Youth and the 1990s Labour Market

by

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Abstract

A key element of youth labour market experience is the continued decline in the number of hours young people work since the late 1980s. Unlike adults, the number of hours worked by youths has failed to grow in recent years despite the recovery. This suggests that there may be important structural factors underlying their labour market experience that may not be reversed as the recovery continues. This paper therefore seeks to explain the reduced hours of work by young people over the last decade using a neo-classical model of youth labour supply estimated using cross-sectional data from 1986 and 1993. The model provides a framework in which the effects of economic conditions and wages on the aggregate number of hours young people work can be evaluated, while controlling for personal characteristics important to labour supply such as educational attainment and the presence of children. The results imply that compositional changes in the youth population – of which the increased share of *full-time students* was the single-most important factor – explained almost half of the decline over the period. A change in the labour supply "behaviour" of young people, whereby young people in 1993 of the same characteristics and in similar situations as in 1986 worked less, and a reduction in the size of the youth cohort explained most of the balance of the decline in hours worked. The decline in real wages for youth was found to explain only 3% of the decline. These results suggest that the key unanswered question is: what underlies the increase in the share of youths who are full-time students?

Résumé

Un élément clé de l'expérience du marché du travail des jeunes, c'est la baisse continue de leurs heures travaillées depuis la fin des années 80. Contrairement aux adultes, le temps de travail des jeunes n'a pas augmenté au cours des dernières années malgré la relance de l'économie. Ce qui fait penser que d'importants facteurs structuraux seraient à la base de leur expérience du marché du travail et pourraient persister avec la poursuite de l'expansion. Pour tenter d'expliquer pourquoi la durée du travail des jeunes a baissé pendant la dernière décennie, l'auteur du document se sert d'un modèle néoclassique de l'offre de main-d'œuvre des jeunes estimé à l'aide de données transversales de 1986 et 1993. Le modèle fournit un cadre permettant d'évaluer les effets des conditions économiques et des salaires sur les heures travaillées par les jeunes tout en contrôlant les caractéristiques personnelles importantes pour l'offre de main-d'œuvre comme le niveau d'instruction et la présence des enfants. Les résultats indiquent que les changements survenus dans la cohorte des jeunes - dont le facteur le plus important est la part accrue des *étudiants à plein temps* - expliquent presque la moitié de la baisse de la durée du travail des jeunes pendant la période. Un changement survenu dans le «comportement» des jeunes en quête de travail, par lequel les jeunes en 1993 ayant les mêmes caractéristiques que ceux de 1986 et se trouvant dans une situation semblable à la leur ont travaillé moins, et une réduction de la taille de la cohorte des jeunes expliquent la plus grande partie des autres causes de la réduction de la durée du travail. La baisse des salaires réels des jeunes n'explique que 3 p. 100 de la réduction de la durée du travail. Ces résultats laissent toutefois en suspens une grande question restée sans réponse : pourquoi la part des étudiants à plein temps a-t-elle augmenté ?

1. Introduction and Summary

All of the labour market indicators that economists typically use show that the 1990s labour market has not been hospitable to young Canadians. The most widely publicized of these indicators is the unemployment rate. The youth unemployment rate has been quite high, averaging 16.2% from 1990 to 1997. And while there is nothing new in the fact that the youth unemployment rate has exceeded the adult rate throughout the 1990s, the gap between the two rates has widened after narrowing in the 1980s.

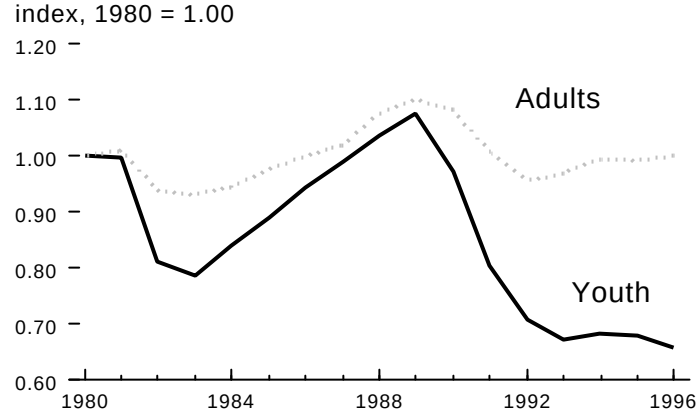
Unemployment statistics can mask important information. For example, it is important to know if the increase in youth unemployment has come about because there are fewer young people working or simply because more young people are entering the labour force to look for work.

The former explanation is the correct one. The proportion of youths with any employment (the employment ratio) has fallen dramatically in the 1990s. Just before the recession, the youth employment ratio stood at 62.7%, actually exceeding the adult ratio. By 1997, the youth employment ratio had fallen sharply to 51.0%. The adult employment ratio also fell over the same period, but much less dramatically, dropping from 62.3% in 1989, to 60.4% in 1997.

Moreover, part-time work has become more prevalent among youths with jobs. In 1997, 45% of young people with jobs worked part-time. In the 1980s, part-time work had never accounted for more than 33% of youth employment.

A good way to capture these trends in a single indicator is to consider the total number of hours that young people work each year. For young people, average annual hours worked per person have been on a downward trend since the late 1980s (Chart 1). Unlike adults, the number of hours worked by youths has failed to grow in recent years despite the recovery. This suggests that there may be important structural factors underlying their labour market experience that may not be reversed as the recovery continues.

Chart 1
Annual Hours Worked Per Person
index, 1980 = 1.00



Around two-thirds of the fall in the number of hours young people work is due to a decline in the average number of hours worked each week, while the remaining third is due to a decline in the average number of weeks worked each year. Compared with adults, the labour market performance of young people has deteriorated significantly on these two fronts. Specifically, the gap

between the average number of hours worked per week of youth and adults has nearly doubled between the 1980s and so far in the 1990s.

This paper therefore seeks to explain the reduced quantity of work by young people over the last decade, with an emphasis on determining to what extent the decline in hours reflects:

- a reduction in the demand for young workers; and,
- a reduction in the amount of labour that young people are willing to supply.

In order to distinguish between these effects, a neo-classical model of youth labour supply is estimated using cross-sectional data from the Labour Market Activity Survey (LMAS) for 1986 and the Survey of Labour and Income Dynamics (SLID) for 1993. The model provides a framework in which the effects of economic conditions and wages on the aggregate number of hours young people work can be evaluated, while controlling for personal characteristics important to labour supply such as educational attainment and the presence of children. This method has a distinct advantage over simple cross tabulations, which typically account for only one or two personal characteristics. Moreover, using a labour-supply model, rather than reduced-form model, allows the effects of demand and supply to be disentangled.

Supply factors turn out to explain virtually the entire decline in aggregate hours worked by young people between 1986 and 1993. In particular, compositional changes in the youth population – of which the increased share of *full-time students* from just over 50% in 1986 to around 64% in 1993 was the single-most important factor -- had the largest impact, explaining almost half of the decline over the period. A change in the labour supply "behaviour" of young people, whereby young people in 1993 of the same characteristics and in similar situations as in 1986 worked less, and a reduction in the size of the youth cohort explained most of the balance of the decline in hours worked.

In contrast, demand factors were found to explain a much smaller part of the decline in the aggregate number of hours that young people worked between 1986 and 1993. Specifically, the decline in real wages for youth was found to explain only 3% of the decline, the result of the rather small estimate for the uncompensated wage elasticity in the labour supply equation.

