Earnings of women with and without children

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Raising children entails not only child care responsibilities, but also monetary costs. One cost is the so-called 'family gap,' also referred to as the 'child penalty' or 'motherhood earnings gap.' It measures how much the earnings of women with children fall below those of women without children, other factors being equal.

A significant earnings gap would place financial stress on young families and might discourage the labour force participation of new mothers, if, for example, the gap were sufficiently high to preclude the mother's earnings from adequately covering her work-related expenses, including child care. Withdrawal from the labour market can become attractive in such circumstances.

Financial concerns related to childbirth may affect the take-up of maternity leave allowances made available through provincial and federal legislation. A recent survey showed that more than 40% of new parents could not take maternity leave because their financial situation did not allow it, and among parents who took the leave and returned to work, 81% indicated that they would have stayed home longer if they could have afforded to do so (Beaupré and Cloutier 2007).

In addition, studying the earnings gap between women with and without children helps to better understand issues related to parents' decision about family size. As in other developed countries, the fertility rate in Canada has declined and stayed below the replacement level for many years. One reason for the low fertility rate may be the high costs associated with child rearing and child care.[1] The family gap concept captures, at least in part, the opportunity costs of having children.

It is not surprising that both economists and sociologists have studied the earnings gap between women with and without children. Indeed, family-gap studies

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Table   Women age 18 to 44

	With children	Childless
Average age	**35.1**	**28.1**
Years of potential experience	16.2	7.9
Years of education	13.8	15.3
Years of work experience[1]	10.5	5.5
Marital status	%	
Married or common-law	76.8	29.8
Separated	15.6	6.1
Never married	7.7	64.0
Number of children		
One	28.8	…
Two	43.4	…
Three	27.8	…
Education		
Less than high school	11.7	4.8
High school diploma	16.6	8.1
Some postsecondary	56.4	60.2
Bachelors or higher	15.1	26.8
Full-time job	68.0	77.0

1. Full-year full-time equivalent work experience.
Source: Statistics Canada, Survey of Labour and Income Dynamics, 1993 to 2004.

by American and European researchers have proliferated in the past two decades. For instance, one study found the earnings of American and British mothers to be about 20% below those of their childless counterparts (Waldfogel 1998a).

Several studies found that a sizeable portion, typically between 50% and 60%, of the observed gap can be explained by a number of socio-economic factors. Fewer years of work experience because of career interruptions due to childbirth is probably one of the most noticeable factors. As well, the presence of young children may limit the hours that mothers want to work, or may prompt them to choose jobs with more flexibility but lower pay. The unexplained portion of the earnings gap is typically attributed to unobserved individual characteristics like career motivation or to employer discrimination against mothers.[2]

In Canada, much less research has been done, and with mixed results. For example, one study of child penalties for seven OECD countries, found, in the raw data, no earnings gap between mothers and childless women. But, after controlling for a few factors such as age and education, gaps of 4%, 5%, and 13% were found for mothers with one, two and three or more children respectively (Harkness and Woldfogel 1999). In another study, a significant penalty was found for mothers born between 1948 and 1960, while those born after 1960 enjoyed an earnings premium compared with their childless counterparts (Drolet 2002).

This study expands the Canadian literature in several different ways. In particular, it is the first to use three complete panels of earnings data from the Survey of Labour and Income Dynamics (see *Data source and definitions*), which allows controls for unobserved individual characteristics like career motivation that may be correlated with both earnings and childbirth.[3] It attempts to answer several key questions: Is there indeed an earnings difference between women with and without children in Canada? How large is the difference? Do different groups of mothers experience the same gap? What factors may explain the gap?

Substantial earnings gap between women with and without children

Age-earnings profiles of Canadian mothers and women without children show that women without children systematically earned more than women with children (Chart A). At age 30, for example, the aver-

Chart A   At any given age, mothers' hourly earnings were below childless women's...

