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Dropout, School Performance and Working while in School : An Econometric Model with Heterogeneous Groups[*]

Marcel Dagenais, Claude Montmarquette[†], et Nathalie Viennot-Briot[‡]

Résumé / *Abstract*

Exploitant les données d'une enquête canadienne sur les sortants de l'école secondaire, nous trouvons que les déterminants de la performance scolaire, les déterminants de la décision de travailler ou non pendant les études secondaires et celle d'abandonner ou non l'école doivent prendre en considération l'existence de deux groupes distincts d'étudiants. Un premier groupe d'étudiants privilégie la scolarisation et la performance scolaire plutôt que le marché du travail. Le second groupe considère l'accès rapide au marché du travail comme prioritaire aux études et succès scolaire. En supposant que les termes d'erreurs des équations de ce modèle avec groupes hétérogènes sont corrélés, nous aboutissons à une série de termes d'un normale quadrivariée comme éléments de la fonction de vraisemblance de ce modèle. Les résultats économétriques montrent que d'être une femme, fréquenté une école privée et avoir des parents scolarisés augmentent la probabilité d'appartenir au groupe d'étudiants privilégiant les études. De plus, nous trouvons que travailler moins de 15 heures par semaines pendant les études a relativement peu d'effet sur la probabilité d'abandonner les études secondaires, que l'âge légal d'accès au marché du travail importe dans la décision d'abandon, que les salaires minimums influencent cette décision de même que la situation courante sur le marché du travail. Nous tirons de ce résultat plusieurs politiques d'intervention visant à réduire l'abandon des études secondaires.

We develop an econometric model where the determinants of work while in school, dropout and academic grades are set in the context of two types of high school students: those who favor schooling and those who are more inclined to access rapidly the labor market. The individuals contributions to the likelihood function of this heterogeneous groups model are made or 48 terms of a standard quadrivariate normal function. Exploiting a unique Canadian microdata set of high school leavers, we show that being a female student, attending a private school and being part of a family of better educated parents matter to identify a high school student's preference for schooling over the labor market. We also found that working less than 15 hours per week while in school is not necessarily detrimental to success in school; that legal age to access the labor market is important in the decision to dropout; that high minimum wages are incremental for many students to dropout; and that low unemployment rates encourage dropout. Several policies aim to reduce dropout are derived from our results.

Mots clés : Abandon scolaire, travail pendant les études, performance, modèle avec groupes hétérogènes

Keywords : *School dropout, hours of work during study, grades, model with heterogeneous groups*

JEL Classification : I2, C5, H0

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1. Introduction

Unemployment of the unqualified young workers is an important source of political preoccupation for most governments. The mondialisation of the economies entails a larger pool of unqualified young workers, thus their unemployment could be accentuated in many developed countries. The dropout of high school students is an important source of workers' non qualification. It deprives many of any formal training in the future. While there are many factors to explain the decision to dropout, working while in school is often considered as an obstacle to obtain a high school diploma. Does working while in school negatively affect academic achievement of students and ultimately lead some of them to dropout? Alternatively, is working while in school a valuable experience into the labor market, rather than a simple short term desire to increase consumption? To answer these questions, we develop an econometric model with heterogeneous groups. The model is estimated using an exclusive set of Canadian microdata.

Several authors from Stephenson's earlier work (1981) to a recent study by Ruhm (1997) have shown that among youngsters who entered the labor market after high school, those who worked while in school present lower unemployment rates and higher wages. Despite this positive effect, there are however numerous studies in the literature showing that too many hours of work while in school will affect academic achievement and reduce the probability of pursuing schooling after high school. D'Amico and Baker (1984), Steinberg and Dornbusch (1991) showed that time spent studying decreases with the number of hours spent working while in school. Marsh (1991) demonstrated that working while in school has a negative consequence on many indicators related to school performance. For Turner (1994), the results follow the number of hours worked. Turner stressed that in 1980, the typical American high school student in terminal year spent 18 hours of week watching television and less than 4 hours at studying. He suggested that a student working 20 hours a week while in school reduces mainly his or her leisure time, and time spent studying by only 7.2 minutes per week.