This suggests that a significant part of the decline in youth labour supply is structural and therefore unlikely to be reversed over the recovery. However, that conclusion relies on the untested assumption that the increase in school enrolment is structural, rather than the indirect result of weak demand. As a result, more work is needed to confirm the reasons why young people are staying in school longer. For example, this work could profitably focus on measures of the change in the nature of work for young people and its impact on the decisions to be a student and to supply labour.

The remainder of the paper is organized as follows. Section 2 advances in more detail explanations for the decline in the number of hours young people work based on evidence from both data analysis and estimates from the labour supply model. Section 3 describes the methodology employed in

estimating the model and the regression results. Section 4 draws conclusions and suggests avenues for future research. Details on the methodology and data employed are outlined in the annexes.

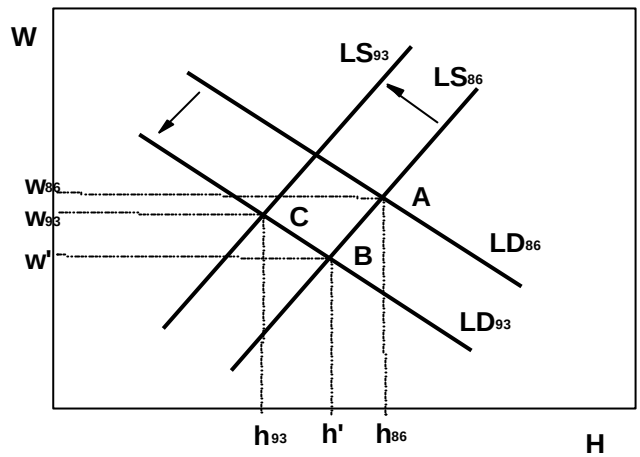
2. Explaining Youth Labour Market Developments

The aggregate number of annual hours young people worked fell around 36% between 1986 and 1993. *A priori*, a simple neo-classical model of labour demand and supply would suggest two possible explanations for this decline (Chart 2).

a) *A drop in the demand for young workers*

Theoretically, a shift in the demand curve from LD^{86} to LD^{93}, all else being equal, would result in a decline in hours from h^{86} to h', and a decline in wages from w^{86} to w'. Such a shift could result from the combination of a change in the composition of demand towards industries and occupations requiring fewer hours of work by young people or a general decline in demand.

Chart 2
Simple Model of Aggregate Labour Demand and Supply



Evidence from recent work points to sluggish growth over the past few years rather than change in the composition of demand since industries that typically hire young people have enjoyed above average employment growth so far over the 1990s (Billings, 1997). In fact, Lavoie (1996) found that only 11% of youths worked for industries normally exhibiting a stronger than average cyclical pattern in 1995. Billings suggests that the deterioration in youth employment conditions in the current cycle reflects in part overall demand conditions, interacting with the common practice of firing young people first and hiring them last in favour of older workers.[1]

However, others point to a structural change in labour markets that has resulted in a substantial decline in traditional entry level jobs for young people in the goods-producing industries, as well as in public administration, health, social services and education (Marquardt, 1997). This may have forced more young people into part-time work, as evidenced by the increase in the share of young employees working part-time noted earlier.

[1] This view is supported by Lavoie (1996), who finds that seniority is a key factor determining the cyclicality of unemployment rates; he finds the difference between youth and adult unemployment rates is much more cyclical for strongly unionized industries than for weakly unionized industries.

A shift in the demand curve to the left, all else being equal, would result in a decline in both the number of hours worked and real wages paid to young people (a move from point A to point B). The magnitude of the hours and wage declines would depend on the wage elasticity of supply. Since average annual hours fell 30% between 1986 and 1993, and real hourly wages fell by around 6%, the wage elasticity of supply would have to be rather large – somewhere on the order of 4.5 – for a leftward shift in the demand curve to be the sole explanation of the decline in hours. This points to a second possible explanation.

b) *A drop in both the supply of and demand for young workers*

Theoretically, a shift in the labour supply curve from LS^{86} to LS^{93}, with unchanged demand, would result in a decline in hours and an increase in wages. Since real wages actually fell between 1986 and 1993, this suggests that a shift in the supply curve occurred in conjunction with a fall in demand. Compared to the case where only demand shifts, a shift in both supply and demand would result in a larger decline in hours than above (h^{86} to h^{93}) and a smaller decline in wages (w^{86} to w^{93}), which seems to be more consistent with the data.

Given the shrinking size of the youth cohort between 1986 and 1993, this explanation makes sense but is potentially trivial. However, previous work has also attributed part of the decline in youth labour market participation to more interesting supply factors, such as the increased share of full-time students, as students are less likely than non-students to be active in the labour market or to work full-time. In fact, research by Lavoie (1996) and Rose (1994) finds that the increase in school enrolment and the fall in the proportion of students participating in the labour market are the single-most important factors explaining the fall in the youth participation rate in the 1990s.

The following analysis uses the estimation results from a labour supply model to quantify the importance of these two explanations, focusing on changes between 1986 and 1993.[2] It also permits a further decomposition of the supply effect into three components, as discussed below. As explained in detail in Section 3, the model chosen for this paper involves estimating three equations for young people: the probability of working, the offered wage, and labour supply measured as the annual number of hours worked.

(i) Aggregate Annual Hours of Work

This simple model of aggregate labour demand and supply can be used to decompose the source of the decline in aggregate hours worked by young people into one factor related to labour demand – the decline in real wages[3] (AB on Chart 3) – and the following three factors related to labour supply:

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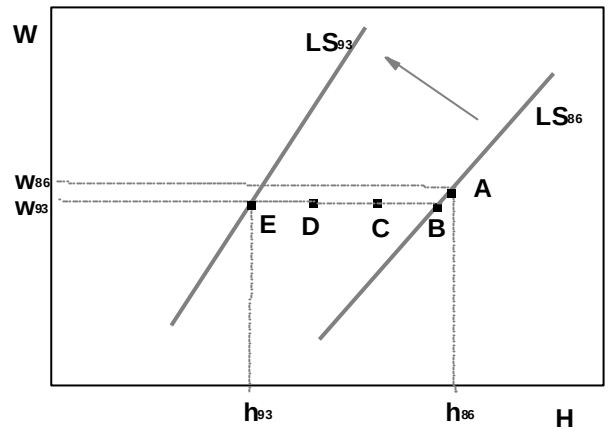
[2] As noted earlier, the LMAS and SLID data are used in the analysis. They were chosen over other possible sources such as the Survey of Consumer Finances for several reasons: more detail on job characteristics like wages, more detail on changes in labour market states, and they can be extended to longitudinal analysis.

[3] It is implicitly assumed here that the decline in average real wages reflects a decline in demand for young workers of all types, rather than a change in the composition of employed youth.

a) *A decline the size of the cohort (BC).* This component is calculated assuming that the only change from 1986 was in the number of young people.

b) *A change in the composition of youth (CD).* This component is calculated assuming that the only change from 1986 was in the personal characteristics of young people (e.g., student and marital status). This implicitly assumes that these characteristics are exogenous. Given that that the average annual number of hours worked vary widely among different groups of young people – for example, full-time students work on average well under half the hours of non-students (Table 2.1) – changes in the composition of youth can be expected to have large effects on labour supply.

Chart 3
Decomposition of Change in Aggregate Hours Worked



c) A change in labour supply behaviour (DE). This component is calculated assuming that the only change from 1986 was the "behaviour" of individuals (proxied by the change in labour supply estimates between 1986 and 1993) rather than in the personal characteristics of individuals. For example, the larger decline in average annual hours worked of young people with high school or less compared to those with a post-secondary certificate or degree may reflect a drop in the relative taste for work for young people with lower educational attainment (Table 2.1).