Hourly earnings (2004 $)
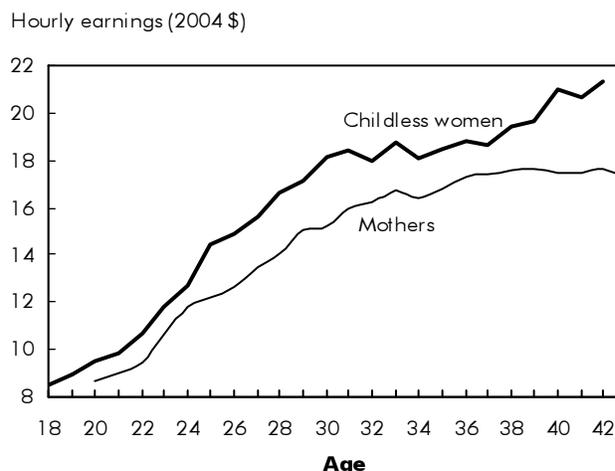
Source: Statistics Canada, Survey of Labour and Income Dynamics, 1993 to 2004.

Chart B   ...and this gap generally widened as the number of children increased

Hourly earnings (2004 $)
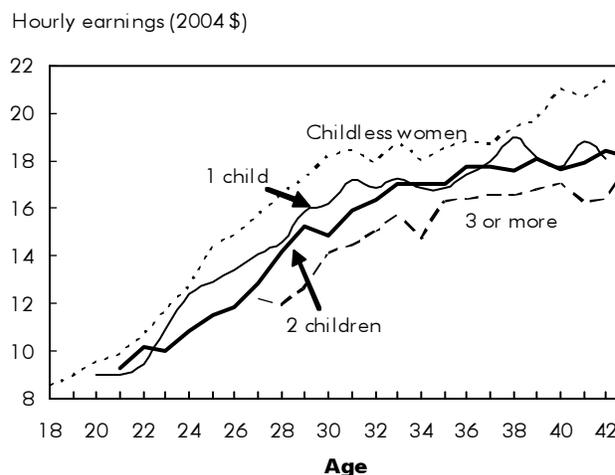
Source: Statistics Canada, Survey of Labour and Income Dynamics, 1993 to 2004.

age hourly earnings of women with children were $15.20 while those for women without children were $18.10 (2004 dollars). Averaging the differences over all plausible ages showed that hourly earnings of mothers were about 12% lower than those of their childless counterparts.[4]

The gap widened with the number of children (Chart B). For mothers with one child, the average gap was about 9%. It increased to 12% and 20% respectively for mothers with two and three or more children. This indicates that, although the gap increased as the number of children increased, it did not do so proportionately. Nevertheless, the observed earnings gap grows with each successive child.[5]

At younger ages, the gap between women with and without children was quite small. For example, at age 20, earnings of women with one child and childless women were almost identical. This suggests that issues related to mothers' self-selection into childbirth were unlikely to be important.[6] On the other hand, earnings of mothers did not grow as fast as those of childless women, so the earnings losses incurred by mothers might never be regained (Phipps et al. 2001).

Mothers with long career interruptions face larger earnings gap

The data suggest an almost six-year difference between actual and potential work experiences of women with children, while the difference for women without children was only slightly above one year.[7] In other words, women with children experienced a much longer time out of work (or career interruptions) than their childless counterparts.

In order to see the effect of years of work experience on the motherhood earnings gap, mothers were grouped according to length of career interruption (years of potential work experience minus years of actual work experience).[8]

Clearly, long career interruptions had a negative impact on the earnings of mothers (Chart C). For example, the difference in average hourly earnings between childless women and mothers with more than three years of interruption was close to 30% at age 40. On the other hand, relatively short career interruptions made little difference—before age 33, average earnings of mothers with more than one year but less than three years of interruption were somewhat below the average of childless women, but after age 33, they were similar.

Earnings gap higher for lone mothers than for married mothers

Of particular interest are single mothers, who are more likely to face financial hardship. How do their earnings compare with those of single childless women? How do the earnings of married (or common-law) mothers compare with those of their childless counterparts? And how do these two gaps compare?