Previous authors have also noticed that for young people working more than twenty hours per week while in school, the mean level of years of schooling is inferior. Similar results were obtained by McCartin, Schill and Meyer (1985), Steel (1991), and Barone

(1993). One exception is the study by Ruhm (1997) who found a positive effect on the probability of obtaining a diploma over a specific range of hours of work while in school with a nonlinear (quadratic) specification. Eckstein and Wolpin (1999) recognized that working while in school affects school performance, but their simulations suggest that prohibiting working while in school would have little impact on the dropout rate of white Americans attending high schools. Finally, Neumark and Joyce (2000) suggest that the School-to-Work Opportunities Act (created in the US to provide a more successful transition from school to stable employment) has increased, for those participating, their subjective probabilities of obtaining a high-school diploma as well as their perceived likelihood of future labor market activity.

Thus, the nexus working while in school-school performance-dropout is more complex than it appears.

In this paper, we consider the possibility of two models to explain the decisions for a student to work while in school and to dropout or not. In the first model, experience of work while in school is the leading decision: the student finds a job because he or she anticipates an early insertion to the labor market. Here we expect that working while in school affects his or her grades. In the second model, school is the main preoccupation of the student and working is a secondary concern. Here the grades affect the decision to work while in school. Not knowing a priori to which model a student belongs, we seek the best adjustment to the data to deduce the probability of a student with given characteristics to match the first or the second model. This study benefits from a unique microdata base: The 1991 Statistics Canada's School Leavers Survey and its 1995 Follow-up. The School Leavers Survey enquired retrospectively participants, aging from 18 to 21 in 1991, on their actual and past schooling related situation (still in school at the secondary or postsecondary level, dropout from high school, has completed high school successfully, working while in school in the last year at high school, grade-point-average), and about their personal and socioeconomic characteristics. The Follow-up survey complete previous information on participants still in school in 1991. The national and temporal dimensions of the surveys (the surveys cover all provinces in Canada and is retrospective over 5 years) give us a natural experiment to understand the role of

macroeconomics and institutional variables such as the unemployment rate, the level of minimum wage rate, and the compulsory school attendance age law on the participants' decisions to dropout and to work while in school. Our research identifies several determinants of dropping out and explores different policies to reduce dropout at the high school level.

In the next section, we present the different components of our econometric model. In section 3, we introduce the data and discuss the econometric results. Our conclusions and policy recommendations are in section 4.

2. The Econometric Model

2.1. The Work, Grades and Dropout (WGD for short) model: the student's main interest is to enter the labor market.

In this model, the student is more inclined to reach the labor market, in a relatively short time, than to pursue schooling. Therefore, the student chooses to experiment the labor market by working while in school. This work might negatively affect the student's grades, potentially leading to a dropout. Three equations are considered in this model:

$$W_i^* = x_i.b + u_i. \qquad (1)$$

Equation (1) is an ordered probit model on the utility of working while in school, W_i^*. The observed counterpart variable is working while in school, with 4 categories: no work, working less than or equal to 15 hours, working more than 15 hours but less than or equal to 30 hours, working more than 30 hours. Explanatory variables x_i are all exogenous. u_i is the error term of a standardized normal function.

$$G_i^* = z_i g + \sum_{j=0}^{3} l_j A_{ij} + v_i \qquad (2)$$

Equation (2) is an ordered probit model of the utility of schooling performance or grades, G_i^*. We have 3 observable categories for this latent variable: the student's grade-point average is inferior to 60%; it is superior or equal to 60% but inferior to 70%; it is superior

to 70%. In this specification, schooling performance is function of hours of work while in school, thus $A_j = 1$ *if* $W = j$ and $A_j = 0$ otherwise. z_i is a set of exogenous variables. n_i is the error term of a standardized normal function.

The third equation is a binary probit of the utility of dropping out of school, D_i^*. Specifically:

$$D_i^* = w_i d + \sum_{j=0}^{3} \Pi_j A_j + \sum_{k=0}^{2} \Phi_k M_k + h_i \qquad (3)$$

D_i^* is latent but the decision to dropout or not is observed.

Dropout is function of the number of hours of work while in school and school performance:

$A_j = 1$ *if* $W = j$; $A_j = 0$ otherwise; $M_k = 1$ *if* $G = k$; $M_k = 0$ otherwise.

w_i is a set of exogenous variables. h_i is the error term of a standardized normal function.