The labour supply equations estimated for 1986 and 1993 (reported in Table 3.3) are used to calculate the contributions of these factors (see Annex 1 for details). These equations assume that the number of hours worked is a function of marital status, student status, education level, presence of children if female, visible minority status, country of birth, the real wage, and an index of Employment Insurance (E.I.) disincentives by province (see Annex 2 for a table of sample averages). It is estimated over the sample of young people who worked at least one week in the reference year, but is corrected for sample selection bias. Most coefficient estimates for the equations are statistically significant and of the expected sign. By explicitly modelling the effect of wages and regional labour market conditions and personal characteristics, this method has a distinct advantage over simple cross tabulations, which typically account for only one or two personal characteristics. Moreover, this equation can be interpreted as a supply equation, rather than a reduced-form that confounds the effects of both demand and supply.

Table 2.1: Average Annual Hours Worked, Persons Aged 16-24[1]

	1986	1993
All[2]	**995.1**	**711.0**
Male	1061.8	759.6
Female	927.3	659.7
Student Status:		
Full-time student	568.4	454.0
Not full-time student	1497.1	1278.8
Level of Education		
High school or less	938.0	572.6
Some post-secondary	936.3	776.9
Certificate or degree	1289.4	986.8

Source: LMAS and SLID.

(1) For all persons aged 16-23 for 1993. Hours data for only those who worked are contained in the Annex.

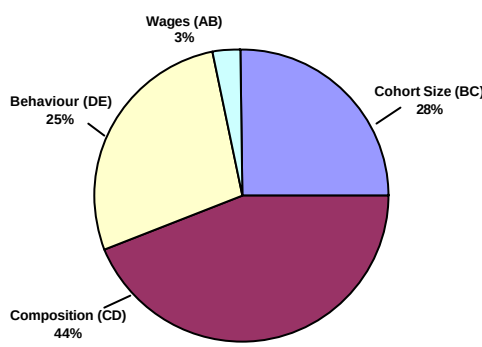
(2) LFS estimates of actual weekly hours are somewhat lower, particularly in 1986, but follow the same downward trend.

Supply factors (leading to a leftward shift in the supply curve) turn out to explain virtually the entire decline in aggregate hours worked by young people between 1986 and 1993 (Chart 4):

- *Compositional changes* in the youth population had the largest impact on hours worked by young people, explaining 44% of the decline over the period.

  – Of these changes, the increased share of *full-time students* from just over 50% in 1986 to around 64% in 1993 was the single-most important factor. This is not surprising, since full-time students are more likely than are other young people to take only part-time jobs or to not work at all. Other compositional changes were also found to have contributed to this decline, including changes in *family composition* -- measured by the reduced share of young married men and women -- as well as an increase in the share of those who identified themselves as belonging to a visible minority or were not born in Canada and did not signal English or French as their

Chart 4
Decomposition of Change in Aggregate Hours Worked



mother tongue.[4] The downward pressure of these factors on average annual hours per young person was partly offset by a decline in estimated E.I. disincentives, stemming from several reforms to the E.I. system over the period.

- *A shrinking youth cohort* explained 28% of the decline in aggregate hours worked. This is not surprising as the number of young people declined some 437,000 or 10% between 1986 and 1993.

- *Changes in labour supply behaviour* accounted for 25% of the decline in aggregate hours worked. As most of this component stems from a large difference in the constant in the 1986 and 1993 equations, rather than in coefficients on the explanatory variables, it is difficult to interpret.

In contrast, a reduction in *real wages* accounted for only 3% of the actual decline in aggregate annual hours worked. This reflects the relative magnitude of the other changes important to aggregate hours outlined above, as well as a relatively small estimated uncompensated wage elasticity of supply of around 0.3.[5]

Since the neo-classical model estimated here assumes that all changes in demand are reflected in the real wage, it may not capture all potential effects of weak demand on labour markets such as the effect of deterioration in aspects of job characteristics other than the wage on labour supply. For example, while the average real hourly wage declined by nearly 6% over the 1986 to 1993 period, particularly for young men and non-students, the share of jobs covered by a union or pension agreement also declined. By level of education, the largest real wage declines were for those with a post-secondary or university certificate or degree, possibly indicating a change in the characteristics of 'first' jobs.

However, estimates of the offered wage equation (reported in Table 3.2) for youth, which control explicitly for relevant personal factors and job type, suggest that changes in the nature of work for young people have been at least partly reflected in the real wage:

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[4] As shown in Table 3.2, some of the estimated coefficients for these characteristics are not significantly different from zero at the 5 per cent significance level in the 1993 sample. This does not pose a serious problem, however, for two reasons. First, all of the coefficients are individually significant for the 1986 sample, and this step in the process examines the impact of changes in the composition of the youth cohort assuming that youths behave as they did in 1986. Second, even if some of the coefficients had been not significantly from zero in the 1986 sample, it would still be the case that the estimated coefficients would the best available estimates of the impact of personal characteristics on labour supply. Also note that the compositional changes between 1986 and 1993 are measured using slightly different age cohorts (16-24 for 1986 and 16-23 for 1993). The increase in school enrolment and decrease in the share of married young people, and therefore the contribution of compositional changes, may as a result be biased upwards. That said, reference to other data sources such as the LFS and the SCF indicate that the magnitude of this bias is likely to be small.

[5] This proportion falls to 1% when the 1993 wage elasticity of 0.1 is used, with a corresponding increase of 3 percentage points in the composition component.

- Together, the decline in the share of union jobs and jobs with a pension plan – proxies for job quality – accounts for around 2 percentage points of the 6% decline in real youth wages over the 1986 to 1993 period.

- A shift from higher to lower paying industries accounts for about one percentage point of the decline in real youth wages over the period. For example, the share of young people working in manufacturing declined from over 13% in 1986 to under 9% in 1993, while the share working in wholesale and retail trade increased from 25% to 28% over the same period.

About 2 percentage points of the decline is also explained by the increasing share of full-time students, who tend to earn less than other young workers. About one percentage point is unexplained by changes in the means of the explanatory variables in the equation.

Table 2.2: Wage and other Compensation of Persons Aged 16-24(1)

	1986	**1993**
Average Hourly Wage	**8.62**	**8.13**
($1993)		
Male	***9.13***	***8.28***
Female	***8.08***	***7.98***
Full-time student	***7.54***	***7.55***
Not full-time student	***9.77***	***9.17***
Education		
High school or less	8.00	7.60
Some post-secondary	8.51	7.91
Certificate or degree	10.84	9.58
Union Index	**0.17**	**0.13**
Pension Index	**0.13**	**0.09**

Source: LMAS and SLID.

(1) 16-23 for 1993.

Overall, these results point to structural, rather than demand, factors underlying the decline in youth labour supply. The implication is therefore that the hours lost due to these 'structural' changes – like reduced cohort size, increased school enrolment and changed family composition – are unlikely to be recovered over a period of stronger growth. As discussed in more detail later, however, this analysis relies on the untested assumption that the decision to stay in school is unaffected by demand conditions.

(ii) Participation in the Labour Market

This section focuses on the increase in the share of young people who were inactive in the labour market (who do not work at all) which contributed significantly to the decline in aggregate hours worked.

