) has changed over time. One argument along these lines specifically reflecting social change in the education system is that it has become more 'feminized' over recent decades. This process, it is argued, includes a trend towards more female teachers in elementary and high school as well as pedagogical changes, such as more frequent testing, that tends to favor girls. There is, however, substantial debate about the merits of the feminization of education hypothesis. In many countries the fraction of women teachers at the elementary and especially high school level has been increasing and some researchers have argued that girls do better when taught by women teachers.[3] As Dee (2005, p. 2) notes, however, ' … empirical evidence on whether these interactions actually matter is limited and contradictory'. More generally, studies that follow several cohorts of boys and girls and can address changes in non-cognitive abilities and the relative impact they have in a changing school system are, not surprisingly, difficult to carry out. Moreover, it is not clear that girls have not always been 'better' students at the high school level. Goldin, Katz, and Kuziemko (2006), for example, point out that over the past century girls in the US have consistently outperformed boys in post-secondary education. This may suggest that the school system has always 'favoured' the superior non-cognitive abilities of females. The problem in completely resolving this question is that data sets which include PSE decisions taken by populations over long periods of time do not have the sort of detailed information about non-cognitive abilities and academic preparedness that would are required to address these issues.

Accordingly, we content ourselves with controlling (in ways that we describe below) for these secular trends so as not to contaminate our estimation efforts in other directions. We do investigate the significance of another secular force, the university premium. To our knowledge, Johnson and Rahman (2005) is the only other Canadian study taking this factor into consideration. In their research, which was based on the Labour Force Survey (LFS) and covered the years 1976-2003, the return to university education is found to have a positive, albeit not statistically significant, effect on university participation. Although male and female individuals are separated for regression purposes, the gender imbalance issue is not an explicit concern in that study. Finally, the LFS does not include important information, such as family income, that helps shape the university participation decision. Finnie *et al* (2005) also investigate the determinants of attending postsecondary institutions in Canada. Family

[3] There are, of course, other changes that may benefit girls over boys. For example, Burman (2005, p. 353) points out that the new AS level system in the UK has been predicted to benefit girls due to the fact that girls do best on continuous assessment.

background variables appear to be important determinants of participation in postsecondary education. Although gender-specific regression results are presented in their work, they do not explicitly address the gender imbalance issue. Moreover, their study does not include information about tuition fees which have increased dramatically since the mid 1990's[4]. A host of other features of this study presented below differentiate it from earlier efforts.

To try to explain the increasing gender imbalance, we use Linear Probability and Logit models to explain university attendance for each gender. Following Jacob (2002), we analyze estimates from these models in the context of the Oaxaca and Ransom (1994) decomposition techniques applied to the Linear Probability models. We also use the techniques recently proposed by Fairlie (1999, 2006) to construct similar decompositions in the context of the Logit models. Both decomposition techniques examine how, on average, differences in the values of variables and their coefficients combine to explain differences in the average university attendance by gender. We also use the results from the two models to see how, in light of the estimated gender-specific coefficients, the evolution of variables through time influences university attendance by gender. We find that the Oaxaca and Ransom (1994), Neumark (1988) and Fairlie (1999, 2006) decompositions, which examine the relative importance of characteristics and coefficients over the entire period, averaging over all years in the sample, point mainly to differences in characteristics, notably the university premium, as the reason for the average difference in the female and male university participation rates. In this sense, our results complement those in Jacob (2002). The relative importance of characteristics and coefficients is somewhat sensitive to how the university premium (broadly speaking, the additional earnings that accrue to those with a university degree relative to those with high school only) is defined and we explore several possibilities.

Going beyond the entire-sample, average, decompositions above and looking at the predictive performance of our estimated models over time, we conclude that the growth in the *level* of the university participation rate over time is shaped by the evolution of time varying regressors such as a time trend, parental education, the university premium, tuition fees, and real income - in that order. The

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[4] The literature related to the effect of tuition fees on Canadian postsecondary education enrolment includes Christofides, Cirello and Hoy (2001), Rivard and Raymond (2004), Junor and Usher (2004), Johnson and Rahman (2005), Neill (2005), Coelli (2005), and Fortin (2005).

trend stands in for a host of socioeconomic forces that cannot be modeled and (given this conditioning) makes possible a clearer definition of the role of other variables that also have a time dimension. A significant new result is the cumulative importance of the parental education variables: As more parents get more education and, given that this influences the children's university participation positively, more children are encouraged to go to university; this force cumulates over time and shows up in an important way when beginning and end-of-sample predictions are compared. We explore this force for single as well as couple-based families. The university premium is also an important force in shaping the predicted level of the participation rate. Increases in tuition fees act as a (more modest) force in the opposite direction. Real income increases contribute only slightly to the secular growth in participation rates. The increasing *gap* between the predicted female and male participation rates is explainable equally by individually small but important overall differences in the coefficients of (or the behavior in) gender-specific equations and by differences in the only gender-specific variable in the models, namely the university premium.

In section two, we present more details on the trends in female and male participation rates. In section three, data and variables used in this study are explained in detail. In section four, results are presented and analyzed. In section five, a summary and some concluding comments are provided.

2. Female and Male Trends in University Attendance

As noted in Table 1, the university participation rates for females and males, aged 18-24, have been increasing over time but the former have been increasing at a higher rate. In Tables 2 and 3, the participation rates for females and males in different income quintiles are presented[5] for selected years. In 1979, the participation rate for females, in Table 2, was marginally higher than that for males, in Table 3, for all but the third quintile which was the same. By 1994, the female participation rate was uniformly higher than that for males and, by the end of the sample period, the gender differences were very pronounced indeed. It is interesting that the relative likelihood (the proportion in the fifth quintile divided by that in the first quintile) shrank somewhat faster for females than for males: In 1984, for

[5] The sampling weights for each survey are used in the calculation of all means.

example, these values (from Tables 2 and 3 respectively) were 4 for females and 4.83 for males. By 2005, these values were 1.97 for females and 3 for males. This suggests that family income may play an important and gender-specific role in explaining the university participation decision.

However, family income is not the sole factor influencing individual participation decisions. Tables 4 and 5 present the participation patterns for female and male children given the absolute value of family income over time. In any given year, an individual from a family with higher income is generally more likely to go to university regardless of gender. However, it is also clear that, even in a given real income bracket, there is a powerful upward trend for university attendance. This trend is far stronger for females than males, especially for lower-income families. This suggests that some other (time-varying) variables, in addition to family income, should be included in analyses of these issues.

Table 6 shows the university premium calculated for all the years under investigation; a number of variants, discussed in section 3, are included. Focusing for the moment on the last two columns (i.e. the three-year moving average, Jacob, variant), in each and every year in the sample, the female university premium is higher than the male premium. Both premiums increased over time, but the female premium increased (from 1.61 in 1977 to 2.03 in 2005) more than the male one (from 1.24 in 1977 to 1.54 in 2005). It is noteworthy that these observations hold regardless of the definition of the university premium adopted. Since the premium may influence the incentive to attend university, it is important to take its behavior into account as we attempt to understand why women have shown an increasing interest in university education as compared to men.

The Canadian university system imposed dramatic increases in tuition fees over the last two decades. Real tuition fees have roughly doubled during the period under discussion – see Appendix A. The implied increase in the cost of obtaining a university education represents a time-varying change that may moderate any secular trend towards increased participation and must be taken into account.

Beyond these two time-varying forces, a host of other secular socioeconomic developments have been influencing university participation over the period studied, particularly for women. These are surveyed in Goldin, Katz and Kuziemko (2006) and include the increasing labor force participation rate of women, the fact that marriage occurs much later in life and the increasing acceptance of women in a variety of occupations. These forces are not easy to identify individually and are not the main focus of this study. We, therefore, include a time trend that should mop up all secular societal and economic forces not specifically accounted for in our equations.

3. Data Sources and Variable Description

In this paper, the Statistics Canada Master Files for the SCF, covering the years 1977 to 1997, and the SLID (which took over the role of SCF), covering the years 1998 to 2005, are used. All statistical work was physically carried out at the Statistics Canada Data Resource Centres of Toronto and Waterloo and results obtained were released by these organizations. Due to restrictions in the Master Files of the 1975 SCF, data for that year are not included in our analysis. In addition, data for 1976, 1978, 1980 and 1983 are not used either as these were small-sample years of the SCF. Thus, 1977 is the starting point of the sample while 2005 was the last available year of the SLID Master Files. When constructing the data set used in the econometric analysis, care was taken to set up variables in such a way as to avoid a seam between the SCF and SLID part of the sample – as an example, see footnote 6. Robb *et al* (2003) compare the SCF, SLID and the LFS in the context of studying the education premium and conclude that, for that particular purpose, combining data from the SCF and SLID is not unreasonable. As an extra precaution, the econometric analysis below includes the dummy variable S which takes the value of 1 when an observation comes from SLID and is otherwise equal to 0. The variable S would mop up any intercept shift at the seam between the SCF and the SLID. Unless otherwise stated, sample weights are used throughout.

Our units of analysis are the young (aged 18 to 24) adults in economic families defined as groups of persons residing together and related by blood, marriage or adoption. For the purpose of investigating the possible factors influencing university attendance, we use only the sub-sample of economic families with children between 18 and 24 in the corresponding survey year. Using the Master Files, we combine information from the individual and family files in order to construct data for individuals, by gender, but for whom important family characteristics (such as family income, the number of children in the family and the education of the Head and Spouse) are available. We use the Linear Probability and Logit models to analyze the university participation behavior of these individuals. $PROBU_f$ equals 1 for a female child in a family if that child attends university and it equals zero otherwise. Similarly, $PROBU_m$ equals 1 for a male child in a family if that child attends university and it equals zero otherwise.

Our equations condition on the total number of children (Children) and its square (Children 2) in the economic family within which the individual resides. These are all children aged 18-24. We are aware of a number of arguments in the literature concerning the possible influence of the total number of children on the probability of any one child in the family attending university. For instance, a higher number of children may, other things equal, mean that less family resources are available to finance university education for any child. On the other hand, there may be mutual academic learning and transference of knowledge concerning the university application process in large families and these may reduce the 'cost' of any one child attending university. Since these issues are not the main focus of our analysis, we adopt the quadratic specification that is flexible enough to capture a variety of possible forces and let the data determine the shape of the underlying relationship.

Tuition fees (Tuition) represent an important cost component of attending university. This may be particularly so for the children of low-income families operating in the context of liquidity constraints and capital market imperfections. The tuition fee variable for each year is generated by using the tuition fees for Arts programs in the largest university of each province of residence. Nominal fees are converted into real terms by deflating with the All Items Consumer Price Index (1992=100) for the largest city in each province. The real tuition fee variable thus constructed is reported, for each year and province, in Appendix A.

Family income (Income) is another potentially important variable. We define family income as the sum of the parents' after-tax income and deflate by the All Items Consumer Price Index (1992=100) for the largest city in the province in which the economic family resides. Since the relationship between postsecondary attendance and Income may not be linear, we include a quadratic term in Income, labeled Income 2.

When considering the cost of attending university, transportation and rental expenditures are important elements to be taken into account. Living far from a university may mean that university education is costlier than when living in a city with a university. At the other extreme, living in a large city, where more than one university may be available, increases the choice of available programs and may increase the probability that a student can study while living at home. To capture these forces, we use the dummy variables Urban A and Urban B, to generate a proxy for these cost considerations. The variable Urban A is equal to 1 if the economic family lives in a small urban area (29,000-99,000 inhabitants) where at most one university is available; otherwise it equals 0. The variable Urban B is equal to 1 if the economic family lives in a large urban area (more than 99,000 inhabitants) where, generally, one or more universities are available (all principal metropolitan areas have at least one university); otherwise it equals 0. The default category is rural areas and small communities where very few universities are available.[6] We would expect Urban B to have a greater influence on PROBU than Urban A. The role of the proximity to university was examined by Frenette (2006) and, in a different context, by Card (1995).