2.2. The Grades, Work and Dropout (GWD for short) model: the student's main interest is academic performance.

In this model, the student is more inclined to stay in school with the main goal to achieve a strong academic performance. However, good grades might induce the student to work while in school. Again three equations are considered in this model:

$$G_i^* = y_i a + m_i \qquad (4)$$

Equation (4) is an ordered probit model of the utility of schooling performance, G_i^*, with the 3 same categories observed as before. Explanatory variables y_i are all exogenous. m_i is the error term of a standardized normal function.

$$W_i^* = t_i t + \sum_{k=0}^{2} l_k M_k + J_i \qquad (5)$$

W_i^* is the utility of working while in school and equation (5) is an ordered probit with the 4 observable categories as before. Affecting the hours of work while is school is a set t_i

of exogenous variables and the 3 categories of grades with $M_k = 1$ *if* $G = k$; $M_k = 0$ otherwise. J_i is the error term of a standardized normal function.

The final equation of this model is the dropout equation:

$$D_i^* = p_i x + \sum_{j=0}^{3} j_j A_j + \sum_{k=0}^{2} k_k M_k + y_i \qquad (6)$$

D_i^* is the latent variable associated with the binary choice of dropping out of school or not. The utility of dropping out depends: on the hours of work while in school with $A_j = 1$ *if* $W = j$; $A_j = 0$ otherwise; on the student's grades with $M_k = 1$ *if* $G = k$; $M_k = 0$ otherwise; and on a set of p_i of exogenous variables. y_i is the error term of a standardized normal function.

2.3. Student's preference for the WGD and the GWD models.

As discussed above, it is reasonable to assume that some students want to access the labor market in a near future while others plan to continue their schooling further high school level. Which model best explains the behavior of each student in our sample? Their decision is not random: it reflects their relative preferences for schooling and work, and the influence of their socioeconomic environment. A priori we do not know to which models a student belongs, but we will assume that the determinants of the student's preference are known. Consider the following equation:

$$P_i^* = S_i \lambda + m_i . \qquad (7)$$

P_i^* is a latent variable indicating the propensity for student i to belong to the GWD model. S_i is a set of the determinants of this propensity, and m_i is a an error term of a standardized normal function. Thus, the probability that student i follows the GWD

model ($P_i^* > 0$) is: $\int_{-s_i l}^{\infty} f(m_i)dm_i$. And, with a probability $\int_{-\infty}^{-s_i l} f(m_i)dm_i$, the student i favors the WGD model.

For each model, the error terms of the three equations are correlated and are also correlated with the error term, m_i of the preference equation.

With 2 choices for the probit preference model, 2 choices for the probits of the dropout equations, 3 categories for the ordered probits of the grade equations and 4 categories for the ordered probits of the work while in school equations, the likelihood function of the complete model is made of 48 terms of a quadrivariate standard normal function. Elements of this likelihood function are presented in Appendix A.

3. Data and the Econometric Results

The 1991 Statistics Canada's School Leavers Survey enquires retrospectively participants, aging from 18 to 21 in 1991, about their actual and past schooling related situation (still in school at the secondary or postsecondary level, dropout from high school, has completed high school successfully, worked while in school in their last high school year), and on their personal and socioeconomic characteristics. The Follow-up survey completes previous information on participants still in school in 1991. Statistics Canada has oversampled the school leavers, a situation accounted for in our econometric estimates by weighting the likelihood function appropriately[1]. Full information was obtained for 5584 individuals. In Appendix B, we present the definition and construction of variables.

In Table 1, we report the econometric results of our model. In the first column, we have

[Insert Table 1 about here]

[1] The sampling procedure is discussed in Statistics Canada (1992,1995).

the determinants of the preference equation. It shows that women favor schooling (the GWD model) more than men do. Also, attending private school and having parents with a postsecondary education significantly improve the probability of preferring schooling over the work.