As shown in Table 2.3, the average number of weeks worked per year declined by 10% between 1986 and 1993 – a decline equivalent to a drop in the employment-to-population ratio of 6 percentage points.[6] In principle, the decline in the average number of weeks worked could have been due to an increase in non-employment (persons who do not work at all), or to a decline in average number of weeks worked per year of those who are employed (workers are employed for fewer weeks each year).

Examination of the data suggests that the decline in average weeks was caused almost entirely by an increase in the share of non-employment, rather than by workers being employed fewer weeks per year. In fact, the distribution of weeks worked reveals a growing polarization, with an increasing share of both those who never worked and those who worked all year (see Annex 3 for more details on the distributions of several labour market states). Specifically, between 1986 and 1993, the share of young persons who did not work at all increased from 14.7% to 26.9%, while the share who worked all year increased from 31.8% to 32.6%.

Since people may be either unemployed or out of the labour force (inactive) while not working, it is necessary to examine the distributions of both unemployment and inactivity in order gain further precision on the decline in the average number of weeks worked. Table 2.3 indicates that the increasing share of people who never work stems almost entirely from an increase in the share of people who do not participate in the labour force. The most striking fact is that the share of young persons who were out of the labour force for the entire year rose from 10.9% 1986 in 19.0% in 1993. A closer look indicates that most of the increase in non-participation is due to full-time students (see Annex 3 for more details).

As a result, the data suggest that the decline in the average weeks worked per year of young people over the 1986 to 1993 period, which accounts for about one-third of the decline in the number of annual hours worked in the youth population as a whole, was driven by a drop in their participation rate. The drop in the participation rate, in turn, is linked to a significant increase in the share of young people who never joined the labour force.

Possible sources of this decline were identified using estimates of the probability of working (reported in Section 3.a), which included both those who did and did not work in the reference year. The estimates indicate that the increased share of students and less favourable economic conditions were the most important factors in the model explaining the decline in the probability of working between 1986 and 1993. This suggests that, while structural factors are important in explaining the

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[6] The employment-to-population ratio is a weeks-based measure, and is derived from the average number of weeks worked (including those who do not work) divided by the number of weeks in a year (53 in this case).

reduction in youth labour market participation over this period, demand factors (possibly discouragement effects) may be equally important. However, the equations poorly predicted those who did not work, indicating the exclusion of other important variables or a lot of idiosyncratic behaviour. An approach that explicitly models the decision to be a full-time student may better explain why more young people are not participating in the labour market.

Table 2.3: Labour Force Status of Persons Aged 16-24[1]

	1986	**1993**
Average weeks worked	**30.7**	**27.5**
employment-to-population ratio[2]	*57.9*	*51.9*
- worked all year (53 weeks) (%)	31.8	32.6
- never worked (zero weeks) (%)	14.7	26.9
Average weeks not in the labour force	**17.5**	**27.5**
participation rate	*67.0*	*59.6*
- in the labour force all year (%)	41.5	41.9
- never in the labour force (%)	10.9	19.0
Average weeks unemployed	**4.8**	**4.1**
unemployment-to-population ratio	*9.1*	*7.7*
- unemployed all year(%)	0.8	1.5
- never unemployed (%)	66.8	70.2

Source: LMAS and SLID.

(1) 16-23 for 1993.

(2) Corresponding LFS estimates are 58.9% in 1986, and 52.3% in 1993.

(iii) A Second Look at Students

While the increasing share of full-time students has been identified as a key reason for why young people are working less, it remains to be seen whether this is a structural or cyclical change. This is because, by treating school enrolment as exogenous, this paper leaves unanswered the question of why young people are staying in school longer. Other work, however, does suggest that most of the rise in school enrolment is structural. For example, Blanchflower and Freeman (1996), in their study on youth labour markets of OECD countries, find that changes in school enrolment in Canada and some other countries like the United States, are not driven by aggregate demand conditions. This finding corresponds with many other studies (Lavoie 1996, Rose 1994), which note in their arguments the fact that school enrolment rates have been increasing since the early 1980s.

Moreover, even though overall labour market conditions for youth have deteriorated over the past decade, the relative improvement in labour market prospects for higher-educated workers may be one reason - aside from the cyclical response of discouraged young workers to weak labour market conditions in general - why an increasing proportion of young people are staying in school. In fact, Beaudry and Green (1997) found that females and university educated males have experienced little increase in employment instability over the last generation, while non-university educated males have indeed seen an increase in employment instability and a reduction in their access to full-time full-year jobs.

3. The Empirical Method and Results in More Detail

(i) Theory

The results presented in the previous sections stem from both data analysis and the estimation results of a labour supply model for young people. While the data analysis is straightforward, the labour supply estimations warrant further explanation, especially since there is no consensus among economists on how to properly model labour supply decisions. For example, some empirical models focus on *individual* labour supply decisions and treat the income of other family members as exogenous (Nakamura and Nakamura, 1978, Osberg and Phipps 1993). In contrast, other models focus on *family* labour supply decisions based on a joint utility function (Blundell and Walker, 1986, Ransom, 1987), in an attempt to capture the inter-relatedness of labour market decisions of husbands and wives.

It is not clear *a priori* which of these two broad types of models is appropriate for youth labour supply. The view held in this paper is that young people make their labour supply decisions based on individual utility, given they anticipate eventually forming a separate household from their parents. This view ignores the potential impact of prospective large bequests on current labour market decisions. Moreover, children may enjoy higher consumption levels if they come from wealthy families, implying that children from poorer families will have higher rates of participation and work more hours. However, evidence for U.S. teenagers actually finds that children from high-income families are *more* likely to participate in the labour market (Ransom, 1996).

Specifically, the demand side of the model used in this paper is given by:

$$(1) \quad w_i = d_0 + Z_i d_1 + R_i d_2 + e_i$$

where w_i is the offered wage. It is assumed to be related to observed personal characteristics (Z), regional economic conditions (R) and unobserved personal characteristics (e).

The supply side of the model includes an equation for the reservation wage and labour supply. The reservation wage (w^*) is given by:

$$(2) \quad \ln w_i^* = a_0 + Z_i^* a_3 + e_i^*$$

where Z^* is a vector of personal characteristics (which differ in some way from Z) and e^* reflects unobserved personal characteristics. If the individual chooses to work, then the reservation and offered wage are equal and labour supply is given by:

(3) $h_i = b_0 + b_1 \ln w_i + Z_i^* b_2 + m_i \quad for\ h_i > 0$

where h is the average number of hours worked. This specification can be shown to be consistent with a standard neo-classical, one period model of labour supply where individuals seek to maximize their utility, derived from their consumption of goods and leisure, subject to time and budget constraints (Killingsworth, 1988). Equation (2) excludes wealth, as these data are not readily available. The consequences of this omission are unlikely to be large, given that the study focuses on young people, who have unlikely accumulated much wealth themselves and may not take into account the wealth of their parents in their decision to work.

The following sections review the estimation, data, and results of this labour supply model.

(ii) Estimation

Equations (1) and (3) cannot be directly estimated successfully using the Ordinary Least Squares (OLS) estimation method for two reasons:

- First, since the wage and the number of hours worked are observed for only those who have worked for pay, then the expected values of e_i and μ_i of the selected sample are not necessarily zero. OLS estimates of the coefficients of the offered wage and labour supply equations would therefore be inconsistent.

- Second, equations (1) and (3) may suffer from simultaneity bias, as there may exist a non-zero correlation between e_i and μ_i. OLS estimates of the labour supply equation would in this case be inconsistent.