Earnings of married and single childless women were similar, suggesting that marital status might not affect the earnings of childless women. This observation casts some doubt on the marriage-earnings penalty hypothesis (Chart D).[9] But the gap between single mothers and childless women appeared to be greater than that between married mothers and childless women. A comparison between single mothers and childless single women showed that the average earnings gap was close to 20%. But for married/common-law mothers versus childless women in couples, the gap was only about 10%.

In other words, the earnings gap between single mothers and single childless women was almost twice as large as that between married mothers and married childless women. The presence of a partner seems to

Chart C   The longer the career interruption, the higher the earnings losses

Hourly earnings (2004 $)
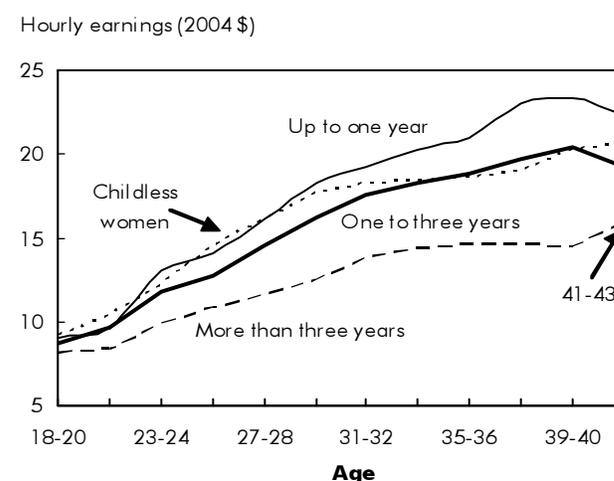
Source: Statistics Canada, Survey of Labour and Income Dynamics, 1993 to 2004.

Chart D Single mothers lost more earnings than married mothers

Hourly earnings (2004 $)
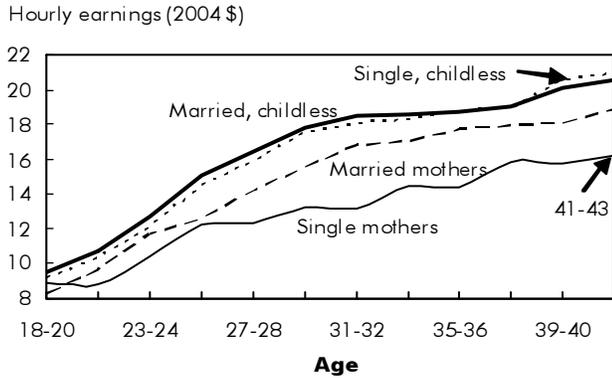
Source: Statistics Canada, Survey of Labour and Income Dynamics, 1993 to 2004.

age range, and beyond that, the gaps were very small. But for highly educated mothers, the gap was observed at almost all ages.

Full- or part-time employment makes little difference

Since mothers are more likely to work part time than childless women and part-time workers usually earn less than full-timers, a seemingly plausible way to deal with the child penalty would be to help mothers get full-time jobs.

However, beyond age 34, very few childless women worked part time and the earnings difference between mothers and childless women was trivial (Chart F). On the other hand, young mothers who worked part time seemed to be somewhat disadvantaged relative to childless part-timers. But, overall, the hourly earnings of mothers who worked full time were only

reduce the negative effect of childbirth on a mother's earnings, making it necessary to take marital status into consideration when examining the earnings gap between women with and without children.

Earnings gap higher for highly educated mothers

The link between delayed motherhood and the declining fertility rate among highly educated mothers can be seen in many countries. Since education is positively correlated with earnings, an important question is whether mothers with higher education incur a greater earnings penalty than their counterparts with less education.[10]

Among women with less education, the earnings gap between those with and those without children was generally lower than that for their highly educated counterparts (Chart E). For less-educated mothers and childless women, the gap was confined to the 27 to 34

Chart E Highly educated mothers earned less than childless women at almost all ages; for low-educated mothers, earnings losses were confined mostly to those age 27 to 34

Hourly earnings (2004 $)