The effect of the endogenous variables on Grades, Working while in school and Dropout decisions cannot be easily deduced from the coefficients estimates as we have correlated error terms among all endogenous variables of the model. We have to compute conditional probabilities to obtain the effect of hours work while in school on the probability of dropping out[2]. The following figures show some specific conditional probabilities. In figure 1, we see that male student's probability to dropout of school (other variables taken at their mean value) increases substantially if the number of hours of work is above 30 hours. Working less than 15 hours raises to 3% the probability to drop out; it is less than 1% for the average male student who has not worked.

[Insert Figure 1 about here]

Figure 2 concerns women without child, and in figure 3 we select young mothers[3]. For women with no child, the probability of dropping out is low except for those working more than 30 hours. However, for women with parenthood responsibility, this probability is much greater and reaches more than 20% for those working more than 30 hours. Note that in both cases, women working less than 15 hours while in school have a lower probability to dropout than those not working at all.

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[2] This conditional probability of dropping out is: $P(D/W) = P(D, L_1/W) + P(D, L_2/W)$, with,

$$P(D, L_1/W) = \frac{\sum_{K=0}^{2} P(D, W, L_1, G_K)}{\sum_{i=0}^{1}\sum_{j=1}^{2}\sum_{k=0}^{2} P(D_i, W, L_j, G_k)}; \quad P(D, L_2/W) = \frac{\sum_{K=0}^{2} P(D, W, L_2, G_K)}{\sum_{i=0}^{1}\sum_{j=1}^{2}\sum_{k=0}^{2} P(D_i, W, L_j, G_k)}$$

L_1 represents the WGD model and L_2 the GWD model.

[3] We do not know if a woman had a child while in school, but individuals in our 1991 sample were very young, between 18 and 21.

[Insert Figures 2 and 3 about here]

Figure 4, shows for a representative student, the conditional probability of having grades inferior to 60%. Even tough working less than 15 hours has no negative effect on grades, this conditional probability to dropout increases with more hours of work.

[Insert Figure 4 about here]

The conditional probability of having grades superior to 70% declines whenever students work while in school, as seen in figure 5.

[Insert Figure 5 about here]

The exogenous variables affecting the working, grades and dropout variables for both the GWD and WGD models are organized in subgroups of personal and socioeconomic characteristics, institutional and macroeconomic variables. Some variables have a different effect on the decisions variables according to the reference model considered. Women with children or not, for example, have the same probabilities to dropout if they favor schooling (the GWD model). But, women with children have a greater probability to dropout than childless women in the WGD model. With respect to grades, men and women are at par in the WGD model, but women present better grades than men in the GWD model. In the WGD model, women work less while in school than men do, but in the GWD model, women work more than men do. That last result is perhaps a reflection of women better grades allowing them to spend time working as babysitter, for example. Having fail at least a year in primary school has the same negative effect on grades at the secondary level in both models.

For the socioeconomic variables, having attended a private school increases the probability of working in the WGD model, but has no effect in the GWD model. Having parents with postsecondary education increases the probability of students to work in both models. It also positively influences the student's grades in the GWD model. Coming for a biparental family augments work in the WGD model, and grades in the

GWD model. Changing schools frequently has no influence in the GWD model, but increases the probability to dropout and improves schooling performance in the WGD model. This is coherent with Tinto's (1993) well known environmental fit and interaction effets in explaining dropout and grades.

The national and temporal dimensions of our data are important for this research: they give us a natural experiment to explore the role of institutional and macroeconomics variables on the students work while in school and dropout decisions. Descriptive statistics show a significant level of variability for these variables, thus avoiding any clustering concern for the standard estimates of the regression coefficients.

Over the time period covered in our study, 69% of the students were living in provinces where the legal age to leave school is 16 years old, and for the 31% remaining, this legal age is 15 years old. Our results strongly support those of Angrist and Krueger (1991) on compulsory school attendance laws which suggest that the 16 years old rule reduces the probability of dropout for both models. This reduction is particularly strong for the GWD model.

The effect of minimum wage rates (measured in real terms) on dropout is highly significant and important. Thus a student at the margin of deciding to finish or not high school considers that not much more expected gain will be made by continuing his or her education[4]. The effect of minimum wage on work while in school differs from models. It is positive in the WGD model, but negative and less important in absolute value in the GWD model. In theory, Card and Krueger (1995) have shown that a positive effect is possible with a monopsonistic situation at a local level. The fast food sector where many high school students are likely to work while in school provides a good example of their theory. Assuming this to be the case, students of the WGD type are expected to accept working more in this situation. But, this is not likely to be the case for the GWD type: here, students will be able to work slightly less to earn the same income, a situation more favorable with their schooling objective.