Parental education often conditions a child's participation in university education. Because our sample contains single-parent as well as couple-based families, we adopt a specification that can appropriately account for parental education regardless of the nature of the family unit - we have tried to distinguish between male and female single-parent Heads of Family but we do not have enough observations to allow for reliable inference at that level of detail. The following dummy variables capture the Head's educational attainment: NonGrad equals 1 if the family Head has not completed high school; it equals 0 otherwise. This variable represents the omitted category. High School equals 1 if the family Head has completed high school but no further education; it equals 0 otherwise. Some Postsec equals 1 if the family Head has had some post-secondary education but received no certificate, diploma or degree; it equals 0 otherwise. Postsec Diploma equals 1 if the family Head attended postsecondary education and received a certificate but no degree; it equals 0 otherwise. Degree equals 1 if the family Head has a university degree; it equals 0 otherwise. The above set of variables captures the influence of parental (the Head's) education in the case of single-parent families. In the case of couples, the above

[6] In 2006, of the 35 communities (Cities, Towns, or Communities) in Urban B, 30 had at least one university; of the 52 communities in Urban A, 8 had one university each; in the entire default category of all remaining small communities and rural areas in Canada, only 3 small universities exist.

variables which characterize the Head's[7] level of education need to be supplemented by analogously defined variables for the Spouse. The econometric specification used to implement all these cases is

$$Y = \beta_{0c} D + (\beta_1 + \beta_{1h} D) H_1 + (\beta_2 + \beta_{2h} D) H_2 + ... + \beta_{1s}(D * S_1) + \beta_{2s}(D * S_2) + ... \qquad (3.1)$$

where D=1 for couples and 0 for single-parent families, H_1 and S_1 are the dummy variables referring to the first level of achievement (i.e. High School) beyond the default level for Heads and Spouses respectively, the subscript 2 refers to the second level of achievement (i.e. some postsecondary education), and so on. Thus, single-parent families are characterized by the overall equation constant (which does not appear above) and the coefficients β_1, β_2 and so on for other levels of educational attainment. Couples have a *further* constant term β_{0c} added to the overall equation intercept. In addition, the Head's education variables within couples carry *additional* effects on the coefficients for educational levels 1, 2, and so on given by β_{1h}, β_{2h}, etc. On the other hand, the Spouse's educational variables 1, 2 and so on carry the effects given *entirely* by the coefficients β_{1s}, β_{2s}, and so on. This way of modeling the influence of parental education makes it possible to consider whether, other things equal, a female or male child of a couple-based family is more likely to attend university than an otherwise identical female or male child of a single-parent family. We are also able to consider whether, in a couple-based family, the educational attainment of the Head is more or less important than that of the Spouse and to do so according to the gender of the child. A further point to note is the feedback loop that exists between parental education and the propensity of children to attend university. By the end of our sample, the level of education of the parents is very much higher than at the beginning and this induces more children to attend university. For example, the 1977 proportion of Heads and Spouses in the data for the female equations who had Degree=1 was (reflecting the history of the past) 0.09 and 0.03 respectively; by 2005 these values were, at 0.22 and 0.16 respectively, very much higher. These numbers for single-parent Heads were 0.10 in 1977 and 0.26 in 2005. We are able to comment on the

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[7]In the SCF, Head refers to the husband, while in SLID it refers to the main earner in each family. Because we had access to the Master Files, we were able to construct our data imposing the SCF convention (since it holds for most years) thereby avoiding one possible reason for a 'seam' between the two data sets.

quantitative significance of these increases in parental educational attainment by gender and by type of family.

When investigating the problem of university attendance for the whole of Canada, it is natural to take regional aspects into consideration. This is because the incentive to attend postsecondary education is likely to be related to region-specific effects, such as differences in provincial student loan programs, which are too diverse and complex to be included here. As noted by JR, although one should compute tuition costs net of any scholarships or loan information (including subsidies), this is not practical given the complex rules around the interest rate and repayment system, which are person-specific and have changed over time. Moreover, there are also subsidies built into the tax system which are not easy to model given their person-specific nature. Hence, provincial dummy variables are used to capture intercept differences between provinces, with British Columbia as the omitted category.

The university premium is an important influence on the decision to attend university – Jacob (2002, pp. 590-1) provides a sketch of the relevant theoretical processes. However, the empirical implementation of the premium is not clear cut and we have carried out all our work with a number of variants. Bar-Or *et al* (1995), Burbidge *et al* (2002), and Robb *et al* (2003) demonstrate that the university premium calculated from Canadian survey data (LFS, the SCF, and the SLID) is relatively constant over time when more than five years of experience are taken into account. However, individuals contemplating the possibility of university education may monitor primarily the earnings of the cohorts immediately ahead of them, rather than including those close to retirement. With this notion in mind, it is possible to think of the University Premium as the average additional earnings that accrue to individuals with up to five (or in our second variant of University Premium ten) years of experience beyond their university degree relative to the average additional earnings that accrue to individuals with up to five (or in our second variant ten) years of experience beyond the completion of high school. Thus, for those with a university degree, we select employees aged 25 to 29 (or in our second variant 25-34) and, for those with 11-13 years of schooling, we select employees aged 19 to 23 (or in our second variant 19-28). Jacob (2002, p. 591) opts, instead, for a comparison of the earnings of college and high-school graduates at the same age bracket (25-34). The Jacob (2002) age bracket is the basis for our third variant of University Premium. For each of the three variants, we calculate the average earnings for the relevant age groups, on a province-by-province basis, by survey year and the University Premium is defined as the ratio of the average earnings for those with a university degree to those without. Because the provincial variation in this variable is substantial and because graduates tend to, at least initially, search for employment in their province of residence, the value of University Premium is calculated separately for each province and is assigned to each individual according to her/his province of residence.[8] Because the annual averages are relatively noisy, we also define three-year moving averages of the yearly concepts described above and use these as the basis for constructing further variants of University Premium which we also use. Thus, in total, six variants are utilized. These calculations are done for women and men separately and the gender-specific University Premium is assigned to the women and men in our sample. The six variants are presented in Table 6, where the numbers for each year are the gender-specific averages of the provincially based University Premium values assigned to each individual in the sample by province of residence. As can be seen, the University Premium is higher for women than men and increases more for women than men over time. The moving average specifications are less noisy. While we conduct our analysis using all six variants, we report most results using the moving average version of the Jacob (2002) age bracket specification - the two rightmost columns of Table 6[9]

Tuition fees and the University Premium have clear time dimensions but may not adequately capture secular forces that operate on the propensity to attend university. For this reason we include a time trend (Trend) with observations for 1977 taking a value of 1, 1979 a value of 3, and so on to 2005.

[8] In Canada, most individuals go to university within province. Burbidge and Finnie (2000) use data from the National Graduate Survey of cohorts that completed a post-secondary diploma in 1982, 1986, and 1990 and were interviewed after graduation. Over these three cohorts, 6.3%, 7% and 6.5% respectively attended university out of their home province. These authors also report that, five years after graduation, the percentage of graduates from the same cohorts who had changed province of residence was 14.8%, 13.5% and 12.7% respectively. Therefore, using tuition fees and calculating the University premium based on the province of residence is justified. UNESCO (2006, p. 45) reports that only '… 3% of Canada's tertiary students are mobile', meaning that they attend university outside Canada.

[9] We use full-time full-year paid employees, thus avoiding possible reporting problems involving the self-employed.

Appendix B gives the number of individuals appearing in our samples by year. These numbers reflect the fact that the percentage of unmarried men living at home is higher than that of women.

4. Empirical results

4.1 Main Results

To explore the quantitative relationships alluded to above, two models are utilized. The Linear Probability model, estimated using Ordinary Least Squares (OLS), is generally viewed as a benchmark. It is the model used by Jacob (2002) in his analysis of the US cohort. The dependent variables are $PROBU_f$ and $PROB_m$. The independent variables are Tuition, Income, Income 2, Children, Children 2, Urban A, Urban B, the Head's and Spouse's education dummy variables allowing for family structure as in equation 3.1, the provincial dummy variables, S, University Premium and Trend.

Table 7 provides results for the two genders separately, for the sample pooled across the genders and for the latter but with a female dummy variable included – more on the last specification appears below. Coefficients and the ratio of coefficients to estimated standard errors are also provided. An F test for the structural homogeneity of the male and female equations suggested that separate equations should be estimated. In all four equations, a concave relationship between PROBU and Income as well as Children can be observed.[10] Thus, increases in each of these variables increases PROBU but at a decreasing rate up to a maximum. In the case of Children, that maximum is (rounding up) three for both genders, suggesting that any positive scale effects favoring university attendance are exhausted fairly early, leaving children from larger families at a disadvantage. Parental education levels play an important role in determining university participation. In the simplest case in Table 7, that of a single-parent family, a more educated Head is likely to be associated with increased probability of university participation especially for female children. This effect for girls reaches 29.6 percentage points for Heads with a degree (relative to Heads with incomplete high school). In couple-based families the overall parental effects are stronger but there is a noteworthy difference in the mechanisms for girls and boys. In the case of the former, generally negative *additional* Head effects (especially for

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[10] Unless otherwise stated, all tests are two-sided and conducted at the 5% level.

higher levels of education) are dwarfed by strong positive Spousal effects. In the case of boys, the *additional* Head effects are not significant and the Spousal effects are still positive and significant. Thus, the parental effects for couple-based families are generally stronger than those in single-parent families. The overall coefficient for Degree is stronger for Heads than Spouses for both genders, suggesting that the father's educational attainment is more influential than that of the mother. The coefficients on Urban A and Urban B suggest that children from families living in urban areas, particularly large ones, are more likely to attend university than those from rural areas. The provincial dummy variables show some significant differences in PROBU between each province and British Columbia, with Prince Edward Island being the strongest case in point. Tuition carries the anticipated negative coefficient in all equations. University Premium has the expected positive coefficient in all equations and is significantly different from zero at the 1% level. It is important to note that these effects are well-established even in the presence of the significant Trend. The seam variable S achieves significance only in the pooled sample with no female dummy variable, suggesting that individuals from the SLID data do not have an obviously different propensity to attend university. We have checked for structural breaks at points other than the SCF/SLID seam using CUSUM tests but have found none.

Jacob (2002) used standard decomposition techniques to evaluate the extent to which the variables in the Linear Probability models for females and males in Table 7 explain the gender participation gap. Following Oaxaca and Ransom (1994, 1998) and Neumark (1988) the difference between female and male attendance probabilities can be written as:

$$\overline{P}_f - \overline{P}_m = \overline{X}'_f \hat{\beta}_f - \overline{X}'_m \hat{\beta}_m = \left(\overline{X}'_f - \overline{X}'_m\right)\hat{\beta}_p + \overline{X}'_f\left(\hat{\beta}_f - \hat{\beta}_p\right) + \overline{X}'_m(\hat{\beta}_p - \hat{\beta}_m) \qquad (4.1)$$

The scalars $\overline{P}_f$ and $\overline{P}_m$ are the observed and predicted probabilities of female and male participation rates, i.e. of $PROBU_f$ and $PROBU_m$ respectively. $\overline{X}_f$ and $\overline{X}_m$ are $k \times 1$ vectors of the mean values of the k independent variables in the female and male sub-samples. $\hat{\beta}_f$ and $\hat{\beta}_m$ are the $k \times 1$ vectors of estimated coefficients, in Table 7, for the female and male regressions respectively. $\hat{\beta}_p$ is the $k \times 1$ vector of coefficients estimated from the pooled regression, also in Table 7. Since Fairlie (2006) presented results with the pooled sample containing a female dummy variable, we explore (columns 7 and 8,

Table 7) this possibility as well. In the decomposition of equation (4.1), the first term gives the role of the difference in the average value of the female and male characteristics. The second term is interpreted as the female advantage (for university attendance) and the third term is interpreted as the male disadvantage. It is well-known that using the pooled coefficients as the standard circumvents the sensitivity in the decomposition results that would emerge if either the female or the male estimated coefficients were used instead – as in the early forms of these decompositions. An important difference between this paper and that of Jacob (2002) is that we explore participation trends over a very long period, rather than differences at a point in time.