Hourly earnings (2004 $)
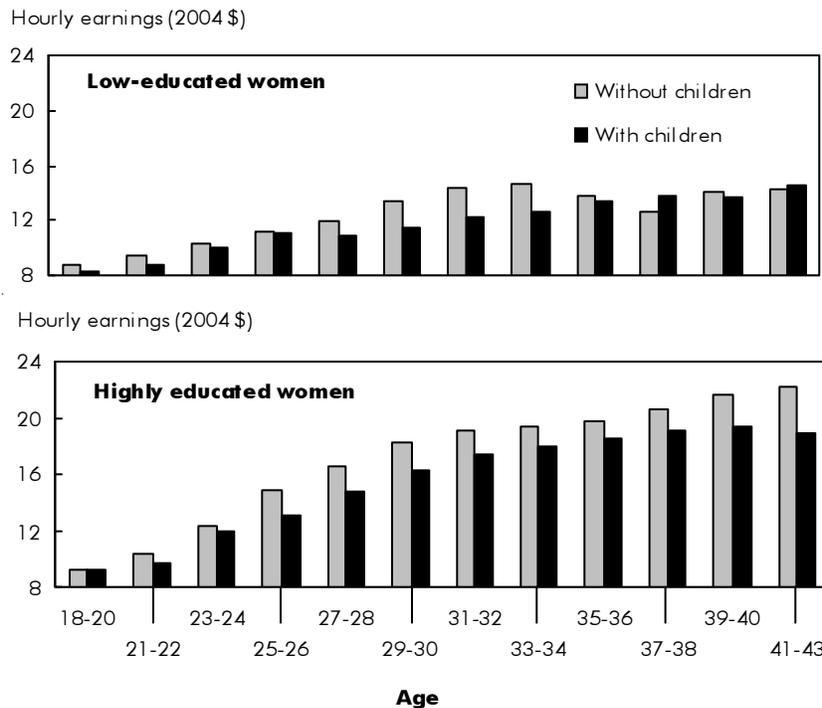
Source: Statistics Canada, Survey of Labour and Income Dynamics, 1993 to 2004.

Chart F Mothers working full time incurred somewhat more earnings losses than those working part time

Hourly earnings (2004 $)

Childless, full time

Childless, part time

Mothers, part time

41-43

Mothers, full time

Age
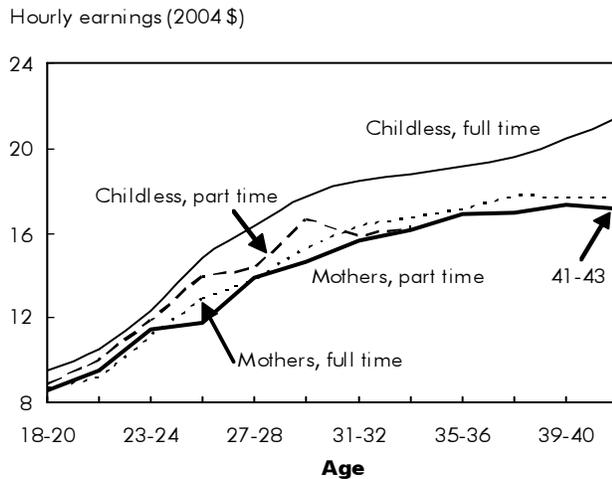
Source: Statistics Canada, Survey of Labour and Income Dynamics, 1993 to 2004.
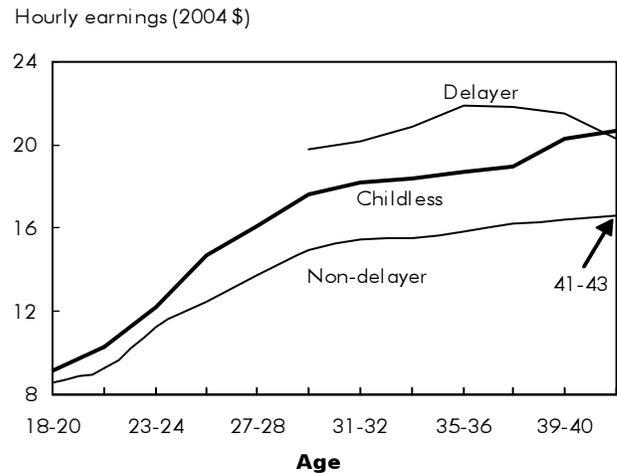
Chart G Mothers delaying their first childbirth beyond age 30 earned more than childless women

Hourly earnings (2004 $)

Delayer

Childless

Non-delayer

41-43

Age

Source: Statistics Canada, Survey of Labour and Income Dynamics, 1993 to 2004.

slightly higher than those of mothers who worked part time, suggesting that hours of work are unlikely to play any major role in the earnings gap.