[4] See Dagenais et al (2000/1) for a formal theoretical model developing this idea. In a related context, Goux and Maurin (2000) studying the decline in the demand for unskilled labor in France, discuss various policies such as raising minimum wage to prevent wage inequality with skilled labor. But, by showing that higher minimum wage increases dropout, new pressure on the wages of unskilled workers will result as their stock will increase.

The situation of the general labor market, captured here with the unemployment rate variable of the metropolitan regional census or the province of localization of the students (the interaction variable of "unemployment rate and non MRC resident" is a control variable) also plays a significant role on the working while is school and dropout decisions. A high (low) unemployment rate significantly decreases (increases) the probability of dropout. It also decreases the number of hours of work while in school. The interaction variables, "unemployment rate and postsecondary educated parents "and" unemployment rate and biparental family" are insignificant in the WGD model but are significantly positive in the GWD model. Looking at the coefficients estimates for all the variables concerned, it appears that students of the GWD type of postsecondary educated parents and from a biparental family are insensitive to the level of unemployment with respect to working while in school decision .

Dummy variables introduce provincial particularities not accounted by our institutional or macroeconomic variables. For the Province of Quebec, for example, completing high school requires 11 years instead of 12 years elsewhere. Thus, everything else maintained constant, it is not surprising that the probability of droping out is lower for that province.

Finally, in both models, we have substituted the conventional unit residual standard error associated with ordered and binary probits with an heterogeneous residual standard error that depends of the variable "postsecondary educated parent". Coefficient estimates are always negative and generally statistically significant, suggesting that the residual variance is smaller when one of the parent has more than a high school diploma.

4. Conclusion

Exploiting a unique Canadian microdata set, we found that the determinants of work while in school and dropout decisions are to be discussed in the context of two types of students. In the GWD type, a student favors schooling over a near labor market full time participation. The WGD type student on the contrary is more inclined to limit schooling in order to access rapidly the labor market. For both types, we have three endogenous variables: schooling performance (grades), the number of hours of work while in school and a dropout decision. Assuming correlated error terms within both models and a

correlation with the error term of a type identification equation, we were able to estimate the rather complex likelihood function corresponding to our model. Our results show that the sex of the student, attending a private school and the education of parents matter to identify the student's preference for schooling over the labor market. We found that working less than 15 hours per week while in school is not necessarily detrimental to success in school.

Legal age to access the labor market is important in the decision to dropout. Since high school is completed around 17 or 18 years old, it is surprising that the compulsory school attendance rules are not modified to be 17 or 18 years old, instead of the usual 16. Minimum wages decisively affect the decision to dropout for many students. It could be worthwhile to consider two sets of minimum wage rates, one for those less than 18 years old and one for the above 19 years old. Finally, low unemployment rates encourage dropout. Thus, many policies aimed at lowering the unemployment rates of young unqualified workers might perversely add to the stock of the young unqualified workers.

Table 1

Parameter estimates of the model

		WGD			GWD		
	Preference	**Work**	**Grades**	**Dropout**	**Grades**	**Work**	**Dropout**
Personal Characteristics:							
Man	Ref	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Woman	0.3036 (5.265)	-0.3963 (-8.896)	0.1697 (0.262)	-0.5390 (-1.568)	0.5857 (6.875)	0.1518 (4.199)	-0.0194 (-0.066)
Woman with at least one child		-	-	0.4761 (5.126)			0.0929 (0.251)
Repeater		-	-0.5300 (-3.242)	-	-1.3299 (-12.781)	-	-
Grades inferior to 60%		Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Grades between 60% and 70%		-	-	-0.4586 (-3.684)	-	0.4239 (2.258)	-0.8597 (-1.175)
Grades superior to 70%		-	-	-0.8475 (-3.420)	-	0.0488 (0.220)	-1.2241 (-1.192)
No work while in school		Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
0< Hours of work while in school =15		-	0.8414 (3.087)	-0.8687 (-8.730)	-	-	0.8883 (2.098)
15< Hours of work while in school =30		-	0.8695 (3.108)	-1.7796 (-15.476)	-	-	1.5531 (2.595)
Hours of work while in school >30		-	1.1085 (3.059)	-2.4899 (-17.002)	-	-	-0.4637 (-0.117)
***Socioeconomic characteristic*:**							
Single family		Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Biparental family		0.1349 (3.055)	0.0894 (1.456)	-	0.2311 (2.954)	0.0342 (0.633)	-
Number of schools attended		-	0.0760 (2.349)	0.0616 (3.019)	-0.0278 (-0.791)	-	-0.1356 (-0.956)
Public school	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.