While there are several methods that may be used to circumvent these problems, the approach taken here follows a three-step method outlined in Killingsworth (1983) and employed in several studies of labour supply including Nakamura and Nakamura (1981) and Conway (1997). This method is summarized in Box 1.

The first step applies a technique developed by Heckman (1976) that uses 'Heckman's *?*' to correct for the sample selection bias caused by the first problem. The calculation of *?* employs an equation for the probability of working that is estimated over the entire sample and therefore includes information on those who do not work. This equation is based on the hypothesis that the number of hours worked are proportional to the difference between w and w^*, if $w>w^*$ and zero otherwise, implying the following equation for probability of working:

(4) $\Pr ob[i\ works] = \Pr ob[w_i > w_i^*]$

In other words, the probability of working is equal to the probability that the offered wage (w) exceeds the reservation wage (w^*).

Substituting in equations (1) and (2) into (4) yields:

$$(5)\quad \Pr ob[i \text{ works}] = \Pr ob\left[d_0 + Z_i d_1 + R_i d_2 + e_i > a_0 + Z_i^* a_3 + e_i^*\right]$$

Equation (5) is estimated using a probit estimation method. The estimated coefficients are then used in the calculations of Heckman's λ:

$$(6)\quad l_i = f(\Phi_i)/\mathrm{F}(\Phi_i)$$

where $f(\Phi_i)$ and $\mathrm{F}(\Phi_i)$ are the density and cumulative density functions, respectively, of the standard normal distribution (Maddala, 1983). The cumulative density function gives the probability that person i worked; the lower that probability, the higher the value of l for that observation. As described below, the estimated l is then used in further estimations as an explanatory variable.

The second step addresses the second problem, caused by the endogeneity of w. The offered wage equation (1) is estimated using a two-step method to obtain the fitted value (w), which serves as an instrument for the offered wage in the labour supply equation.[7] However, since the estimation accounts for only those who work, the offered wage equation also suffers from the same sample selection bias as the labour supply equation. To resolve this problem, equation (1) includes the estimated l from step 1 as a right hand side variable, and is estimated over the selected sample (those who worked). The resulting w is then used in step 3.

The *third step* is to estimate a variant of the labour supply equation given by (3) over the selected sample:

$$(7)\quad h_i = b_0 + b_1 \ln \hat{w}_i + Z_i^* b_2 + b_3 \hat{l}_i + e_i^*$$

Equation (7) differs from equation (3) in two ways. First, the fitted value from the offered wage equation (w) is used as an instrument in (7) instead of the offered wage (w). Second, it includes $\hat{l}$, correcting for the sample selection bias.

What may be of importance, however, is the implicit assumption that actual and desired hours worked are equal given the offered wage. Osberg and Phipps (1993) find evidence of the existence of labour supply constraints in Canada, leading to much smaller estimates of wage elasticities than those estimated in unconstrained models. While no attempt is made here to correct for this, potential bias

[7] In the two-step procedure used for both the offered wage and labour supply equations, the standard errors are computed taking into account the fact that there is a generated regressor.

stemming from underemployment should be kept in mind when evaluating the results. As the estimated wage elasticity is quite low, this may not be a problem.

Box 1:

Summary of the Three-Step Estimation Procedure

1. Estimate the probability of working (equation 5) over the entire sample using a probit estimator. The coefficients are then used to calculate $\hat{l}$, which is then included as an explanatory variable in the following two steps. This equation is also used to gain insight on the changes in the participation rate of young Canadians.

2. Estimate the offered wage equation (1) over the selected sample (those who worked). This equation is used to provide an instrument for the offered wage used in step 3. It is also used in the analysis to examine the source of changes in wages.

3. Estimate the labour supply equation (7) over the selected sample. This equation is used to examine the source of changes in the number of hours worked.

iii) Data

All of the equations estimated use cross-sectional data on young persons from the LMAS and the SLID. The equations are estimated separately for 1986 (LMAS), and 1993 (SLID). While they are not strictly equivalent years in terms of the business cycle, as overall economic conditions were stronger in 1986 than in 1993, they are two years in which the actual rate of unemployment probably exceeded its natural rate. It is also important to note that young persons are defined as being between the ages of 16 and 24 in 1986 and 16 and 23 in 1993. This unavoidable discrepancy in ages, reflecting changes in age groupings between the LMAS and the SLID, could potentially bias the decomposition results. However, as discussed in the following section, reference to other data sources suggests that this bias is likely to be small. The sample excludes those who were self-employed. As very few young people are self-employed, this is unlikely to bias the results. A detailed description of the data is in Annex 2.

iv) Results

The following sections present the estimation results for the final equations in the three-step procedure outlined above.

a) Step 1- The Probability of Working

A person is designated as having worked if they reported working one week or more in the reference year. Recall from equation (5) that the probability of working depends on characteristics affecting the

reservation and the offered wages. The observed personal characteristics affecting the probability of working are chosen to reflect costs of working, including student status, education level, marital status and presence of children (for women). Country of birth, mother tongue and visible minority status are also included. Because of data limitations, measures of wealth or income of other family members are not included. To some extent, education levels proxy this effect, as young people with low educational attainment are more likely to be in their teens and therefore live with their parents.[8]

The probability of working is also expected to depend on economic conditions, which are proxied by the provincial unemployment rate.[9] While regional economic conditions may also vary by rural and urban centre (Nakamura and Nakamura, 1978), data limitations preclude greater than provincial detail. The provincial unemployment rate is meant to proxy varying demand conditions across provinces, although this variable likely also picks up other interprovincial differences affecting labour supply that may exist.[10]

The probit coefficients and partial derivatives for the final specification of equation (5) are shown in Table 3.1 for 1986 and 1993. The control 'person' in these regressions has the following characteristics: unmarried male or female, not a full-time student, some post-secondary education, born in or outside Canada but with English or French as their mother tongue. This person is without children if female, but may have children if male. In previous versions of the model, young men with children did not have a significantly different probability of working from young men without children. Also, single young women without children were not found to have a significantly different probability of working than single young men.

Most coefficient estimates are significant at the 95% confidence level and are of the expected sign:

- Full-time students are less likely to work in both equations. Among full-time students who have at least a post-secondary degree, the probability of working is higher than for students with only some post-secondary education or less.

- College or university graduates (young people who had obtained a post-secondary certificate or diploma or university degree and were no longer in school full-time) are more likely to work than non-students with lower education. This effect is smaller in 1993, possibly reflecting what others have identified as a decline in the number of entry-level jobs.

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[8] A dummy variable for those living with their parents was included in the estimations to proxy this effect, but was found to be insignificant.

[9] Provincial unemployment rate data are from the Labour Force Survey.

[10] Replacing this variable with provincial dummies did not appreciably affect the regression results.

- Being married does not significantly change the likelihood of working for young women, while it significantly increases the likelihood of working for young men in the 1986 equation. In the 1993 equation, marital status is insignificant for both sexes.

- The presence of children, however, significantly decreases the probability of working for young women in both equations.

- Those born outside of Canada who reported neither English nor French as their mother tongue generally had a lower probability of working.

- The higher the provincial unemployment rate, the lower the probability of working in both equations. This may reflect the effect of demand on wages, discouragement or other interprovincial differences affecting labour market participation.

While the sign and significance of the coefficients is generally consistent among the years, their magnitude changes rather dramatically in several instances. Given that no attempt is made at this stage to test whether these changes are statistically significant, inferences about structural changes in the probability of working must be made with caution (or not at all).