Earnings premium associated with delayed childbirth may eventually disappear

The pursuit of higher education and careers appears to lead many women in industrialized countries to delay marriage and childbirth. Canada is no exception—those who delayed marriage or childbirth earned more (Drolet 2002). However, the direction of any causality between earnings and delayed childbirth is unclear.

Conditional on age, the earnings of mothers who delayed childbirth (first child at age 30 or later) were higher than those of childless women by about 10% (Chart G).[11] But their earnings fell over time and dropped below the average of childless women after age 40.

Factors explaining the earnings gap

The observed earnings gaps, while being accounted for by age, do not necessarily represent the true disadvantage incurred by women with children because

earnings are determined not only by age and the presence of children, but also by factors such as work experience, education, industry, occupation, union membership and unobserved individual characteristics like career motivation and ability. It may well be that women who became mothers had less education or fewer years of work experience, or chose to work for firms offering lower pay but more flexibility or other employment benefits.

In order to account for the effects of the above factors on the earnings of mothers and childless women, researchers typically estimate models that control for the presence of children (see *The earnings models*). The starting point in this study was an extended human capital model in which age, years of education, work experience, marital status, full- or part-time status, union membership, employer size, family income (earnings from spouse and other family members as well as non-employment income), industry, occupation and management responsibilities were included.[12]

The model simultaneously controlled for age, years of schooling and work experience. Since this is mathematically equivalent to controlling for the length of career interruptions—widely regarded as the most

According to human capital theory, earnings depend on education, work experience, occupation, firm size, union membership, and so on. Following other researchers, the following model was used first

$$Y_i = \alpha + \beta_1 K_{1i} + \beta_2 K_{2i} + \beta_3 K_{3i} + \theta X_i + \varepsilon_i \qquad (1),$$

where Y_i represents earnings, K_1, K_2 and K_3 are equal to 1 if a woman has one child, two children, or three or more children, respectively, and 0 if she has no children. X_i contains other variables affecting earnings, and the effects of these variables are captured by θ. The term ε_i represents random error. The coefficients β_1, β_2 and β_3 measure the penalty for mothers with one, two, or three or more children.

With longitudinal data, the model can be modified to control for unobserved factors affecting earnings

$$Y_{it} = \alpha_i + \beta_1 K_{1it} + \beta_2 K_{2it} + \beta_3 K_{3it} + \theta X_{it} + \varepsilon_{it} \qquad (2),$$

where i indexes a worker and t indexes time (year). The constant term α from equation (1) is now indexed by i, indicating that each worker now has a different intercept in her earnings profile. This person-specific intercept captures the joint effect of unmeasured factors such as motivation and ability affecting earnings.

The model given by equation (2) has two different specifications. If α_i is assumed to be correlated with X_{it}, the specification is referred to as a fixed-effects model, otherwise, it is referred to as a random-effects model.

Two types of unmeasured factors can be postulated: those that affect earnings and fertility in the same direction, either increasing or decreasing them, and those that affect earnings and fertility in different directions. Innate ability is an example of the former, and it can be positively associated with both earnings and fertility. While career motivation is an example of the latter, it can be positively correlated with earnings but negatively correlated with fertility. Theoretically, the estimated earnings gap will have a downward bias when the former type is not accounted for, while the opposite would occur when the latter is not.