Table 8, column 1, shows the decomposition results that are implied by the first term in equation (4.1) and the pooled sample estimates $\hat{\beta}_p$ in Table 7 that exclude the female dummy variable. Rows 1 and 2, Table 8, show the average participation rate for the whole period for females and males respectively; note that, by a property of OLS, these numbers represent both the predicted and actual participation rates. Row 3 shows the difference between the female and male averages. Rows 4 and 5 show (in levels and percentages respectively) the part of row 3 that can be explained by differences in Tuition, while row 6 provides the relevant standard errors – their size suggests that all effects are statistically significant. Rows 7 to 9 deal analogously with the part of row 3 that can be explained by differences in Income and Income 2, rows 10 to 12 the part of row 3 that can be explained by differences in the University Premium and rows 13 and 14 the part of row 3 that can be explained by *all* the characteristics in Table 7. The difference between the female and male participation rates is 7.74 percentage points. As in Jacob (2002, Table 3), almost all (94.69 %) of this participation gap can be explained by the difference in the average values of characteristics between females and males, leaving very little role for differences in coefficients.[11] Among the independent variables, only University Premium is capable of explaining the difference in characteristics to any great extent, contributing 81.56% of the difference of 7.74 percentage points. This is not surprising given that a random sample of female and male children is being compared; the average values of their respective characteristics (say

Income) are likely to be similar except in the case of variables (such as the University Premium) which have a gender-specific dimension. For this reason, we go beyond the Oaxaca and Ransom (1994, 1998) and Neumark (1988) decompositions to also evaluate the contribution over time of each variable to the predictions of the female and male equations and to the gap between them. Before turning to that evaluation in section 4.2, we offer an improvement (and a simultaneous check and sensitivity test) to the Linear Probability model.

The finite-sample assumptions entailed in the OLS regressions and hypothesis test procedures in Table 7 are too strong, given that the distribution of the residual term does not follow the normal distribution in this context. A common alternative is the Logit model defined as

$$\Pr(y_i = 1 \mid X_i) = \frac{e^{X_i'\beta}}{1 + e^{X_i'\beta}} \tag{4.2}$$

where the right hand side of the equation is the logistic distribution function and the values of the *k* variables for the ith observation in X_i are the same as those in the Linear Probability model. The $k \times 1$ vector β contains the coefficients on the k variables. Decomposition procedures in the context of the Logit model were proposed by Fairlie (1999, 2006). These decompositions focus on the difference of the average values of the characteristics, i.e. the first term in equation (4.1). The average (over the N observations *i*) contribution of an independent variable X_1 to the gender gap can be expressed in obvious notation as

$$\hat{D}_1 = \frac{1}{N}\sum_{i=1}^{N}\left[F\left(\hat{\beta}_0^p + X_{1i}^f\hat{\beta}_1^p + X_{2i}^f\hat{\beta}_2^p + X_{3i}^f\hat{\beta}_3^p + \ldots\right) - F\left(\hat{\beta}_0^p + X_{1i}^m\hat{\beta}_1^p + X_{2i}^f\hat{\beta}_2^p + X_{3i}^f\hat{\beta}_3^p + \ldots\right)\right] \tag{4.3}$$

The contribution of X_2 to the gender gap is

$$\hat{D}_2 = \frac{1}{N}\sum_{i=1}^{N}\left[F\left(\hat{\beta}_0^p + X_{1i}^m\hat{\beta}_1^p + X_{2i}^f\hat{\beta}_2^p + X_{3i}^f\hat{\beta}_3^p + \ldots\right) - F\left(\hat{\beta}_0^p + X_{1i}^m\hat{\beta}_1^p + X_{2i}^m\hat{\beta}_2^p + X_{3i}^f\hat{\beta}_3^p + \ldots\right)\right] \tag{4.4}$$

This process goes on until all observation values of female variables are substituted with male observation values. Here, *F* is the logistic distribution function, N denotes the number of observations

[11] The role of characteristics is lower when other versions of University Premium are used. It is important to note that University Premium is always statistically significant and quantitatively important, regardless of the variant in Table 6 that is used. For details in the context of the Logit model, see Table 10.

and $\hat{\beta}^p$ is the $k \times 1$ vector of Logit coefficients estimated using the pooled sample of male and female observations.[12] This equation holds for the logistic distribution in (4.2). In practice, it is unlikely that the number of observations N will be the same for the male and female sub-samples. Some observations must be dropped from the larger sub-sample so as to keep the same number of observations for the above switching process. In order to avoid biased estimation, a simulation process is suggested by Fairlie (1999, 2006). In this paper, the following Fairlie-based simulation process has been conducted: (i) Estimate a Logit model for the pooled sample; (ii) Predict the probability of participation, using results from above step, for each individual in both the male and female sub-samples; (iii) The number of observations for males exceeds that for females. Randomly draw samples from the male sub-sample that have the same number of observations as in the female sub-sample; (iv) Sort the male and female data by the predicted probabilities; (v) Do the switching process, variable by variable, as described in (4.3) and (4.4); (vi) Repeat steps (iii) to (v) 1000 times. Use the average decomposition result as the final decomposition output.

The switching process described in (4.3) and (4.4) is switching from female to male observations. It is also possible to do the reverse and we will report results from using both switching processes. Another problem is that, when using the survey data, generally the sample weights should be considered. When we do the switching process, we need to decide which weight, the weight with respect to female or male observations, should be used. We report results using both sets of weights as well as no weights.

For each iteration, standard errors are calculated as

[12] Fairlie (2006) includes a gender dummy variable (Female) in the pooled regression but its coefficient is not used in the decompositions. It is possible that, by including a female dummy into the pooled regression, we introduce a 'discrimination' term in the regression equation which may distort the no-discrimination counterfactual. Thus, in our main tables, we use the pooled results in Table 9 which do not include a female dummy variable. However, we repeated the analysis using the pooled results which include the female dummy variable. Characteristics still explain an important portion of the gender imbalance and the University Premium is the main reason for this. Nevertheless, two quantitative differences should be mentioned. First, the role of characteristics is predictably smaller since the female dummy variable which is not included in the decompositions does much of the 'explaining'. Second, the role of University Premium is correspondingly scaled down. For brevity's sake, these results are reported only partially in Table 10.

$$Var\left(\hat{D}_j\right)=\left(\frac{\partial \hat{D}_j}{\partial \hat{\beta}^p}\right)' Var\left(\hat{\beta}^p\right)\left(\frac{\partial \hat{D}_j}{\partial \hat{\beta}^p}\right) \quad (4.5)$$

where $\hat{D}_j$ is the contribution of the jth variable to the gender gap. For example, if $j=1$,

$$\frac{\partial \hat{D}_1}{\partial \hat{\beta}^p}=\frac{1}{N}\sum_{i=1}^{N}[f\left(X_i^{ff}\hat{\beta}^p\right)X_i^{ff}-f\left(X_i^{mf}\hat{\beta}^p\right)X_i^{mf}] \quad (4.6)$$

where X_i^{ff} are the values (in row vector form) of the ith observation on the *k* variables in the first round bracket of equation (4.3), X_i^{mf} are the values (in row vector form) of the ith observation on the *k* variables in the second round bracket of equation (4.3), and f is the logistic probability density function.

Logit output is presented in Table 9. Generally, we have very similar results for the Logit and Linear Probability models. Notice, however, that (i) the couple-based parental effects for female and male children are more similar to each other than in Table 7, (ii) the University Premium now has a marginal effect which is somewhat higher for females than males and (iii) that the seam variable S is never significant. Continuing with the approach in Jacob (2002), we now focus on the Fairlie decomposition results using the Logit regression coefficients. Columns 2-4, Table 8, report results for the switching process from female to male observations using female, male, and no weights respectively.[13] Columns 5-7, Table 8, report results for the switching process from male to female observations using female, male, and no weights respectively. The overwhelming qualitative conclusion from these additional columns in Table 8 is consistent with that reached using the Linear Probability model and column 1, Table 8. Indeed, these additional columns in Table 8 suggest that effectively all the average gender participation gap is accountable by differences in the average values

[13] Note that, when no weights are used, the Logit results are re-estimated without weighting the individual observations. When switching from the characteristics of one gender to those of the other, gender-specific weights produce some difficulty of interpretation and it is more straightforward to focus on the no-weight results in columns 4 and 7, Table 8. Note that when the part of the gender gap attributable to characteristics exceeds the observed gap itself (as is the case in columns 2, 3, 5, and 6, Table 8) the implication is that, based on the average values of characteristics, the participation gap should have been even larger than observed according to the estimation.

of characteristics, mainly the University Premium. As a check and further sensitivity analysis, Table 10 provides the percentage of the average gender gap attributable to the University Premium when the five other definitions of this variable are used in the context of both the Linear Probability and Logit models. In almost all cases, these percentages are high; they are higher when more years of experience are taken into account, when the Jacob window is used and when the moving average specification is adopted - note that some of the information in Table 8 is repeated, for the reader's convenience, in the rightmost column of Table 10. Table 10 also includes a similar analysis when the dummy variable Female is included in the participation equations - as in the rightmost columns of Tables 7 and 9; as might be expected from the fact that the female dummy absorbs much of the gender difference in the participation rates, the percentages due to characteristics and the University Premium in particular are lower, albeit continuing to be substantial.

The results in the Linear Probability and Logit models are mutually consistent and reinforcing and the various decompositions carried out are very suggestive of the role played by characteristics generally and particularly the University Premium in explaining the difference in gender participation rates over the entire time period 1977 to 2005. Of course, by construction, these decompositions do not attempt to describe the secular growth in the *level* of the participation rates for women and men, the increasing *gap* between them and the role of the variables in Tables 7 and 9. What we now focus on are the model predictions for the gender-specific participation rates, the increasing gap between them, and the relative quantitative importance of variables and coefficients in explaining this behavior. These issues are addressed, in the context of a different methodology, in the next sub-section.

4.2 The Secular Role of Variables

Figures 2 and 3 plot the (annual average) predicted values for the female (top solid line marked with Δ) and male (bottom solid line marked with ×) participation rates from the Linear Probability and Logit models respectively. The predictions from the two models are very similar and quite accurate when compared to the actual yearly average participation rates in Figure 1. In addition, Figures 2 and 3 provide the Linear Probability and Logit predictions for the female (top broken line marked with Δ) and male (bottom broken line marked with ×) participation rates when, following the spirit of the Oaxaca and Ransom (1994, 1998) and Neumark (1988) approach, the *pooled* (no female dummy) estimates in Tables 7 and 9, respectively, are used. These predictions give the models' best guess as to what the female and male participation rates would be under a common set ($\hat{\beta}_p$) of coefficients. In this sense, we are able to examine the female and male predictions, through time, abstracting from any differences in the estimated coefficients for females and males - that is assuming that there are no behavioral differences between the genders.[14] These pooled coefficient predictions are more extreme (i.e. higher for females and lower for males) than the model predictions at the beginning of the sample, about equal to the model predictions in the middle of the sample and less extreme in the last ten years of the sample. On average, the pooled predictions would be close to the own-coefficient predictions for each gender signifying no behavioral differences and, consistent with results in the previous sub-section, attributing the gap between the predicted values to differences in the average values of the variables for the two genders. By 2005, the gap between the predicted values is 14 percentage points (the actual gap is 15 percentage points) but the gap between the pooled-coefficient female and male predictions is only 7 percentage points. Thus behavioral differences which are neutralized when using the pooled-coefficient predictions explain half the predicted gap and the remaining 7 point gap is entirely due to differences in the average values of the female and male characteristics. The only variable in Tables 7 and 9 that is gender-specific and can change through time (except for differences that may arise for compositional reasons and by chance) is the University Premium. Thus, as in the previous sub-section, the University Premium emerges as a variable to which particular attention should be paid. Nevertheless, Figures 2 and 3 provide a more detailed characterization of the temporal aspects of our results than section 4.1.

Table 11 provides, for the first and last year in the sample, more details on these points and, in light of the importance of this variable, for all six variants of the University Premium. Table 11 relies on the Linear Probability model. In this table, columns 1 and 2 provide the actual values (solid lines in Figure 1) and columns 3 and 4 the predicted values (solid lines in Figure 2) of the university participation rates of women and men. Column 5 shows the predicted participation gap between the genders (the

[14] Note that the Logit model's formulae have been used to generate all Logit predictions (whether based on the own or pooled coefficients) appearing in this paper.

difference between the solid lines in Figure 2). Columns 6 and 7 indicate the female and male participation rates that are predicted by the pooled coefficient estimates from column 5, Table 7. Column 8, Table 11, notes the distance between them (the distance between the broken lines in Figure 2). As already noted, this distance is entirely due to gender-conditioned differences in the average values of variables or characteristics. Since University Premium is in fact the only gender-conditioned variable, column 9 in Table 11 provides the difference between the female and male values of University Premium for each of the six variants explored in Table 6. Column 10 contains the coefficient on University Premium in the pooled equations for each of the six definitions of this variable. Column 11, which is the product of the difference between the female and male values of University Premium and the pooled coefficient on the University Premium, provides the part of the characteristics contribution (in column 8, Table 11) that can be explained by the University Premium itself. As can be seen by comparing the values in columns 11 and 8, Table 11, these are very close. That is, allowing for random differences in the average values of female and male characteristics as well as rounding, the difference in the University Premium for females and males is responsible for just about all the portion (i.e. column 8) that is due to characteristics. An alternative way to view the results that is more convenient for the Logit model below is that the sum of the figures in Columns (11) and (7) should produce something close to the female pooled coefficient predictions in column (6), all in Table 11; this is indeed the case.