	Preference	Work	Grades	Dropout	Grades	Work	Dropout
Private school	0.5403 (5.417)	0.3943 (4.074)	0.0107 (0.008)	0.4551 (0.760)	0.4604 (3.268)	-0.0800 (-1.548)	-0.9139 (-0.697)
Parent with no postsecondary education	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Parent with postsecondary education	0.5278 (8.069)	0.2562 (4.720)	0.0015 (0.002)	-0.0087 (-0.097)	0.2186 (1.981)	0.2739 (2.594)	-0.1681 (-0.314)
Institutional and macroeconomics variables:							
Province with legal age to dropout is 15 years old		Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Province with legal age to dropout is 16 years old		-	-	-0.3836 (-5.181)	-	-	-3.3248 (-3.219)
Minimum wage		0.3849 (14.524)	-	0.5333 (8.427)	-	-0.0702 (-3.577)	1.9506 (2.738)
Unemployment rate		-0.4865 (-8.550)	-	-0.9786 (-12.243)	-	-0.3097 (-4.454)	-2.4805 (-3.433)
Unemployment rate * living outside MCR		-0.0545 (-2.017)	-	-0.0825 (-2.158)	-	-0.1248 (-5.051)	0.4116 (2.814)
Unemployment rate * Parent with postsecondary education		0.0215 (0.431)	-	-	-	0.2779 (5.470)	-
Unemployment rate * Biparental family		-0.0044 (-0.091)	-	-	-	0.1746 (2.978)	-
Living in British Colombia		Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Newfoundland		0.2859 (1.483)	-0.0125 (-0.061)	0.9663 (3.382)	0.5905 (2.346)	-0.5125 (-2.782)	-1.2444 (-1.100)
Prince Edouard Island		0.7768 (1.091)	-0.2691 (-0.298)	1.4857 (1.882)	0.6563 (0.532)	-0.2881 (-0.350)	2.1303 (0.322)
Novia Scotia		0.0909 (0.562)	-0.1415 (-0.708)	0.0052 (0.022)	0.6740 (2.526)	-0.1882 (-1.084)	0.7091 (0.696)
New Brunswick		0.1765 (1.142)	-0.1699 (-0.900)	-0.0011 (-0.004)	0.8102 (3.007)	-0.1619 (-0.945)	-1.4216 (-1.316)
Quebec		-0.8048 (-8.777)	0.3707 (2.490)	-1.2096 (-5.737)	1.5075 (10.180)	0.0325 (0.476)	-4.7788 (-2.831)

	Preference	Work	Grades	Dropout	Grades	Work	Dropout
Ontario		-0.5940 (-6.722)	0.1257 (1.244)	-1.6309 (-7.248)	1.0879 (9.882)	0.1647 (2.560)	-2.3802 (-2.262)
Manitoba		-0.5795 (-3.510)	0.0863 (0.457)	-1.0697 (-4.678)	0.3930 (1.812)	0.1034 (0.800)	-2.6114 (-2.170)
Saskatchewan		-0.9395 (-6.254)	0.1884 (0.931)	-1.6768 (-6.765)	0.4834 (2.347)	-0.1854 (-1.342)	-5.6062 (-2.229)
Alberta		0.3491 (3.671)	-0.2607 (-1.814)	-0.1705 (-0.893)	-0.0462 (-0.389)	-0.1960 (-2.709)	0.0696 (0.090)
Others:							
Constant	-0.2801 (-4.330)	0.7992 (7.148)	0.3205 (0.137)	2.2986 (2.244)	1.6305 (8.699)	-0.4113 (-1.530)	2.6910 (1.601)
σ (Parents education)		-0.4295 (-8.745)	-0.1142 (-1.191)	-0.3869 (-3.583)	0.1293 (1.780)	-0.4437 (-7.673)	-0.4164 (-1.269)
e_1			0.6261 (14.847)			-	
e_2			1.8172 (31.655)			-	
q_1			0.7951 (3.266)			-	
Ω_1			-			1.0682 (14.423)	
z_1			-			0.8108 (17.790)	
z_2			-			2.6269 (14.343)	
Likelihood	-10647.09						