The factors explaining the decline in the probability of working reported in earlier sections of the paper are calculated by fitting the 1986 equation with both the 1986 and 1993 averages of the right hand side variables. One caveat to this method, which applies equally to the earlier decomposition of aggregate hours worked, is that the increase in school enrolment and decrease in marriage rate could be potentially overstated due to the different age cohorts used for the two years (16-24 for 1986 versus 16-23 for 1993). However, reference to Labour Force Survey data for the school enrolment rate suggests that this bias is small.[11] Reference to Survey of Consumer Finance data for the marriage rate is equally reassuring in this regard.[12] Another is that changes in the averages may not be strictly exogenous in that they may reflect in part endogenous changes in behaviour. For example, as noted an earlier section, the increasing youth who are full-time students may be in part a response to poor labour market conditions. Keeping these limitations in mind, this method suggests that the decline in the fitted value of the probability of working is explained entirely by two factors: the increased share of students (65%) and the increase in the unemployment rate (35%).

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[11] The LFS estimates that the school enrolment rate for 15-24 olds increased by around 10 percentage points between 1986 and 1993, only around 2½ percentage points less than in this paper. Even assuming that this discrepancy is entirely due to differences in age categories does not appreciably alter the decomposition results.

[12] . The SCF estimates a significantly smaller drop in the marriage rate for 16-24 year olds than used in this paper (although it is impossible to tell whether this discrepancy is due to survey differences or differences in the age cohorts). In any case, overall bias caused by this discrepancy is minimal given the small estimated marginal impact of marital status on participation and the number of hours worked (reported later).

Table 3.1

Estimates for the final model: Probability of working

	1986		**1993**	
	Coefficient *(partial derivative)**	**t-stat**	**Coefficient** *(partial derivative)**	**t-stat**
Constant	2.234	26.35	1.525	11.42
Full-time student	-0.305 *(-0.12)*	-4.29	-0.470 *(-0.17)*	-6.68
Married male	0.360 *(0.14)*	3.75	0.198 *(0.08)*	1.09
Married female	0.140 *(0.06)*	2.14	0.210 *(0.08)*	1.71
High school – student	-0.386 *(-0.15)*	-8.69	0.384 *(0.15)*	4.14
High school – not student	0.172 *(0.07)*	2.57	0.475 *(0.19)*	3.95
At least post-sec. cert. – student	0.350 *(0.14)*	4.84	0.645 *(0.26)*	7.64
At least post-sec. cert. – not student	0.790 *(0.31)*	6.91	0.587 *(0.23)*	4.84
Visible minority	-0.188 *(-0.07)*	-3.04	-0.134 *(-0.05)*	-1.46
Not born in Canada and language **	-0.187 *(-0.07)*	-2.81	-0.397 *(-0.16)*	-3.57
Female with kids	-1.400 *(-0.56)*	-19.96	-1.030 *(-0.41)*	-8.21
Unemployment rate	-0.083 *(-0.02)*	-15.61	-0.062 *(-0.02)*	-6.23
Adjusted R^2	0.12	-	0.090	-
Number of observations	11608	-	3500	-

* Based on the standard formula: $\partial E(Y) / X = f(b' \overline{X}) \times b$

** Mother tongue neither English nor French.

b) Step 2 – The Offered Wage

The offered wage equation is estimated using *gross* hourly wages, averaged over all jobs, rather than hourly wages *net* of taxes. Given that young people generally face similar tax situations, omitting taxes is unlikely to significantly bias the results for any particular year. However, to the extent that tax rules affecting young people changed over the period studied, this omission may impose a bias that must be kept in mind when interpreting inter-year comparisons.

The observed personal characteristics affecting the offered wage are gender, student status, and education. Given the sample includes only young people, their education level captures the combined effect of their value and experience.[13]

The offered wage is also expected to depend on economic conditions, which are proxied by the provincial unemployment rate and industry of employment.[14] As industry is correlated with occupation this variable, along with education, may also pick up the effects of skill requirements on the offered wage.

Finally, the offered wage is assumed to be related to other characteristics of compensation. In particular, the degree of unionisation and presence of pension plans are expected to flag stable and therefore higher-paying jobs.[15] Details of how these variables are constructed are in Annex 2.

The estimated coefficients for the final specification of equation (1) are shown in Table 3.2 for 1986 and 1993. The control 'person' in these regressions has the following characteristics: male or female; not a full-time student; some post-secondary education; and working in community, business and personal services. Virtually all coefficient estimates have the expected sign and are significant at the 95% level of confidence. Examination of the results yields the following key points:

- As expected, wages are higher for young people with a higher education, with college or university graduates the highest paid. However, the premium for higher education appears to have declined between 1986 and 1993, while the negative premium for having less than high school disappeared over the same period.[16]

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[13] An experience variable was included in previous estimates of the offered wage equation for 1993. It was not statistically significant.

[14] Industry of the first job. Of those who worked, around 70% had only one job in each year. Of those who held more than one job, not all would have changed industry.

[15] It is assumed that the offered wage and the *presence* of a pension plan or union are not jointly determined. Since the presence of a pension plan or union are certainly considerably less flexible than the offered wage, they can be considered appropriate explanatory variables. However, eliminating these variables from the wage equation does not appreciably affect the decomposition results.

[16] Again, no test is made to determine if this change is statistically significant.

- Every industry offers higher wages to youths than community, business and personal services in all years, with exception of wholesale and retail trade in 1993. However, the premium for working in many of these industries appears to have declined somewhat between 1986 and 1993, except for manufacturing, construction, health and education, and public services.

- The wage is lower for females than for males with the same observed personal characteristics and in the same industries. Since the sample includes only young people, this is unlikely to reflect different experience levels resulting from say, taking time off for child rearing. However, it could reflect in part differences in occupations within certain industries.

- Unionized jobs and jobs with pension plans also pay young people more. In fact, this wage premium is greater than is the premium for higher education. Billings (1995) finds a very similar impact of unionization on wages for workers aged 15 and older. However, he finds a higher wage premium for higher education than is found here. This may be due to the fact that here only young workers are included, who have yet to combine significant experience with higher education. Wages for young people respond significantly, although only slightly, to the provincial unemployment rate, except for in 1986.

The fit of the offered wage equation of around 0.32 is typical for that age group (Nakamura and Nakamura, 1988). However, Billings (1995) obtains a better fit (0.49) in estimate of the offered wage equation, since he includes more age groups and detail on occupation. Including occupational dummies did improve the fit somewhat in the equations estimated here, but were dropped because of the large number of missing values in 1993.[17]

The explanations for the decline in real youth wages reported in earlier sections of the paper are calculated in the same way as with the probability of working, with the same caveat applying. Keeping this limitation in mind, this method suggests that the decline in the fitted value of real wages is explained by the increased share of students, the shift to lower paying industries, and a decline in the share of jobs covered by union contracts or pension plans.

[17] In the occupational breakdown that is consistent with the LMAS, almost half of the values are missing.