An additional point in Table 11 is that the percentage point contribution of characteristics depends on the definition of the University Premium in a way that mirrors the decompositions in Table 10. As the definition shifts to longer, later and more coincident earning horizons and to the moving average over three years, the role of characteristics increases. That is, the numbers in column 11, Table 11, generally increase as we move downward. This is also the message in Table 10 and, in this sense, the decompositions in sections 4.1 and 4.2 are in agreement.

Table 12 provides a similar analysis for the Logit model. In this context, it is necessary to add the amounts in column 11 to the Index values that generated the male predictions in column 7 and then generate the predictions that appear in column 12 of that table. These should be close to the predictions for females in column 6, as is indeed the case. As in Table 11, the role of characteristics increases as the definition of the University Premium changes form annual to the three-year average and as the averaging window becomes longer and more coincident.

These findings enrich the picture supplied by the decompositions in section 4.1. The gap in the participation rates between women and men can be shown to be due to two forces: (i) Gender conditioned, individually small, differences in the coefficients that combine to explain about half of the 15 actual percentage point divergence that opened up by 2005 between the female and male participation rates and (ii) the difference between the values of the University Premium for women and men which explains the remaining half of the 2005 gender participation gap.

Until now, we have focused on the increase in the university participation gap between women and men. Doing so shifts attention away from the forces that shape the two participation rates in their own right (albeit differentially) over time. To redress that omission, we now describe how the overall predictions (the solid lines in Figures 2 and 3) are shaped by the regressors. This analysis is more lucidly carried out using the Linear Probability model. The predictions for women and men are constructed from 'time-invariant' regressors (such as the intercept, Children, Urban A and B, and Province) which, while they may change at random, do no have a strong time dimension and 'time-varying' regressors (such as Tuition, Income, parental education, University premium and Trend). Table 13 provides details, first for females and then for males, using the coefficients in Table 7; all numbers are in percentage points.

We first look at the part of Table 13 that deals with the predictions for women. The predicted values for 1977 and 2005 were 0.13 and 0.39 respectively (c.f. Table 11). In these same years, the overall contribution of the time-invariant regressors was -0.23 and -0.27 points respectively. Of the time-varying regressors, Trend contributed 0.01 points (1 times the coefficient of 0.0060979 in Table 7, rounded up) in 1977 and 0.18 points in 2005 (29 times 0.0060979 rounded up) for a difference of 0.17 points. These effects capture the influence of socioeconomic variables that cannot be modeled explicitly; however, doing so allows for a more accurate assessment of the role of other time-varying regressors. The parental education variables were the next most important factors. Note that the contribution of the

Head in single-parent households increased from 0.07 in 1977 to 0.13 in 2005 for a difference of 0.06 points. That is, the increase in educational attainment of Heads noted in section 3 over this period encouraged additional university participation equal to 6 percentage points. For couple-based households, the influence of the Head is lower (as per the negative coefficients in column 1, Table 7) but there is now the positive influence of the Spouse as well which contributes 0.02 in 1977 and 0.05 in 2005 for a difference of 0.03 points. The couple-based intercept contributes 0.02 points in both years (see column 1, Table 7). Thus parental forces increase university participation over time because parents become more educated, thereby encouraging more children to go to university. This influence is stronger in couple-based than single-parent households. To the best of our knowledge, these dynamic effects have never been quantified. The University Premium contributes 0.25 points in 1977 and 0.31 points in 2005 for an increase of 0.06 points. This is an important effect but smaller in quantitative importance than Trend and equal to the Head effect for single-parent households. It must be emphasized that, while this variable is third in rank (after Trend and the group of parental variables) in terms of contributing to the growth of the participation rate, it is nevertheless the only gender-conditioned variable which can account for the differential growth in the participation rate between women and men. Table 13 shows that Tuition exerted an increasingly depressing effect; it moderated the growth in the participation rate by 0.03 points between 1977 and 2005. Finally, the growth in real income (Income and Income2) increased the participation rate by 0.02 points. The effects of Tuition and real income are smaller than those of Trend, parental education and the University Premium.

The lower part of Table 13 provides the same analysis for men. The noteworthy difference is that the impact of the growth in the time-varying regressors is smaller, leading to smaller increases in predicted participation rates and a growing gap between the predictions for women and men. Note that the dynamic effects of parental education are smaller for males than females.

This analysis in this section complements and completes the average decompositions over the whole time period presented in the section 4.1. The average gap between the participation rates for women and men is indeed mostly due to differences in the University Premium. But this evaluation understates the role of Trend and the parental education variables in increasing the participation rate over time. The University Premium remains an important, albeit no longer the sole, force acting on the participation rate and it is the only force (beyond differences in coefficients) that can explain the increasing gap between the female and male participation rates.

4.3 Independent Households

For a variety of reasons, a number of young women and men aged 18-24 set up independent households, away from their parents. Since these individuals will not have children of their own aged 18-24, they are not captured in the sample that we have been examining so far. Nevertheless, they are likely to be engaged in the same decision processes as the young persons in our main sample and it is important to examine their behavior.

Doing so is challenging. To begin with, it is not clear how the parents of children in independent households respond to questions when surveyed. Depending on the live-away arrangements of the children and a host of other considerations, parents may still declare children as 'at home'. To the extent that this *always* happens, then our work above, while ignoring the fact that some children live independently and may be influenced by further considerations, nevertheless takes these individual observations into account. If this *never* happens, then what we have done so far is (except for the possibility of some sample selection issues being present) appropriate but it would be interesting to also consider the behavior of the independents.

An obstacle in proceeding is that the family background and circumstances (e.g. Income, Children, Head and Spouse educational attainment and area of residence) of an individual living independently is difficult to ascertain in many data sets. For example, including family variables in the data set for independents is not possible in the case of independent cross-sections such as the SCFs. However, the longitudinal nature of SLID makes it possible to connect (through the person identifiers and with some loss of information in the earliest years) young persons in independent households with their original families and to attach to the data set for these young persons the same family characteristics that we were able to include in Tables 7 and 9.[15] It is possible to analyze 8258 observations (4475 women and

[15] Thus, for the independents, Children and Income refer to the latest relevant value of these variables for the original family. Tuition and province were determined by the province of residence of the independent household.

3783 men) on independents[16] on the same basis as was done in earlier sections. This group can be compared to the 26604 young persons (12677 women and 13927 men), drawn from SLID, and included in the work of the earlier sections. This is a first stab at this problem with samples which are restricted to a very much shorter period and, especially when analyzed by gender, are relatively small.

We began by estimating separate Linear Probability and Logit equations for those living independently and at home, by gender. These equations are structurally distinct both when compared by gender and when compared by whether individuals are living independently or with parents. In this short period of time, the time-varying regressors (Tuition, University Premium and Trend) generally lose their usefulness with an important exception in the equations for females. The Linear Probability and Logit models for females living independently and with parents have positive coefficients for Trend which are statistically significant. This effect is stronger for women living independently. The parental educational attainment variables are considerably weaker, particularly for the small samples of women and men living independently. However, having a parent with a degree is always a positive, statistically significant, influence and it appears that the quantitative importance of the Head having a degree exceeds that of the Spouse.[17] Income and Children and their squares behave as in Tables 7 and 9, while some provincial effects continue to be important. These results are not reported in detail.

Having examined how far the sample can be explored in its most appropriate and disaggregated form, we then considered less ambitious specifications. In Tables 14 and 15, we report, for the Linear probability and Logit models respectively, specifications parallel to those in the rightmost columns of Tables 7 and 9 (pooled, with female dummy) but for the feasible SLID period, broken down by whether individuals live independently or with parents. While the equations are structurally distinct, the general conclusions drawn are qualitatively and, in many cases, quantitatively similar. The period is too short

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[16] More women than men are inclined to live independently. Card and Lemieux (1997, p.10) note that 'In both Canada and the US, young women are less likely to live with parents and more likely to head their own families than young men. In part this reflects the difference in average age at marriage … In addition, the much higher fraction of women who head their own single-parent family contributes to the male-female gap in living arrangements.' For Australia, see Cobb-Clark (2008). Here, we assume that living arrangements are exogenous.

[17] The only exception is the case of males living independently in the Linear Probability model and then only once the additional spouse effect is taken into account.

for any of the equations to pick up effects from Tuition and the University Premium, though the latter reasserts itself when Female is excluded and economic variables are forced to pick up the slack. Even Trend is considerably weakened. It is, however, statistically significant in the leftmost columns of Tables 14 and 15 where all children are considered. It is also significant in the equations for those living independently, echoing the result noted in the previous paragraph. Income and Children have the familiar positive, but at a decreasing rate, influence on the probability of attending university. The coefficients on Urban A and B are generally higher for those living independently. The educational attainment variables are clearest in the case of Degree and quantitatively stronger for those living at home. As in the case of the main general results in section 4.1, the propensity to attend university is higher in the maritime and prairie provinces than is the case in the omitted category of British Columbia.

In short, the results in this sub-section suggest that, notwithstanding the statistical distinctness of the two groups, the probability of attending university by individuals living independently is shaped by the same forces and in generally similar ways as that for individuals living at home.

5. Conclusion

In Canada, females now have a larger share than males in university enrolments. We used the master files of SCF (1977-1997) and SLID (1998-2005) to investigate the forces that shape university participation as well as the imbalance between the genders in Canada. The Master Files have to be used physically in designated Statistics Canada Data Resource Centres and results obtained must be approved and released. These features make it difficult and time consuming to process the available information. On the other hand, the Master Files offer several advantages. To begin with, it is possible to establish the gender of each child in an economic family and to treat these individuals as the unit of analysis. Secondly, it is possible to establish whether a child in an economic family attended college or university (rather than simply tertiary education), thus making it possible to focus on university participation rates where the divergence between the participation of females and males has occurred - college participation rates for women and men are very similar. While the individual female and male children can be the unit of analysis, it is nevertheless useful to attach to each child important family characteristics such as income and the education of the Head and Spouse in the family. In addition, it is possible to minimize the seam between the SCF and the SLID by adopting the SCF convention regarding the definition of the household Head in the SLID period. Finally, using the panel structure of SLID, we were able to connect young adults living in their own independent households with their families of origin, thus attaching to them information on important family variables; this made it possible to begin a comparison of the determinants of university participation for individuals living at home and those in independent households. These refinements are not possible when Public Use Files are used. In addition to data from the SCF and SLID, we also include information on Tuition fees and several definitions of the University Premium and consider the role of these forces on the decision to attend university. We do so while allowing for broad socioeconomic secular forces that increase university attendance but are impossible to disentangle.

Participation rates were estimated using both the Linear Probability and Logit models, thus conducting a useful robustness check on our results. The predictive power of these models is high and both predict the increasing participation rates for women and men, as well as the increasing gap between the two, satisfactorily. The results obtained were analyzed using decomposition techniques suitable to both linear and non-linear models and looking at experience when averaged over the entire sample period and at each point in time. The whole-sample decompositions of the role of variables and coefficients indicate that differences between women and men are on average due to both differences in variables (notably the University Premium) and coefficients, with the mix between them tilting much more towards variables as the University Premium definition shifts to longer, more coincident, earning horizons and the three year moving average definition. Looking at the growth in the participation rates for women and men through time, the 15 percentage point actual gap in the participation rates that opened up by 2005 can be explained approximately equally by differences in the coefficients on the variables entering the female and male equations and by gender differences in the value of the University Premium. As with the whole-sample decompositions, the moving average definitions of the University Premium tend to suggest that a higher proportion of the participation gap can be explained by differences in variables than is the case with the annual and shorter horizon definitions. The predicted values of the female and male participation rates grow over time to reflect the broad influence of socioeconomic trends but also the increasing importance of parental education: As parents become more educated, their children are more likely to go to university. We provide what may be the first quantitative estimates of this long-run dynamic. The University Premium remains an important secular force on the predicted participation rates and it is about as important quantitatively as the parental effects. In this long period that we were able to examine in a consistent manner, tuition fee increases undoubtedly moderated the growth in university attendance. This effect, which can only be picked up over long periods, is weaker quantitatively than that of the University Premium. The growth in real income does stimulate university attendance, as might be expected, but this force is less powerful than any of the other secular forces just mentioned.