Note : t - statistics are in parentheses.

Correlation coefficients:	WGD	GDW
ρ (work, grades)	-0.1954 (-3.2289)	-0.0296 (-0.3799)
ρ (work, dropout)	0.9355 (18.4802)	0.4320 (1.2805)
ρ (grades, dropout)	-0.0048 (-0.0271)	-0.8511 (-3.9276)
ρ (work, preference)	-0.0107 (-0.1188)	-0.1417 (-0.9821)
ρ (grades, preference)	0.1332 (0.0346)	-0.0014 (-0.0081)
ρ (dropout, preference)	0.0326 (0.0184)	-0.0591 (-0.0579)

Figure 1
Conditional probability of dropout
(men)

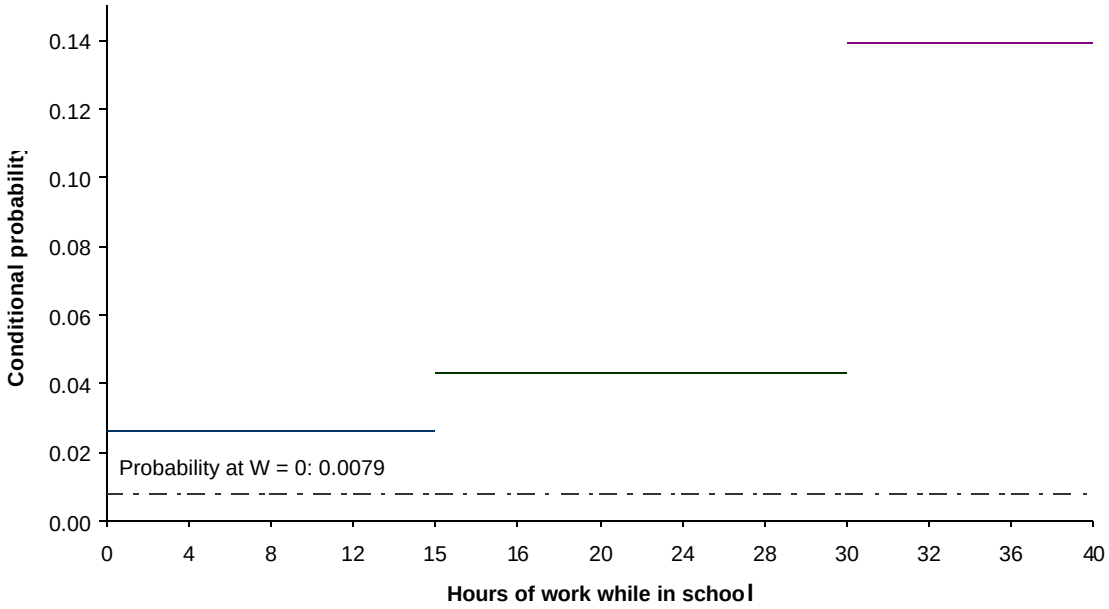


Figure 2
Conditional probability of dropout
(women without child)