Table 3.2

Estimates for final model: Log of offered wage

	1986		1993	
	Coefficient	**t-stat**	**Coefficient**	**t-stat**
Constant	2.097	106.91	2.197	64.38
Female	-0.107	-13.43	-0.029	-2.39
Full-time student	-0.151	-15.34	-0.115	-6.97
High school	-0.066	-6.69	-0.028	-1.44
At least post sec. certificate	0.143	11.40	0.094	4.28
Primary	0.069	3.76	0.097	3.22
Manufacturing	0.161	12.80	0.185	8.22
Construction	0.202	11.72	0.271	9.38
Transportation & comm.	0.236	11.65	0.192	5.24
Wholesale & retail trade	0.060	5.98	0.021	1.46
FIRE	0.258	12.71	0.207	5.87
Health and education	0.132	9.35	0.245	10.87
Public sector	0.147	8.24	0.163	5.35
Unemployment rate	-0.001	-0.51	-0.019	-6.26
Union	0.254	22.10	0.218	10.83
Pension	0.178	13.78	0.212	8.96
Lambda	-0.206	-6.61	-0.013	-0.23
Adjusted R^2	0.32	-	0.32	-
Number of observations	9574	-	2498	-

c) Step 3 - Labour Supply

The labour supply equation is estimated using the total number of hours worked for pay in the reference year. It is expected to depend on the same personal characteristics as the probability of working, and therefore has the same reference person. A provincial employment insurance disincentives index is included to capture the different impact of E.I. on labour supply decisions across regions.[18] As with the unemployment rate in the probit equation, this variable also picks up other differences among the provinces that may exist.[19]

The estimated coefficients for the final specification of equation (7) are shown in Table 3.3 for 1986 and 1993. The estimated coefficients are generally of the expected sign, although not all are statistically significant at the 95% level:

- The uncompensated wage elasticity (evaluated at average hours) is positive in all years, and falls from 0.27 in 1986 to around zero in 1993. This is well within the range of wage elasticities estimated elsewhere.

- Married men work longer hours than unmarried young people in all years, *ceteris paribus*. The effect of marriage on women's on annual hours is insignificant in 1986, but positive and significant at the 90% level in 1993.

- Hours worked generally increase with the level of education in 1986, although this effect is restricted to those with higher education for 1993. This may simply reflect the fact that those with more education may be older and therefore less dependant on their parents.

- The presence of children for young women reduces annual hours worked significantly; in fact, aside from being a full-time student, it is the largest single factor affecting female labour supply.

- E.I. disincentives reduce the hours worked of young people in all years, with a stronger impact in 1993 than in the other two years. However, it is difficult to determine whether this is capturing supply effects from E.I. alone, or the effects of other factors on labour supply that are correlated with the provincial E.I. index.

The selection term, l , is positive as required by the model. However, it is insignificant in 1993. This may be explained by the fact that the probit equations, from which the l is calculated, are able to

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[18] The Sargent (1995) index is used here. More details are in Annex 1.

[19] There is also some question as to whether this variable is an appropriate restriction to identify the selection term in the labour supply equation. Since legitimate exclusion restrictions are difficult to find in the case of participation and the number of hours supplied, this paper relies on differences in functional form between the participation and labour supply equations for identification.

properly predict only a small fraction of people who do not work. This combined with the fact that workers are assumed not to be under- or over-employed, suggests that the wages elasticities presented here may be biased upwards, even though they are quite low.

Table 3.3

Estimates for final model: Labour supply (annual hours)

	1986		**1993**	
	Coefficient	**t-stat**	**Coefficient**	**t-stat**
Constant	1313.900	13.20	2053.000	9.98
Full-time student	-782.280	-25.03	-960.520	-14.09
Married male	225.220	8.07	297.850	3.95
Married female	26.319	1.11	123.220	2.07
High school – student	-172.620	-6.17	171.270	2.49
High school – not student	68.114	2.57	116.010	1.75
At least post-sec. cert. – student	51.039	1.63	313.050	3.50
At least post-sec. cert. – not student	157.580	4.40	70.094	0.94
Visible minority	-84.274	-2.72	-147.910	-2.63
Not born in Canada and language *	28.839	1.22	-50.780	-0.91
Female with kids	-619.350	-8.24	-547.280	-3.73
E.I. disincentives	-3.530	-9.07	-5.452	-5.06
Log wage all (fitted)	361.880	9.79	89.691	1.22
Lambda	342.970	2.80	326.500	1.32
Adjusted R^2	0.41	-	0.37	-
Number of observations	9574	-	2498	-

* Mother tongue neither English nor French.

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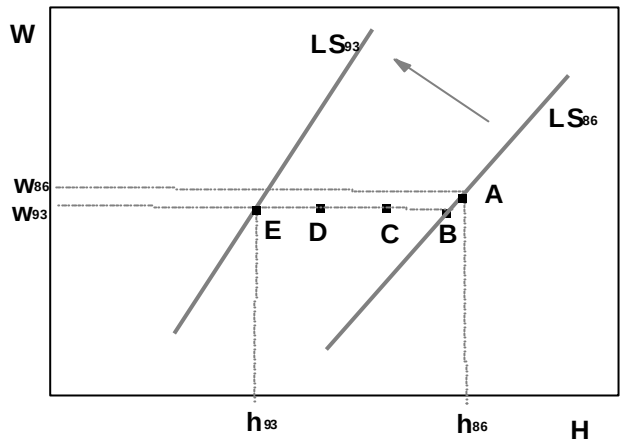
Annex 1: Decomposition Method Details

As outlined in section 2, the change in aggregate hours can be decomposed into one factor related to *demand* (wages (AB)) and three factors related to *supply* (cohort size (BC), composition (CD) and behaviour (DE)).

Using chart A.1 as a guide, the effect of these factors on aggregate hours (H) were calculated as follows:

Chart A.1
Decomposition of Change in Aggregate Hours Worked



1. point $A = P_{86}\, pr_{86} \times h_{86}$

where P is the youth population, *pr* is the share of youth who worked and *h* is average annual hours.

2. point $B = P_{86}\, pr_{86} \times h_{86}(Z_{86}, w_{93})$

where $h_{86}(Z_{86}, w_{93})$ is the 1986 labour supply equation fitted with the 1993 wage.

3. point $C = \left(P_{93}\, pr_{86} \times h_{86}(Z_{86}, w_{93})\right)$

4. point $D = \left(P_{93}\, pr_{86}(Z_{93}) \times h_{86}(\overline{Z}_{93}, w_{93})\right)$

where $pr_{86}(Z_{93})$ is the fitted value of the probability of working equation using the 1993 data set and the $h_{86}(\overline{Z}_{93})$ is the 1986 labour supply equation fitted with the 1993 sample means.

5. point $E = \left(P_{93}\, pr_{93} \times h_{93}(w_{93})\right)$

Annex 2: Detailed Data Characteristics

This annex outlines the characteristics of and developments in the data used to estimate the equations for the probability of working, the offered wage and labour supply. All equations use cross-sectional data on young persons from the LMAS and the SLID. The equations are estimated separately for 1986 (LMAS), and 1993 (SLID). Young persons are defined as being between the ages of 16 and 24 in 1986 and 16 and 23 in 1993. This discrepancy in ages, reflecting changes in age groupings between the LMAS and the SLID, is unlikely to seriously affect the results. The sample excludes those who were self-employed.

a) Labour Force Status

The employment status of those in the two cross-section samples, weighted by the appropriate sample weights (all of the following tables and estimates are weighted) is listed in Table A.1. In interpreting these data, is useful to recall that the employment-to-population ratio is a weeks-based measure, being derived from the average number of weeks worked (including those who do not work), divided by the number of weeks in a year (53 in this case).

Examination of the data suggests that the decline in the employment-to-population ratio between 1986 and 1993 was due entirely to a decline in the share of young people who worked at least one week from 85.3% in 1986 to 70.3% in 1993. In contrast, the average number of weeks of employment for those who did work increased from 36.0 to 37.6 over the same period (Table A.1).