The increasing gender imbalance in university attendance reflects, to an extent, the difference in the returns to a university education for the different genders. As the supply of highly educated women rises relative to that of men, a natural equilibrating process may occur and the difference in post-secondary attendance rates may stabilize. Among those without a post-secondary education, men (on average) earn more than women. This difference is at least somewhat offset by the increasing relative education levels of women. Thus, the higher post-secondary attendance rate of women may not be something that should be rectified through programs that promote more male versus female post-secondary attendance. In fact, through simulation exercises, Shannon and Kidd (2001) note that, although the higher rate of university participation (in Canada) by women may help redress the overall imbalance in male-female earnings, they project that the overall earnings advantage of males is unlikely to be eliminated within the next three decades.

Others have suggested possible problems arising from this gap, such as the difficulty that highly educated women will have in marrying men of equally high education levels (e.g., see Evers, Livernois, and Mancuso (2004)). However, it is not clear that there is any role for policy in removing this cause of this imbalance (i.e., the higher returns for women) or to subsidize more highly the cost of education for males.

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Figure 1
Proportion of Females and Males at University and College for Selected Years

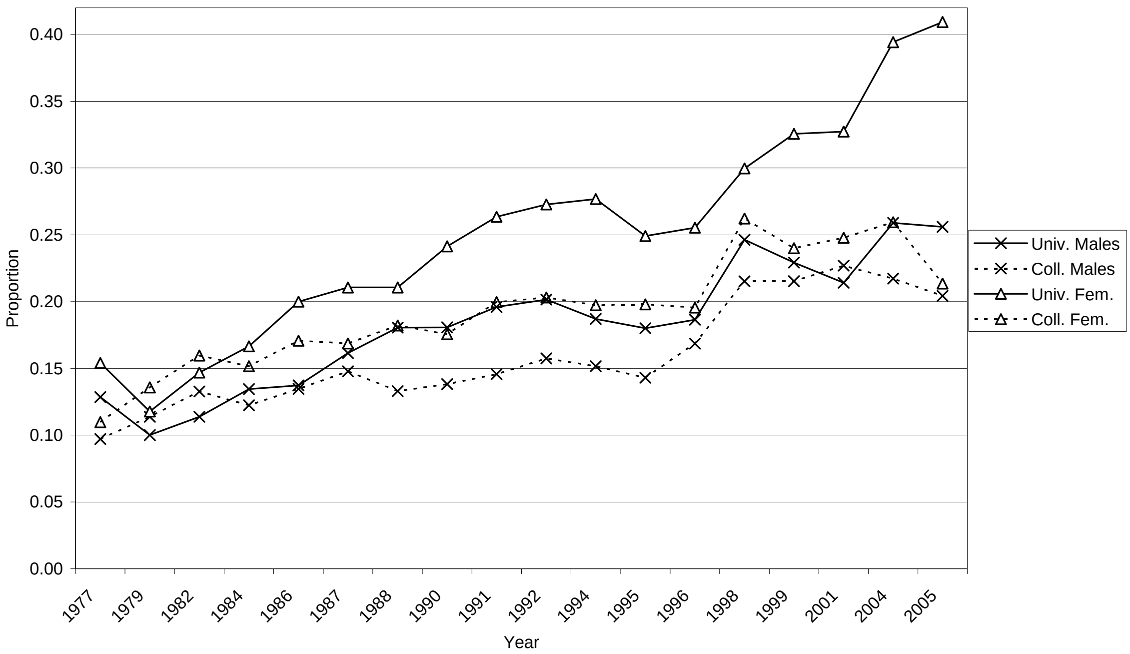

Figure 2
Linear Probability Predictions Using Own and Pooled Coefficients

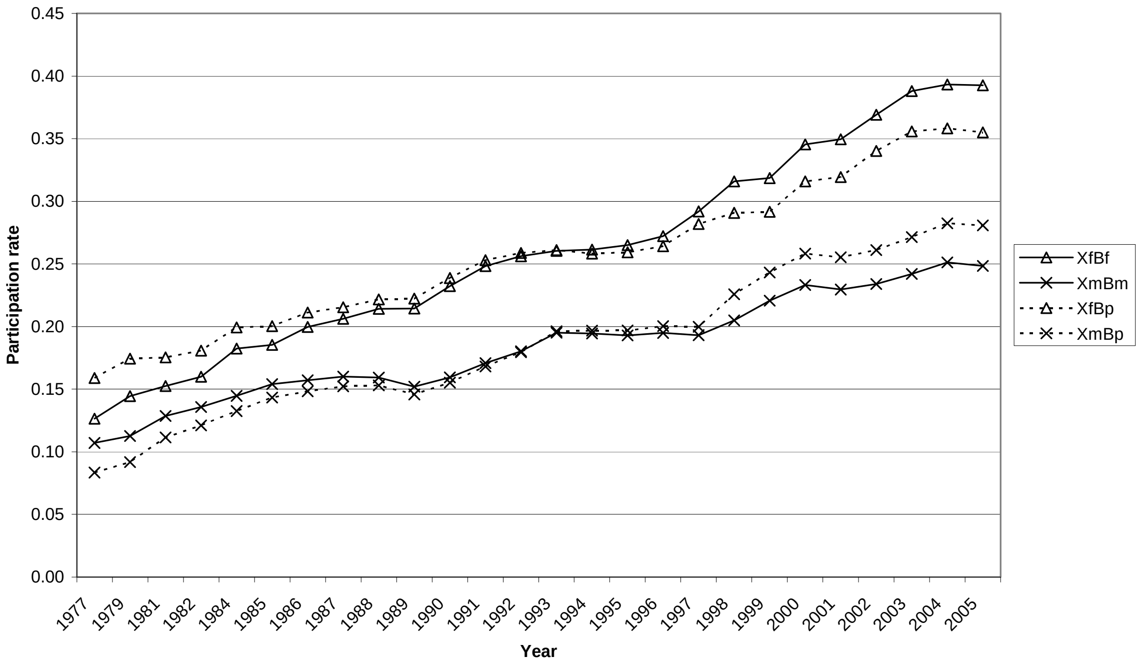

Figure 3
Logit Predictions Using Own and Pooled Coefficients

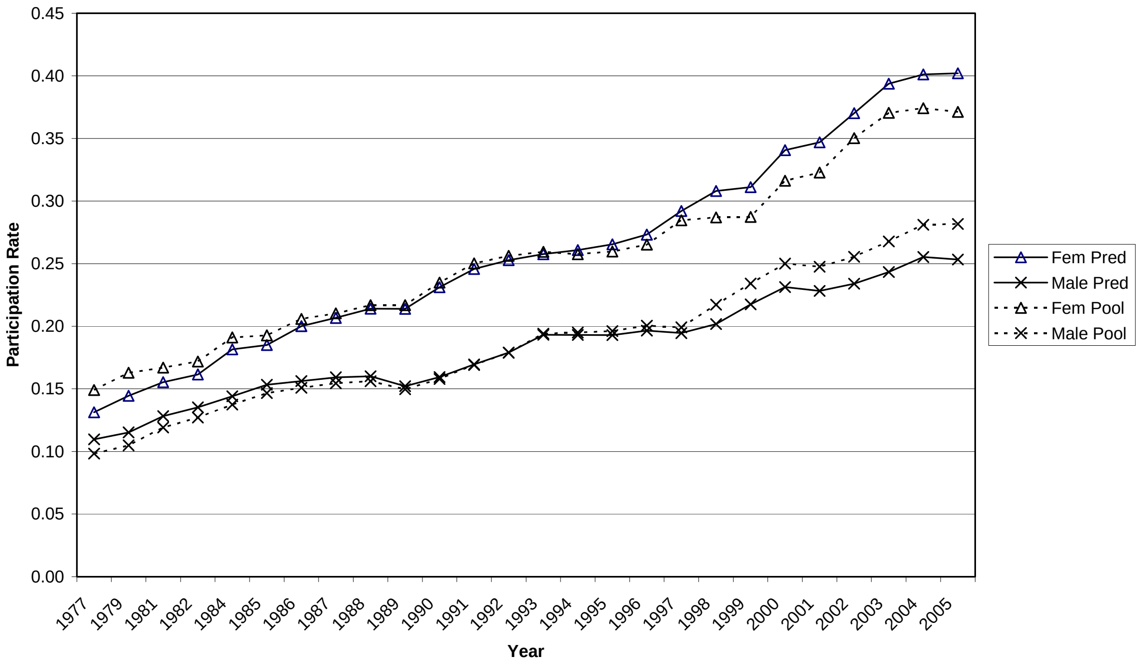

Table 1
The Proportion of Females and Males at University and College (1977-2005)

Year	Females at University	Males at University	Females at College	Males at College
1979	0.12	0.10	0.14	0.11
1984	0.17	0.13	0.15	0.12
1988	0.21	0.18	0.18	0.13
1994	0.28	0.19	0.20	0.15
1999	0.33	0.23	0.24	0.22
2005	0.41	0.26	0.21	0.20

Source: SCF and SLID, various years. A number such as 0.12 for Females at University in 1979 indicates that of all female children in families with children aged (18-24) the proportion of female children attending university was on average equal to 0.12.

Table 2
Proportion of Females Between 18-24 at University by Income Quintile

	Family Income Quintiles				
Year	First	Second	Third	Fourth	Fifth
1979	0.09	0.09	0.12	0.15	0.14
1984	0.07	0.11	0.14	0.21	0.28
1988	0.13	0.17	0.21	0.18	0.35
1994	0.18	0.22	0.26	0.29	0.42
1999	0.24	0.28	0.31	0.34	0.46
2005	0.30	0.32	0.40	0.45	0.59

Source: SCF and SLID, various years. A number such as 0.09 for the first quintile in 1979 indicates that the proportion of female children attending university was on average equal to 0.09.

Table 3
Proportion of Males Between 18-24 at University by Income Quintile

	Family Income Quintiles				
Year	First	Second	Third	Fourth	Fifth
1979	0.07	0.08	0.12	0.12	0.11
1984	0.06	0.07	0.10	0.15	0.29
1988	0.11	0.14	0.14	0.22	0.29
1994	0.12	0.16	0.17	0.20	0.29
1999	0.17	0.20	0.20	0.19	0.37
2005	0.13	0.29	0.22	0.28	0.39

Source: SCF and SLID, various years. A number such as 0.07 for the first quintile in 1979 indicates that the proportion of male children attending university was on average equal to 0.07.

Table 4
Proportion of Females Between 18-24 at University by Income Group (1992 Constant Dollars)

	Year					
Income Range ($)	1979	1984	1988	1994	1999	2005
0-20,000	0.09	0.07	0.12	0.17	0.31	0.30
20,001-30,000	0.08	0.11	0.15	0.20	0.22	0.31
30,001-40,000	0.11	0.14	0.21	0.25	0.31	0.30
40,001-50,000	0.16	0.16	0.19	0.24	0.28	0.34
50,001-60,000	0.13	0.27	0.25	0.35	0.30	0.50
60,001-70,000	0.15	0.20	0.30	0.32	0.39	0.43
70,001-80,000	0.16	0.24	0.40	0.60	0.40	0.48
80,000+	0.12	0.43	0.37	0.45	0.55	0.63

Source: SCF and SLID, various years.

Table 5
Proportion of Males Between 18-24 at University by Income Group (1992 constant dollars)

	Year					
Income Range ($)	1979	1984	1988	1994	1999	2005
0-20,000	0.07	0.06	0.10	0.13	0.18	0.09
20,001-30,000	0.09	0.07	0.14	0.14	0.18	0.18
30,001-40,000	0.08	0.10	0.15	0.15	0.21	0.33
40,001-50,000	0.13	0.13	0.16	0.19	0.19	0.21
50,001-60,000	0.11	0.19	0.27	0.21	0.19	0.22
60,001-70,000	0.12	0.25	0.22	0.22	0.23	0.32
70,001-80,000	0.09	0.32	0.32	0.29	0.32	0.31
80,000+	0.15	0.41	0.37	0.39	0.49	0.42

Source: SCF and SLID, various years.