With longitudinal data, both types of unmeasured characteristics can be taken into consideration with a fixed-effects model.[14] With this model, earnings gaps were 1%, 4% and almost 8% for women with one child, two children and three or more children respectively. Compared with the results from the first model in which only observable factors were controlled for, the estimated disadvantages for mothers with two and three or more children became slightly higher, while the penalty for mothers with one child dropped and became statistically insignificant.

To check the robustness of the fixed-effects model, a random-effects model was also estimated. This model suggests that the gaps were reduced to 1% (and statis-

important factor underlying the earnings gap between women with children and those without—it overcomes a shortcoming of SLID whose panels span only six years, which prevents accurate calculation of the length of career interruptions.[13]

Under the above model, mothers with one child, two children, and three or more children still experienced earnings gaps of 2%, 3% and 6% respectively, meaning that at least 70% of the gaps were explained by the included factors (Chart H). But the remaining gaps were still significantly different from zero.

The importance of unobserved factors

Unmeasured individual characteristics like motivation and innate ability may also affect earnings and, consequently, the gap between women with and without children. In particular, if unmeasured individual characteristics affect pay and fertility decisions at the same time, the estimated earnings gap can be spurious when unmeasured factors are not accounted for.

Chart H   About 70% of the motherhood earnings gap was accounted for by observable characteristics

Gap (%)
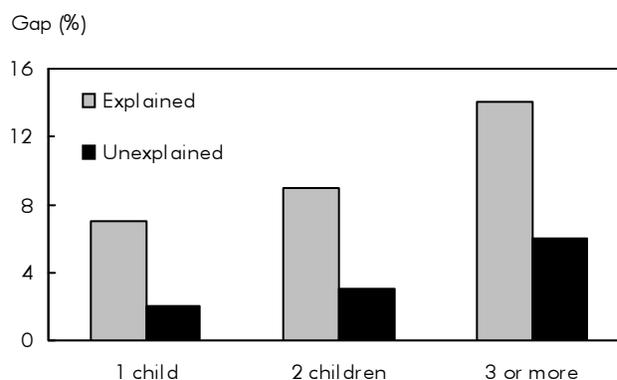
Source: Statistics Canada, Survey of Labour and Income Dynamics, 1993 to 2004, author's calculation.

tical insignificance), 3% and 6%. Hence, for mothers with one child, the results based on random-effects and fixed-effects models were the same, while for mothers with two and three or more children, the former yielded results the same as under the cross-sectional model in which only observed individual characteristics were controlled for.

Overall, results based on longitudinal analysis are quite close to those based on cross-sectional analysis. They suggest that a significant portion of the observed earnings gap between women with children and those without can be explained by observable and unobserved individual characteristics. With longitudinal data, the earnings gap between women with one child and women without children was fully explained, and with either cross-sectional or longitudinal data, about 70% of the observed earnings gap was explained for mothers with two or more children. These results imply that employer practices are unlikely to play a major role in the motherhood earnings gap in Canada.

Earnings gaps for different groups of mothers under multivariate models

Having discussed the earnings gaps for different groups of mothers separately—by length of career interruption, marital status, education, full- or part-time employment, and delayed first childbirth—what remains is to control for various determinants of pay.

Regression results from cross-sectional and longitudinal analyses showed that the earnings gap between women with children who experienced a short career interruption (one year or less) and women without children was not statistically different from zero.[15] Among mothers who interrupted their career for one to three years, a gap of 5% remained for those with three or more children. For those with one or two children, the gaps were not statistically significant. But for mothers who experienced more than three years of interruption, a significant gap of 6% to 8% persisted, regardless of the number of children.

When the effects of observable factors were controlled for, mothers who worked part time had no earnings disadvantage relative to their childless counterparts. On the other hand, although the gap for mothers with one child and working full time was not significantly different from zero, the gaps for mothers with two or more children who worked full time

persisted: for mothers with two children, the unexplained gap was about 3%; for mothers with three or more children, 6%.

The observed earnings gaps between married mothers with one or two children and their childless counterparts were fully explained by observable factors, while the gap between lone mothers and single women without children, and that between married mothers with three or more children and their childless counterparts, persisted. For married mothers with three or more children, the unexplained earnings gap was 4%, while for lone mothers with one child, it was about 3%, and for lone mothers with two or three or more children, the unexplained gaps were 6% and 9%, respectively.