While the average number of weeks of those who worked increased between 1986 and 1993, the average hours worked per week declined. The decline in average weekly hours was shared among men and women, as well as full-time students and non-students.

Table A.1 - Labour Force Status of Persons Aged 16-24[1]

	1986	1993
Worked in reference year	**85.3%**	**70.3%**
Male	88.2%	70.7%
Female	82.4%	69.8%
Average weeks worked[2]	**30.7**	**27.4**
Male	*31.2*	*27.4*
full-time student	23.8	21.9
not	40.9	39.2
Female	*30.2*	*27.6*
full-time student	23.7	24.4
not	37.1	34.8
Of those who worked:		
Average weeks worked	**36.0**	**37.6**
Average weekly hours worked[3]	**31.7**	**27.0**
Male	*33.3*	*29.0*
full-time student	27.4	24.0
not	39.9	36.9
Female	*30.0*	*24.9*
full-time student	24.0	20.7
not	35.8	33.2

(1) 16-23 for 1993.

(2) Corresponds to an employment-to-population ratio of 57.9% in 1986, and 51.7% in 1993. Corresponding LFS estimates are 58.9% in 1986, and 52.3% in 1993.

(3) LFS estimates of actual weekly hours are somewhat lower, particularly in 1986, but follow the same downward trend.

b) Observed personal characteristics (Z and Z)*[20]

The observed personal characteristics affecting the supply of labour (*Z**) are chosen to reflect costs of working; these variables include student status, education level, marital status and presence of children (for women). Country of birth, mother tongue and visible minority status are also included.

The observed personal characteristics affecting the offered wage (*Z*) are gender, student status and education.

As shown in Table A.2, the proportion of full-time students increased significantly from 54.0% of all youths in 1986 to 68.8% in 1993; women went from having a significantly lower school enrolment rate than men to a slightly higher rate over this period. Educational attainment also increased over this period, reflecting higher school enrolment rates and an ageing of the 16-24 cohort.

The share of young people married or living in common law arrangements fell dramatically, from 18.8% in 1986 to 8.5% in 1993, although this may be due in part to the fact that the 1993 sample excludes 24 year olds. Nevertheless, it appears that a significant number of young people are remaining unattached for either social or economic reasons. This may also explain the declining share of women with children over this period; however, this trend is less clear since the data are not strictly comparable between the LMAS and the SLID.

The proportion of young people born outside Canada was virtually unchanged between 1986 and 1993. However, a growing share of young persons born outside Canada had neither English nor French as their mother tongue. In addition, a growing share of these people identified themselves as being part of a visible minority.

[20] The number of possible consistent variables between surveys was somewhat limited in the public-use files.

Table A.2 - Observed Personal Characteristics of Persons Aged 16-24[(1)]

(% share of sample)

	1986	1993
Full-time student	**54.0**	**68.8**
male	56.7	68.3
female	51.4	69.3
Education		
High school or less	*64.3*	*50.6*
male	67.3	53.9
female	61.2	47.2
Some post-secondary	*19.4*	*31.6*
male	18.6	31.4
female	20.2	31.7
Certificate or degree	*16.3*	*17.8*
male	14.0	14.7
female	18.7	21.1
Married or common-law	**18.8**	**8.5**
male	12.3	4.8
female	25.4	12.4
Females with children	12.3	9.3
Born outside Canada	**11.3**	**11.2**
mother tongue neither English nor French	6.6	7.0
visible minority	5.0	7.4

(1) 16-23 for 1993.

c) Wages and other compensation

The model is estimated using gross hourly wages, averaged over all jobs, rather than hourly wages net of tax.

As shown in Table A.3, the average real hourly wage declined over the 1986 to 1993 period, particularly for men who were not full-time students. Real average hourly wages declined only marginally

for women over this period, and actually increased for female full-time students. By level of education, the largest declines were for those with a post-secondary or university certificate or degree.

Table A.3 - Wage and other Compensation of Persons Aged 16-24[(1)]

	1986	**1993**
Average Hourly Wage	**8.63**	**8.13**
($1993)		
Male	***9.13***	***8.28***
full-time student	7.87	7.58
not	10.56	9.40
Female	*8.08*	*7.98*
full-time student	7.15	7.52
not	8.98	8.89
Education		
high school or less	8.00	7.60
some post-secondary	8.51	7.91
certificate or degree	10.84	9.58
Industry		
primary	8.92	8.04
manufacturing	9.81	9.65
construction	9.71	10.32
trans. & communications	11.21	10.02
retail and wholesale trade	7.91	7.34
FIRE	10.22	8.98
health & education	10.02	10.58
comm., pers. & bus ser.	7.10	7.10
public	9.98	9.60
Union Index	**0.17**	**0.13**
student	0.13	0.10
non-student	0.23	0.17
Pension Index	**0.13**	**0.09**
student	0.06	0.05
non-student	0.22	0.17

(1) 16-23 for 1993.

The offered wage is assumed to be related to other characteristics of compensation, including the degree of unionization and presence of pension plans. Because workers may hold more than one job in a particular year of varying status regarding unionization, this concept is measure by the following index (*ui)*:

$$\text{(A.1) } ui_i = \sum_{j=1}^{3} rh_{i,j} * u_{i,j}$$

where $rh_{i,j}$ is the share of the *M*th job's hours of person *i* in the total of paid hours of their first three jobs[21] and $u_{i,j}$ =1 if job *j* is covered by a collective agreement (with or without being a union member) and zero otherwise. As shown in Table 4, this index declined from 0.15 in 1986 to 0.09 in 1993, primarily due to reduced unionization of male non-students.

The pension index (pi_i) is calculated the same way as the union index, fell by a similar amount:

$$\text{(A.2) } pi_i = \sum_{j=1}^{3} rh_{i,j} * p_{i,j}$$

where $p_{i,j}$ =1 if job *j* is covered by a pension plan and zero otherwise.

d) Regional economic conditions (R)

The offered wage is also expected to depend on economic conditions, which are proxied by the provincial unemployment rate and industry of employment.[22] As shown Table A.4, most students work in either wholesale and retail trade or in the business, community and personal services. The share of young people working in these two industries grew between 1986 and 1993 at the expense of all other industries, especially manufacturing.

The disincentives of the Employment Insurance (E.I.) system are expected to influence the number of weeks worked. The Sargent (1995) index by province is used in this analysis; according to this index, even though the unemployment rate increased between 1986 and 1993, E.I. reforms caused the average disincentives of the program to decline. Disincentives declined most in provinces with the highest disincentives, thereby narrowing the divergence among provinces.

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[21] Less than two per cent of the sample held more than three jobs in any one of the years studied.

[22] Industry of the first job. Of those who worked, around 70% had only one job in each year. Of those who held more than one job, not all would have changed industry.

Table A.4 - Regional Economic Conditions

	1986	1993
Provincial Unemployment Rate		
high	19.2	20.1
low	7.0	8.0
average	9.7	11.4
Industry		
(share of total employment %)		
primary	4.7	4.2
manufacturing	13.3	8.5
construction	5.8	4.8
trans. & communication	3.9	2.8
wholesale & retail trade	25.3	28.4
FIRE	3.8	3.0
health & education	10.0	8.9
bus., comm., & per. Services	28.0	34.9
public administration	5.2	4.1
E.I. Disincentives Index		
(1970=100)		
high	210.2	200.9
low	128.4	124.0
average	159.0	148.4

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