Table 6
Three Definitions of University Premium by Gender: Annual Version and Moving Average Version

	Annual Version						Three-Year Moving Average Version					
	Age (25-29)/(19-23)		Age (25-34)/(19-28)		Age (25-34)/(25-34)		Age (25-29)/(19-23)		Age (25-34)/(19-28)		Age (25-34)/(25-34)	
Year	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male
1977	1.96	1.68	1.89	1.55	1.68	1.25	1.89	1.64	1.82	1.56	1.61	1.24
1979	1.86	1.63	1.80	1.56	1.66	1.25	1.90	1.63	1.83	1.55	1.69	1.21
1981	1.84	1.65	1.82	1.59	1.62	1.27	1.84	1.65	1.78	1.59	1.59	1.25
1982	2.10	1.84	1.87	1.53	1.64	1.20	1.92	1.72	1.80	1.58	1.59	1.24
1984	2.14	2.01	1.93	1.66	1.67	1.25	2.11	1.95	1.91	1.68	1.66	1.27
1985	2.34	1.95	1.94	1.74	1.65	1.29	2.19	2.00	1.93	1.75	1.67	1.30
1986	2.19	1.97	1.97	1.70	1.58	1.27	2.22	1.98	1.95	1.70	1.63	1.27
1987	2.14	1.89	1.93	1.64	1.57	1.25	2.23	1.94	1.94	1.69	1.60	1.27
1988	2.21	1.78	2.06	1.64	1.70	1.21	2.18	1.88	1.99	1.66	1.62	1.24
1989	2.30	2.12	2.15	1.73	1.73	1.27	2.22	1.93	2.05	1.67	1.67	1.24
1990	2.46	2.02	2.20	1.78	1.75	1.28	2.32	1.97	2.14	1.72	1.73	1.25
1991	2.56	2.40	2.17	1.97	1.70	1.34	2.44	2.18	2.17	1.83	1.73	1.30
1992	2.55	2.45	2.32	1.97	1.80	1.39	2.48	2.30	2.23	1.91	1.75	1.34
1993	2.95	2.36	2.59	2.02	1.83	1.35	2.65	2.41	2.36	1.99	1.78	1.36
1994	2.79	2.25	2.22	1.93	1.65	1.35	2.75	2.36	2.37	1.97	1.76	1.37
1995	2.60	2.15	2.52	1.96	1.76	1.31	2.78	2.25	2.44	1.97	1.75	1.34
1996	2.72	2.13	2.28	1.76	1.90	1.20	2.65	2.18	2.34	1.88	1.77	1.29
1997	2.84	2.23	2.63	1.93	1.80	1.36	2.65	2.17	2.48	1.88	1.82	1.29
1998	2.79	1.96	2.65	1.94	1.84	1.44	2.72	2.11	2.52	1.87	1.85	1.33
1999	2.70	1.93	2.31	1.93	1.74	1.36	2.75	2.04	2.53	1.93	1.79	1.39
2000	2.37	2.07	2.48	2.04	2.00	1.44	2.60	1.99	2.48	1.97	1.86	1.41
2001	2.53	2.01	2.50	2.07	1.92	1.49	2.51	2.00	2.43	2.02	1.88	1.43
2002	2.49	2.17	2.26	1.99	1.95	1.43	2.46	2.08	2.41	2.04	1.96	1.45
2003	3.04	2.26	2.55	2.18	1.91	1.50	2.69	2.15	2.44	2.08	1.93	1.47
2004	2.77	2.36	2.65	2.13	2.02	1.51	2.77	2.27	2.48	2.10	1.96	1.48
2005	2.51	1.87	2.41	2.05	2.16	1.61	2.77	2.16	2.54	2.12	2.03	1.54

Table 7
Linear Probability Determinants of University Attendance: Female, Male and Pooled Results (1977-2005; sample weights used)

	Females		Males		Pooled Sample (no female dummy)		Pooled Sample (female dummy)	
Variable	Coefficient	Coef/se	Coefficient	Coef/se	Coefficient	Coef/se	Coefficient	Coef/se
Tuition	-0.0000199	-2.33	-0.0000167	-2.39	-0.0000186	-5.01	-0.0000170	-3.14
Income	1.04E-06	7.63	1.05E-06	8.63	1.04E-06	20.10	1.04E-06	11.13
Income 2	-4.77E-13	-4.91	-7.73E-13	-6.61	-6.41E-13	-10.65	-6.41E-13	-5.14
Children	0.0614081	4.95	0.0653865	6.70	0.064441	10.80	0.0644132	8.33
Children 2	-0.0098714	-3.41	-0.0130771	-5.89	-0.0118147	-8.13	-0.0118232	-6-64
Urban A	0.0260031	3.43	0.0338630	5.70	0.0298078	7.01	0.0297369	6.31
Urban B	0.0502279	9.97	0.0683330	17.82	0.0600659	23.71	0.0599055	19.43
Education								
Single Parents: head								
High School	0.0610732	4.66	0.0369246	3.87	0.0476972	6.86	0.0474613	6.07
Some Postsec.	0.0976347	4.20	0.0750185	4.20	0.0840190	8.16	0.0836992	5.81
Postsec. Dipl.	0.1088165	7.27	0.0540354	4.70	0.0793016	10.94	0.0788444	8.50
Degree	0.2961827	12.94	0.2079438	10.36	0.2495233	27.45	0.2489971	16.43
Couples: add. head effect								
Intercept	0.0202224	2.09	0.0053340	0.75	0.0119266	2.14	0.0118386	2.04
High School	-0.0135416	-0.91	0.0074378	0.68	-0.0020083	-0.26	-0.0019093	-0.21
Some Postsec.	-0.0312701	-1.18	-0.0379215	-1.87	-0.0354849	-3.06	-0.0351947	-2.16
Postsec. Dipl.	-0.0514525	-3.05	-0.0065263	-0.51	-0.0281605	-3.49	-0.0277442	-2.66
Degree	-0.0810500	-3.22	-0.0148570	-0.68	-0.0469392	-4.68	-0.0465174	-2.80
Couples: spouse effect								
High School	0.0278135	3.87	0.0173897	3.16	0.0221024	6.56	0.0219947	4.99
Some Postsec.	0.0766240	5.81	0.0260692	2.61	0.0485650	8.95	0.0483748	5.97
Postsec. Dipl.	0.0643379	7.35	0.0578851	8.36	0.0612938	15.87	0.0612343	11.22
Degree	0.1577894	11.30	0.1384067	11.27	0.1479265	27.68	0.1478312	16.03
Province								
Newfoundland	-0.0029532	-0.15	0.0059060	0.46	-0.0096496	-1.20	0.0119421	1.17
Prince Ed. Isl.	0.1356544	9.76	0.0813480	6.60	0.1025282	6.76	0.1092517	12.21
Nova Scotia	0.0703252	5.34	0.0610942	6.17	0.0612371	8.31	0.0680202	8.63
New Brunswick	0.0877716	6.76	0.0727207	7.46	0.0745327	9.92	0.0838111	10.97
Quebec	0.0074232	0.65	-0.0168796	-1.72	-0.0092436	-2.12	-0.0028698	-0.40
Ontario	0.0344830	3.72	0.0177559	2.27	0.0236430	6.03	0.0271559	4.57
Manitoba	0.0653813	5.36	0.0665714	6.87	0.0644610	9.87	0.0679114	8.96
Saskatchewan	0.0493094	3.98	0.0708657	7.83	0.0604766	8.29	0.0654716	9.01
Alberta	-0.0103200	-0.92	0.0083104	0.95	-0.0014732	-0.29	0.0020559	0.30
Female	n/a	n/a	n/a	n/a	n/a	n/a	0.0169434	2.80
Univ. Premium	0.1545524	7.65	0.1656373	6.55	0.1781319	33.32	0.1415168	10.41
Time Trend	0.0060979	10.37	0.0023657	4.83	0.0038825	13.49	0.0039711	10.50
S	0.0196674	1.84	-0.0006521	-0.07	0.0091324	2.02	0.0107282	1.56
Constant	-0.3599068	-11.13	-0.2920843	-9.68	-0.3428998	-31.35	-0.3064269	-17.15
Number of obs.		57109		74131		131240		131240
R Squared		0.1124		0.0958		0.1090		0.1091

Table 8
Decompositions Focusing on Role of Characteristics

	OaxacaRansom Decomposition	**Fairlie Decomposition Switching From Female to Male**			**Fairlie Decomposition Switching From Male to Female**		
Weights		Female	Male	None	Female	Male	None
Female's Participation Rate	0.2558	0.2558	0.2558	0.2558	0.2558	0.2558	0.2558
Male's Participation Rate	0.1784	0.1784	0.1784	0.1784	0.1784	0.1784	0.1784
Gender Imbalance	0.0774	0.0774	0.0774	0.0774	0.0774	0.0774	0.0774
Difference Due to Tuition	-0.0011	-0.0037	-0.0025	-0.0018	-0.0012	-0.0003	-0.0006
Percentage Due to Tuition	-1.36%	-4.78%	-3.17%	-2.35%	-1.54%	-0.38%	-0.83%
Standard Error	0.00021	0.00004	0.00003	0.00078	4.1E-6	5.8E-6	0.00007
Difference Due to Income and Income 2	0.0011	0.0023	0.0004	0.0008	0.0032	0.0016	0.0030
Percentage Due to Income and Income 2	1.49%	2.92%	0.58%	1.01%	4.19%	2.12%	3.86%
Standard Error	0.00006	6.9E-6	2.2E-6	0.00006	0.00001	5.5E-6	0.00015
Difference Due to University Premium	0.0631	0.0615	0.0744	0.0615	0.0559	0.0699	0.0565
Percentage Due to University Premium	81.56%	79.49%	96.1%	79.46%	72.18%	90.29%	72.98%
Standard Error	0.00189	0.00011	0.00013	0.00189	0.00010	0.00012	0.00171
Difference Due to All Characteristics	0.0733	0.0799	0.0823	0.0708	0.0799	0.0823	0.0708
Percentage Due to All Characteristics	94.69%	103.27%	106.37%	91.5%	103.27%	106.37%	91.5%

Table 9
Logit Determinants of University Attendance: Female, Male and Pooled Results (1977-2005; sample weights used)