Among less-educated women, the earnings gap between those with and those without children was fully explained by observable factors, regardless of the number of children. But for highly educated mothers, the gaps varied between 3% for those with one child and 6% for those with three or more children, and controlling for unobserved individual characteristics did not change the results in any significant way.

For mothers who had their first birth at age 30 or later, some of the observed earnings premium persisted in the multivariate model. But the estimated premiums for the delayers were not robust. When the same model was estimated under the fixed-effects specification, the premium for the delayers disappeared almost completely.[16] Hence, while mothers who delayed childbirth might earn a certain premium, part of that premium is due to unobserved factors.

Summary

A sizeable earnings gap exists between Canadian women with and without children. On average, the earnings of women with children were 12% less than those of women without children, and this gap increased with the number of children: with one child, the gap was 9%; with two children, it was 12%; and with three or more children, 20%.

Pooled cross-sectional analyses show that about 70% of the observed earnings gap can be explained by age, education, experience, marital status, industry and occupation. Analyses taking advantage of the longitudinal nature of the SLID data suggest that, even though unobserved individual characteristics such as career motivation and innate ability may help explain the gap

between mothers with one child and women without children, they generally do not affect the gap in any significant way for mothers with two or more children.[17]

The analyses also show that different groups of mothers experienced different earnings disadvantages. In particular, lone mothers, mothers with long career interruptions, and mothers with more than a high school education incurred greater losses than married (or common-law) mothers, mothers with no or short career interruptions, and mothers with no more than a high school education, while the premium enjoyed by motherhood delayers was mostly due to unobserved characteristics.

Perspectives

■ Notes

1. Measures that reduce the direct and indirect costs have a positive effect on the fertility of Canadian women, as suggested by Bélanger and Oikawa 1999.

2. See Waldfogel 1998b for a survey of the international literature. A recent study regarding discrimination against women with children can be found in Correll et al. 2007.

3. The effects of unobserved characteristics are inferred by the change in results between the cross-sectional and longitudinal models.

4. Below age 20, fewer than 100 observations of women with children were available and hence their average earnings are not plotted in Chart A. Similarly, in Chart B, few women had three or more children before age 26, therefore their average earnings appear from age 27.

5. The result was confirmed by a descriptive model in which the log hourly earnings were regressed on age, age squared, and three dummy variables representing one child, two children, and three or more children. The model was also tested by including variables on marital status, province of residence, year, immigration status, employer size, union status and family income.

6. In Zhang 2008, the endogenous motherhood hypothesis was rejected.

7. Potential experience is defined as age minus 5, minus years of schooling.

8. In contrast with Chart A, here and later, individuals are grouped according to age in order to have a reasonable number of observations for each sub-group.

9. See, for example, Loughran and Zissimopoulos 2007.

10. Low-educated women are defined as those with a high school education or less. Those with more than a high school education (including some postsecondary education) are defined as highly educated.

11. Increasing or decreasing this age by one to two years does not quantitatively change the observation.

12. Immigration status, province and year dummies were also included. These variables did not affect the empirical results.

13. Work interruption is measured as the difference between potential and actual years of experience where potential experience is defined as age minus 5, minus years of schooling. See Anderson et al. 2003 for a discussion on the equivalence between controlling for age, schooling and actual experience and controlling for the length of work interruption.

14. There are two ways to estimate the fixed-effects model. One is to model the change of earnings over time. The other is to model the deviation from the average earnings for each person. Both approaches assume that the unmeasured factors are constant during the window of observation, and hence can be differentiated out. The two approaches produce identical results. The second approach was used.

15. The earnings model for each group of mothers was estimated according to the length of career interruption (see footnote 13 for the calculation details). The reference group consists of women without children in each case.

16. A few thresholds of delayed motherhood (ages 29, 31, 32, etc.) were tried, but the conclusions were essentially the same.

17. In the sample used, 29% of mothers had one child, while 71% had two or more children.

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