	Female			Male			Pooled (No Female Dummy)			Pooled (Female Dummy included)		
Variable	Coef.	Coef/se	Marg. Effect	Coef.	Coef/se	Marg. Effect	Coef.	Coef/se	Marg. Effect	Coef.	Coef/se	Marg. Effect
Tuition	-0.0001767	-3.42	-0.0000117	-0.0001413	-2.65	-5.79E-06	-0.0001658	-4.53	-8.68E-06	-0.0001503	-4.06	-7.03E-06
Income	5.27E-06	7.19	3.48E-07	6.05E-06	8.48	2.48E-07	5.68E-06	11.16	2.98E-07	5.70E-06	11.20	2.67E-07
Income 2	-2.07E-12	-2.74	-1.37E-13	-4.66E-12	-5.67	-1.91E-13	-3.68E-12	-6.34	-1.93E-13	-3.69E-12	-6.49	-1.73E-13
Children	0.3767412	4.40	0.0248771	0.5761560	6.08	0.0236160	0.4732008	7.45	0.0247750	0.4719055	7.42	0.0220877
Children 2	-0.0633471	-2.96	-0.0041830	-0.1233007	-5.10	-0.0050540	-0.0919830	-5.74	-0.0048159	-0.0918830	-5.74	-0.0043006
Urban A	0.1724363	3.66	0.0122630	0.3211745	6.59	0.0152766	0.2424843	7.18	0.0141519	0.2413713	7.16	0.0126081
Urban B	0.3202448	10.23	0.0242736	0.5797270	18.05	0.0311510	0.4476987	20.04	0.0286686	0.4455510	19.95	0.0255676
Education												
Single Parents: head												
High School	0.6072919	4.75	0.0520744	0.5824132	4.40	0.0313352	0.6033798	6.56	0.0414625	0.6010696	6.54	0.0370671
Some Postsec.	0.8796876	5.35	0.0846318	0.9371017	5.55	0.0596711	0.9121745	7.75	0.0720475	0.9088292	7.73	0.0646251
Postsec. Dipl.	0.9495361	7.85	0.0940371	0.7700033	5.67	0.0452887	0.8837381	9.83	0.0689180	0.8790802	9.78	0.0616580
Degree	1.8184980	13.59	0.2493797	1.7011610	12.07	0.1540812	1.7682310	18.29	0.2004685	1.7634250	18.24	0.1827148
Couples: add head effect												
Intercept	0.3292985	3.05	0.0250575	0.2705141	2.33	0.0125656	0.3053657	3.86	0.0183346	0.3043269	3.84	0.0163627
High School	-0.2591774	-1.89	-0.0153248	-0.1299512	-0.92	-0.0050212	-0.2007914	-2.04	-0.0096215	-0.1997136	-2.03	-0.0085496
Some Postsec.	-0.4246182	-2.38	-0.0234220	-0.5316215	-2.90	-0.0172056	-0.4876547	-3.81	-0.0206478	-0.4843924	-3.79	-0.0183161
Postsec. Dipl.	-0.5470512	-4.19	-0.0286816	-0.2958376	-2.04	-0.0106133	-0.4472871	-4.64	0.0192669	-0.4430051	-4.59	-0.0170519
Degree	-0.7228357	-5.00	-0.0352723	-0.5170937	-3.42	-0.0168404	-0.6317613	-6.07	0.0251744	-0.6271592	-6.03	-0.0223182
Couples: spouse effect												
High School	0.2161986	4.35	0.0156680	0.2048300	3.96	0.0092276	0.2115484	5.91	0.0121756	0.2107579	5.89	0.0108558
Some Postsec.	0.4701026	6.61	0.0380083	0.2718594	3.73	0.0126360	0.3742205	7.36	0.0231792	0.3724107	7.33	0.0206610
Postsec. Dipl.	0.4006233	7.65	0.0314366	0.4724941	8.73	0.0241327	0.4385273	11.67	0.0279649	0.4375672	11.64	0.0250170
Degree	0.7759056	11.24	0.0714697	0.7863985	11.36	0.0466149	0.7846000	16.08	0.0585192	0.7836485	16.06	0.0525928
Province												
Newfoundland	0.0627180	0.53	0.0042545	0.0698174	0.67	0.0029549	-0.1147136	-1.97	-0.0057086	0.1355129	1.87	0.0067444
Prince Edward Island	0.8515727	10.68	0.0809712	0.7110633	8.01	0.0406665	0.7418157	13.14	0.0542704	0.8078691	14.06	0.0548294
Nova Scotia	0.5015947	6.13	0.0411070	0.4890420	6.17	0.0251740	0.4321715	7.79	0.0274803	0.5087324	9.01	0.0300591
New Brunswick	0.5883189	7.60	0.0500401	0.5894787	7.82	0.0318218	0.5152304	10.34	0.0340185	0.6153987	11.74	0.0382036
Quebec	0.0325852	0.48	0.0021820	-0.1302272	-1.80	-0.0050312	-0.0820854	-1.76	-0.0041441	-0.0229763	-0.48	-0.0010643
Ontario	0.2502613	4.29	0.0184050	0.1611435	2.65	0.0071138	0.1855200	4.48	0.0105533	0.2199603	5.28	0.0113776
Manitoba	0.3826296	5.44	0.0297928	0.4743263	6.93	0.0242473	0.4045157	8.38	0.0254016	0.4391300	9.00	0.0251245
Saskatchewan	0.3291535	4.52	0.0250449	0.5308633	8.02	0.0278727	0.3961657	8.30	0.0247834	0.4495624	9.25	0.0258457
Alberta	-0.0205627	-0.30	-0.0013459	0.0675350	1.02	0.0028553	-0.0093071	-0.20	-0.0004853	0.0297980	0.63	0.0014136
Female	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.1729961	4.57	0.0087583
University Premium	0.7700477	6.93	0.0508481	1.0576700	6.00	0.0433528	1.1232410	24.39	0.0588087	0.7585529	9.34	0.0355043
Time Trend	0.0448547	10.99	0.0029619	0.0222393	5.22	0.0009116	0.0324313	11.03	0.0016980	0.0335626	11.34	0.0015709
S	0.0653028	1.12	0.0044347	-0.0253875	-0.41	-0.0010286	0.0165667	0.39	0.0008738	0.0324493	0.77	0.0015412
Constant	-4.8480430	-23.84		-5.3423280	-22.09		-5.3668770	-45.00		-5.0087530	-37.86	
Number of obs.		57109			74131			131240			131240	
Log Likelihood		-29304			-31439			-60950			-60932	

Table 10
Percentage of Gender Participation Gap Explained by University Premium

	Annual Version			Three-Year Moving Average Version		
	(25-29)/(19-23)	(25-34)/(19-28)	(25-34)/(25-34)	(25-29)/(19-23)	(25-34)/(19-28)	(25-34)/(25-34)
LINEAR PROBABILITY						
Without Female Dummy	28.53	43.00	64.39	42.75	66.59	81.56
With Female Dummy	12.00	18.92	30.62	19.21	41.69	64.79
LOGIT						
Without Female Dummy						
Female to Male						
Female Weight	30.53	44.00	61.68	46.40	71.58	79.49
Male Weight	37.97	54.38	75.28	56.93	86.40	96.10
No Weight	32.00	45.87	62.57	50.83	72.15	79.46
Male to Female						
Female Weight	4.28	33.00	55.19	33.23	54.22	72.18
Male Weight	1.75	44.16	70.74	43.77	68.92	90.29
No Weight	4.20	35.19	57.35	35.88	54.73	72.98
With Female Dummy						
Female to Male						
Female Weight	10.21	16.06	23.35	17.01	37.73	51.84
Male Weight	12.41	18.76	27.73	19.98	44.96	62.10
No Weight	11.61	18.39	23.89	20.63	37.93	44.56
Male to Female						
Female Weight	7.49	12.00	20.59	12.02	27.92	46.68
Male Weight	10.17	15.17	26.31	15.69	35.59	58.52
No Weight	8.67	14.11	21.98	14.81	28.64	41.06

Table 11
Linear Probability Participation Rates and Their Temporal Decomposition

	(1) Actual Fem.	(2) Actual Male	(3) $X_f\beta_f$	(4) $X_m\beta_m$	(5) (3)-(4)	(6) $X_f\beta_p$	(7) $X_m\beta_p$	(8) (6)-(7)	(9) P_f - P_m	(10) $\beta_{prem.}$	(11) (9)×(10)
Annual Version											
Age (25-29)/(19-23)											
1977	0.15	0.13	0.12	0.11	0.01	0.14	0.11	0.03	.28	0.064339	0.02
2005	0.41	0.26	0.38	0.24	0.14	0.31	0.27	0.04	.64		0.04
Age (25-34)/(19-28)											
1977	0.15	0.13	0.12	0.11	0.01	0.15	0.10	0.05	.34	0.101913	0.04
2005	0.41	0.26	0.39	0.24	0.15	0.33	0.28	0.05	.36		0.04
Age (25-34)/(25-34)											
1977	0.15	0.13	0.13	0.10	0.03	0.16	0.08	0.08	.43	0.140225	0.06
2005	0.41	0.26	0.39	0.25	0.14	0.35	0.29	0.06	.55		0.08
Moving Average Version											
Age (25-29)/(19-23)											
1977	0.15	0.13	0.12	0.11	0.01	0.14	0.11	0.03	.25	0.102378	0.03
2005	0.41	0.26	0.38	0.24	0.14	0.33	0.27	0.06	.61		0.06
Age (25-34)/(19-28)											
1977	0.15	0.13	0.12	0.11	0.01	0.14	0.10	0.04	.26	0.164427	0.04
2005	0.41	0.26	0.38	0.24	0.14	0.34	0.28	0.06	.42		0.07
Age (25-34)/(25-34)											
1977	0.15	0.13	0.13	0.11	0.02	0.16	0.08	0.08	.37	0.178132	0.07
2005	0.41	0.26	0.39	0.25	0.14	0.35	0.28	0.07	.49		0.09

Notes:

Col. 5: The gap between the female and male predicted participation rates using the own Linear Probability coefficients in columns 1 and 3, Table 7, respectively.
Col. 6: The predictions of the female participation rate using the pooled linear probability coefficients in column 5, Table 7.
Col. 7: The predictions of the male participation rate using the pooled linear probability coefficients in column .5, Table 7.
Col. 8: The difference between the predicted female and male values using the pooled coefficients in column 5, Table 7. This amount must be due to differences in the values of variables.
Col. 9: The difference between the female and male values of the University Premium in Table 6.
Col. 10: The coefficient on University Premium in pooled equations such as that (for the Jacob, moving average definition) of column 5, Table 7.
Col. 11: The contribution of University Premium to the gap in column 8 of this table that is due to differences in the variable values of the two genders. The sum of columns (7) and (11) should produce a figure that is close to the pooled female predictions in column (6). Remaining discrepancies are due to random differences in the yearly average values of other variables for the two genders and due to rounding.

Table 12
Logit Participation Rates and Their Temporal Decomposition

	(1) Actual Fem.	(2) Actual Male	(3) Fem Pred	(4) Male Pred	(5) (3)-(4)	(6) Fem Pool	(7) Male Pool	(8) (6)-(7)	(9) P_f - P_m	(10) $\beta_{prem.}$	(11) (9)×(10)	(12)
Annual Version												
Age (25-29)/(19-23)												
1977	0.15	0.13	0.13	0.11	0.02	0.13	0.11	0.02	.28	0.394365	0.110422	0.12
2005	0.41	0.26	0.39	0.24	0.15	0.32	0.27	0.05	.64		0.252394	0.32
Age (25-34)/(19-28)												
1977	0.15	0.13	0.13	0.11	0.02	0.14	0.11	0.03	.34	0.611423	0.207884	0.13
2005	0.41	0.26	0.40	0.25	0.15	0.34	0.29	0.05	.36		0.220112	0.34
Age (25-34)/(25-34)												
1977	0.15	0.13	0.13	0.11	0.02	0.15	0.10	0.05	.43	0.868055	0.373264	0.14
2005	0.41	0.26	0.40	0.25	0.15	0.36	0.29	0.07	.55		0.47743	0.40
Moving Average Version												
Age (25-29)/(19-23)												
1977	0.15	0.13	0.13	0.11	0.02	0.13	0.11	0.02	.25	0.636267	0.159067	0.13
2005	0.41	0.26	0.39	0.24	0.15	0.34	0.27	0.07	.61		0.388123	0.35
Age (25-34)/(19-28)												
1977	0.15	0.13	0.13	0.11	0.02	0.14	0.11	0.03	.26	1.010846	0.26282	0.14
2005	0.41	0.26	0.39	0.25	0.14	0.35	0.28	0.07	.42		0.424555	0.37
Age (25-34)/(25-34)												
1977	0.15	0.13	0.13	0.11	0.02	0.15	0.10	0.05	.37	1.123241	0.415599	0.14
2005	0.41	0.26	0.40	0.25	0.15	0.37	0.28	0.09	.49		0.550388	0.40

Notes:

Col. 5: The gap between the female and male predicted participation rates using the own Logit coefficients from columns 1 and 4, Table 9, respectively.
Col. 6: The predictions of the female participation rate using the pooled Logit coefficients in column 7, Table 9.
Col. 7: The predictions of the male participation rate using the pooled Logit coefficients in column 7, Table 9.
Col. 8: The difference between the predicted female and male values using the pooled coefficients in column 7, Table 9. This amount must be due to differences in the values of variables.
Col. 9: The difference between the female and male values of the University Premium in Table 6.
Col. 10: The marginal effect of the University Premium from pooled equations such as that (for the Jacob, moving average definition) of column 7, Table 9.
Col. 11: The product of the difference in the University Premium and the marginal effect. This amount is used to calculate the impact on the predicted values in column 12.
Col. 12: This is obtained, using the prediction formulae for the Logit model, by adding the amounts in column (11) to the Index values that generated the male pooled predictions that appear in column (7) and recalculating. The ensuing probabilities should be close to the female pooled coefficient probability predictions in column (6). Remaining discrepancies between the figures in columns (6) and (12) are due to random differences in the yearly average values of the other variables for the two genders, to rounding and non-linearities.

Table 13
The Influence of Time-Invariant and Time-Varying Regressors on Predicted Participation (in probability points)

	Prediction	Time-Invariant	Time-Varying							
				Parental Education						
			Trend	Single Head	Couple Add Head	Couple-Spouse	Couple-Interc.	Premium	Tuition	Income
Female										
1977	0.13	-0.23	0.01	0.07	-0.02	0.02	0.02	0.25	-0.03	0.04
2005	0.39	-0.27	0.18	0.13	-0.03	0.05	0.02	0.31	-0.06	0.06
Difference	0.26	-0.04	0.17	0.06	-0.01	0.03	0.00	0.06	-0.03	0.02
Male										
1977	0.11	-0.18	0.00	0.04	0.00	0.02	0.00	0.21	-0.02	0.04
2005	0.25	-0.18	0.07	0.08	-0.01	0.04	0.00	0.25	-0.05	0.05
Difference	0.14	0.00	0.07	0.04	-0.01	0.02	0.00	0.04	-0.03	0.01

Table 14
Linear Probability Determinants of University Attendance: All Children, Living Independently, and Living at Home (SLID 1988-2005; sample weights used)

	All Children		Living Independently		Living at Home	
Variable	Coef.	Coef/se	Coef.	Coef/se	Coef.	Coef/se
Tuition	4.08E-06	0.37	-0.0000187	-0.84	7.82E-06	0.61
Income	1.53E-06	15.25	1.86E-06	8.15	1.47E-06	12.54
Income 2	-1.03E-12	-9.30	-3.11E-12	-4.78	-9.64E-13	-8.03
Children	0.0849459	5.11	0.0831976	2.73	0.0930042	4.74
Children 2	-0.0165488	-3.68	-0.0228585	-2.80	-0.0157453	-2.97
Urban A	0.0322685	4.31	0.0408683	3.10	0.0412676	4.57
Urban B	0.0780292	15.58	0.1366287	14.48	0.0646650	10.94
Education						
Single Parents: head						
High School	0.0297266	1.69	-0.0033634	-0.08	0.0454531	2.13
Some Postsec.	0.1280214	6.36	0.0584493	1.33	0.1476268	6.13
Postsec. Dipl.	0.0842606	5.87	0.0477136	1.85	0.1002410	5.43
Degree	0.2997757	16.09	0.2641995	5.61	0.3150211	14.12
Couples: add head effect						
Intercept	-0.0198768	-1.57	-0.0374456	-2.17	-0.0059921	-0.34
High School	0.0480249	2.48	0.0415841	0.94	0.0408015	1.74
Some Postsec.	-0.0475043	-2.11	0.0164074	0.34	-0.0649750	-2.42
Postsec. Dipl.	-0.0102970	-0.64	-0.0119323	-0.41	-0.0200663	-0.98
Degree	-0.0649745	-3.15	-0.1098953	-2.18	-0.0702350	-2.85
Couples: spouse effect						
High School	0.0305677	3.98	-0.0076848	-0.52	0.0389836	4.25
Some Postsec.	0.0400203	4.08	-0.0031839	-0.17	0.0494228	4.26
Postsec. Dipl.	0.0563945	7.78	0.0377451	2.79	0.0589272	6.74
Degree	0.1802170	17.71	0.1550800	7.58	0.1879129	15.81
Province						
Newfoundland	0.1672084	11.69	0.1313473	4.42	0.1707499	10.40
Prince Edward Island	0.1688555	9.26	0.0914310	2.53	0.1841627	8.73
Nova Scotia	0.1196213	5.26	0.1173501	2.72	0.1215067	4.56
New Brunswick	0.1443492	8.85	0.1143940	3.63	0.1508161	7.94
Quebec	-0.0101455	-1.09	0.0133614	0.8	-0.0187822	-1.70
Ontario	0.0067613	0.48	-0.0129864	-0.48	0.0099365	0.61
Manitoba	0.0864655	7.56	0.0392453	1.92	0.1003586	7.38
Saskatchewan	0.0781912	5.33	0.0892141	3.38	0.0770904	4.39
Alberta	-0.0387793	-2.67	-0.0320234	-1.21	-0.0350128	-2.01
Female	0.1113383	21.61	0.0661195	6.76	0.1255124	20.87
University Premium	-0.0020320	-0.35	-0.0088322	-0.78	0.0012957	0.20
Time Trend	0.0025473	2.24	0.0050409	2.19	0.0017735	1.36
Constant	-0.1532562	-4.86	-0.0475932	-0.83	-0.1967119	-5.18
Number of obs.		34862		8258		26604
Adj. R-Squared		0.1346		0.1087		0.1401

Table 15
Logit Determinants of University Attendance: All Children, Living Independently, and Living at Home (SLID 1988-2005; sample weights used)

	All Children			Living Independently			Living at Home		
Variable	Coef.	Coef/se	Marg. Effect	Coef.	Coef/se	Marg. Effect	Coef.	Coef/se	Marg. Effect
Tuition	0.0000367	0.57	2.03E-06	-0.0001303	-0.84	-7.69E-06	0.0000532	0.75	2.46E-06
Income	8.17E-06	14.25	4.52E-07	0.0000185	7.06	1.09E-06	7.54E-06	11.72	3.49E-07
Income 2	-5.53E-12	-9.2	-3.06E-13	-5.80E-11	-4.02	-3.42E-12	-4.95E-12	-7.95	-2.29E-13
Children	0.5278330	5.18	0.0291949	0.6890920	2.91	0.0406738	0.5398548	4.69	0.0249697
Children 2	-0.1073121	-3.87	-0.0059355	-0.1954829	-2.99	-0.0115384	-0.0956051	-3.05	-0.0044220
Urban A	0.1945407	4.26	0.0117301	0.3663257	3.47	0.0254062	0.2338953	4.51	0.0120340
Urban B	0.4869107	15.91	0.0334620	1.0391240	14.00	0.0966966	0.3900681	11.31	0.0215661
Education									
Single Parents: head									
High School	0.3121463	2.38	0.0198364	-0.0212496	-0.06	-0.0012427	0.5377539	3.20	0.0318369
Some Postsec.	0.9751437	7.33	0.0832674	0.4477325	1.43	0.0321899	1.2225710	7.17	0.0992559
Postsec. Dipl.	0.7172915	6.78	0.0546461	0.3424266	1.82	0.0234991	0.9463523	6.42	0.0677184
Degree	1.7677630	15.00	0.2090191	1.3001000	4.70	0.1348925	2.0063660	12.81	0.2267441
Couples: add head effect									
Intercept	-0.0368641	-0.37	-0.0020061	-0.3420188	-2.43	-0.0174153	0.1765438	1.20	0.0088477
High School	0.2579838	1.82	0.0160022	0.3508010	1.00	0.0241631	0.0872181	0.49	0.0041966
Some Postsec.	-0.3905339	-2.66	-0.0182286	0.0662113	0.20	0.0040231	-0.6151084	-3.31	-0.0217348
Postsec. Dipl.	-0.1626861	-1.40	-0.0083784	-0.0346141	-0.16	-0.0020125	-0.3491442	-2.21	-0.0138292
Degree	-0.4880828	-3.78	-0.0218570	-0.4456819	-1.48	-0.0217182	-0.6652701	-3.94	-0.0230163
Couples: spouse effect									
High School	0.2355287	4.74	0.0144636	-0.0524363	-0.45	-0.0030251	0.2873549	4.98	0.0151522
Some Postsec.	0.2930979	4.85	0.0184679	-0.0149828	-0.11	-0.0008786	0.3486826	5.04	0.0189130
Postsec. Dipl.	0.3794957	8.19	0.0248545	0.2343395	2.35	0.0153320	0.3959986	7.27	0.0219541
Degree	0.9157195	15.71	0.0761789	0.7757271	5.93	0.0644302	0.9600757	14.32	0.0691366
Province									
Newfoundland	0.9815127	11.88	0.0840453	0.9600993	4.64	0.0863753	0.9663493	10.59	0.0697899
Prince Edward Island	0.9579593	9.23	0.0811862	0.7209086	2.74	0.0584586	0.9882022	8.60	0.0720902
Nova Scotia	0.6862976	5.21	0.0515669	0.8271491	2.71	0.0702580	0.6692363	4.52	0.0421163
New Brunswick	0.8333731	8.79	0.0668520	0.8969757	3.95	0.0785312	0.8294762	7.86	0.0562316
Quebec	-0.1055969	-1.81	-0.0055757	0.0989602	0.80	0.0061000	-0.1733425	-2.60	-0.0074185
Ontario	0.0344150	0.42	0.0019327	-0.0935478	-0.48	-0.0053011	0.0505716	0.55	0.0023932
Manitoba	0.5005233	7.33	0.0346080	0.2983690	1.97	0.0200809	0.5502992	7.13	0.0327699
Saskatchewan	0.4392592	5.11	0.0295494	0.6175459	3.28	0.0478540	0.4103519	4.19	0.0229014
Alberta	-0.2727752	-3.09	-0.0133926	-0.2750035	-1.41	-0.0144097	-0.2189021	-2.18	-0.0091810
Female	0.6715090	21.64	0.0501236	0.4765780	6.62	0.0347033	0.7222816	20.88	0.0465886
University Premium	-0.0296444	-0.91	-0.0016397	-0.0643867	-0.81	-0.0038004	-0.0139958	-0.38	-0.0006473
Time Trend	0.0148423	2.21	0.0008209	0.0362488	2.20	0.0021396	0.0093523	1.26	0.0004326
Constant	-3.7579060	-19.21		-3.5008100	-8.41		-4.0453870	-17.04	
Number of obs.		34862			8258			26604	
Log Likelihood		4749.36			912.45			3864.44	

Appendix A
Real Tuition Fees for Full-time Students at Canadian Universities

Year	Memorial (NF)	U of PEI (PEI)	Dalhousie (NS)	U of NB (NB)	U of Quebec (QC)	U of T (ON)	U of Man. (MB)	U of Sask (SK)	U of Alberta (AB)	UBC (BC)
1975	1401	1657	1915	1632	1475	1784	1197	1278	1127	1202
1977	1208	1517	1739	1800	1276	1474	1082	1229	1193	1024
1979	1283	1515	1574	1526	1078	1515	1095	1260	1107	1103
1981	1013	1393	1520	1410	868	1457	1022	1127	982	972
1982	1009	1397	1555	1439	779	1434	1023	1109	889	984
1984	1169	1611	1801	1687	708	1561	974	1184	1039	1223
1985	1177	1645	1841	1716	678	1576	1029	1235	1084	1672
1986	1228	1713	1851	1752	647	1576	1043	1282	1078	1787
1987	1254	1814	1860	1911	619	1554	1082	1294	1067	2017
1988	1285	1844	1863	1966	596	1579	1140	1364	1142	1812
1989	1303	1868	1852	1990	571	1551	1350	1417	1127	1830
1990	1373	1863	1827	2012	547	1597	1422	1425	1149	1913
1991	1358	1855	1786	1989	866	1655	1489	1490	1252	1903
1992	1544	2120	2195	2100	1320	1770	1756	1830	1413	2046
1993	1672	2237	2391	2318	1396	1864	2001	2416	1597	1975
1994	1942	2448	2600	2426	1530	1991	2071	2182	1990	1930
1995	2059	2536	2824	2389	1637	2138	2116	2280	2181	2027
1996	2181	2683	2945	2488	1610	2312	2162	2350	2368	2102
1997	2470	2744	3170	2662	1589	2726	2241	2434	2566	2090
1998	2903	2966	3387	2929	2127	2932	2278	2544	2788	2113
1999	2858	3082	3978	3018	2232	3162	2330	3003	2966	2060
2000	2915	3124	3578	3049	2306	3349	2544	2984	3064	2015
2001	2882	3047	4056	3175	2370	3345	2310	3148	3184	1978
2002	2532	3151	4046	3338	2388	3341	2285	3081	3191	1839
2003	2214	3201	4284	3490	2399	3307	2151	3281	3140	2199
2004	2076	3328	4464	3637	2420	3314	2111	3393	3322	2803
2005	2025	3423	4672	3759	2459	3254	2058	3361	3427	3191

Source: Statistics Canada, Tuition and Living Accommodation Costs at Canadian universities.

Appendix B
Summary of Observations from Survey Years

Year	Female	Male	Total
1977	2694	4056	6750
1979	2714	3952	6666
1981	2870	4068	6938
1982	2995	4315	7310
1984	2605	3801	6406
1985	2464	3403	5867
1986	2109	2913	5022
1987	2868	3789	6657
1988	2289	3069	5358
1989	2475	3248	5723
1990	2735	3656	6391
1991	2452	3355	5807
1992	2289	2907	5196
1993	2298	3021	5319
1994	2399	2999	5398
1995	2003	2587	4590
1996	2156	2478	4634
1997	2017	2587	4604
1998	1748	2076	3824
1999	1741	1977	3718
2000	1556	1772	3328
2001	1708	1810	3518
2002	1564	1567	3131
2003	1574	1680	3254
2004	1420	1522	2942
2005	1366	1523	2889
Grand Total	57109	74131	131240

Source: SCF and SLID, various years.

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