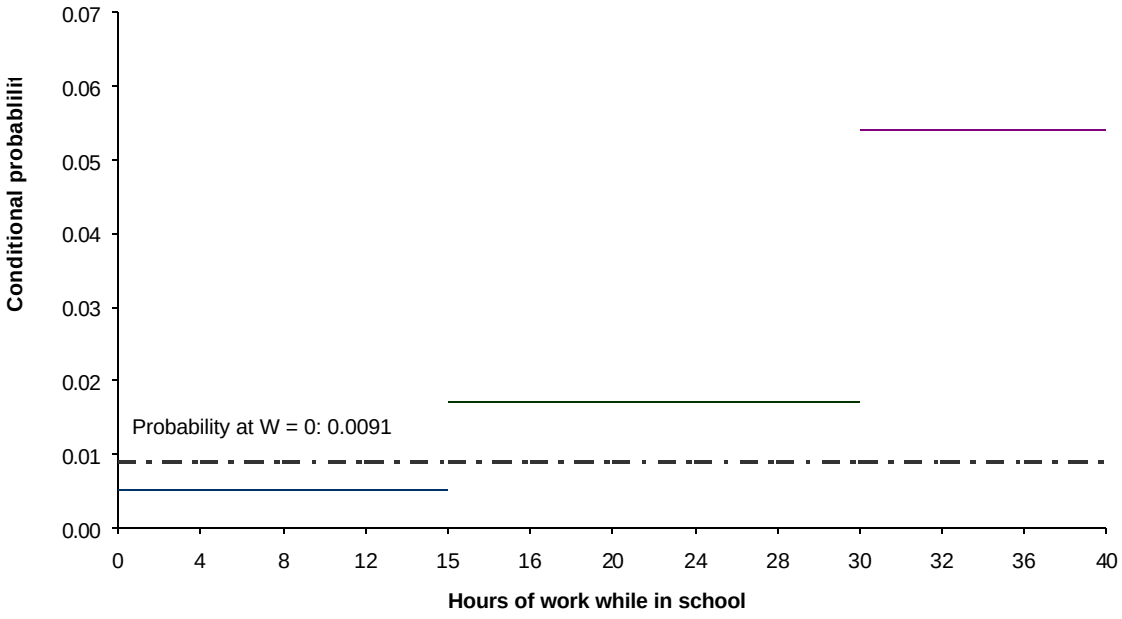


Figure 3
Conditional probability of dropout
(women with children)

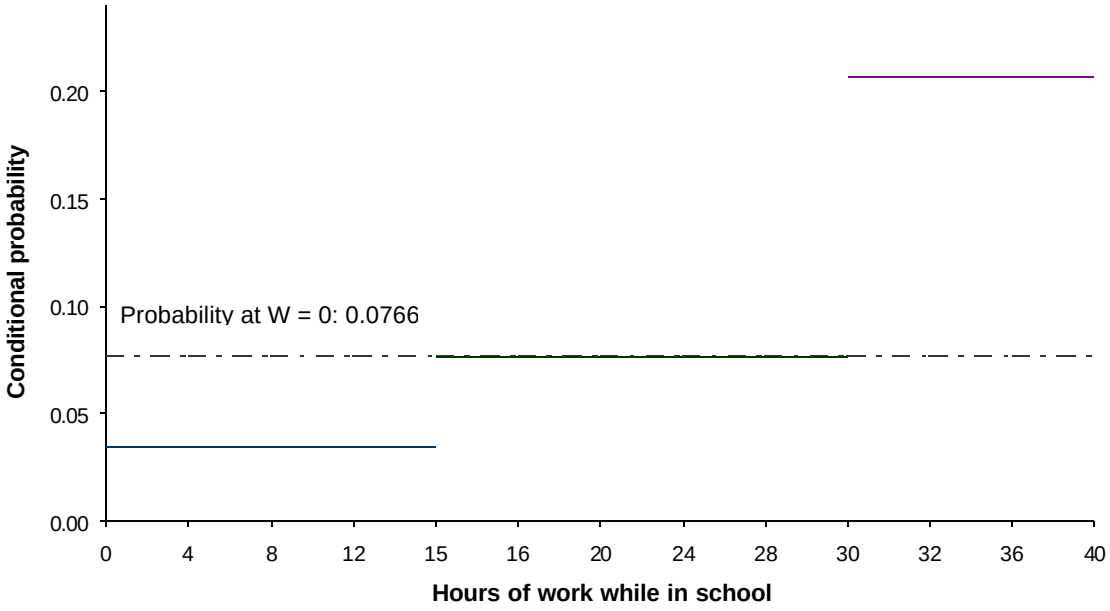


Figure 4
Conditional probability of grades inferior to 60%

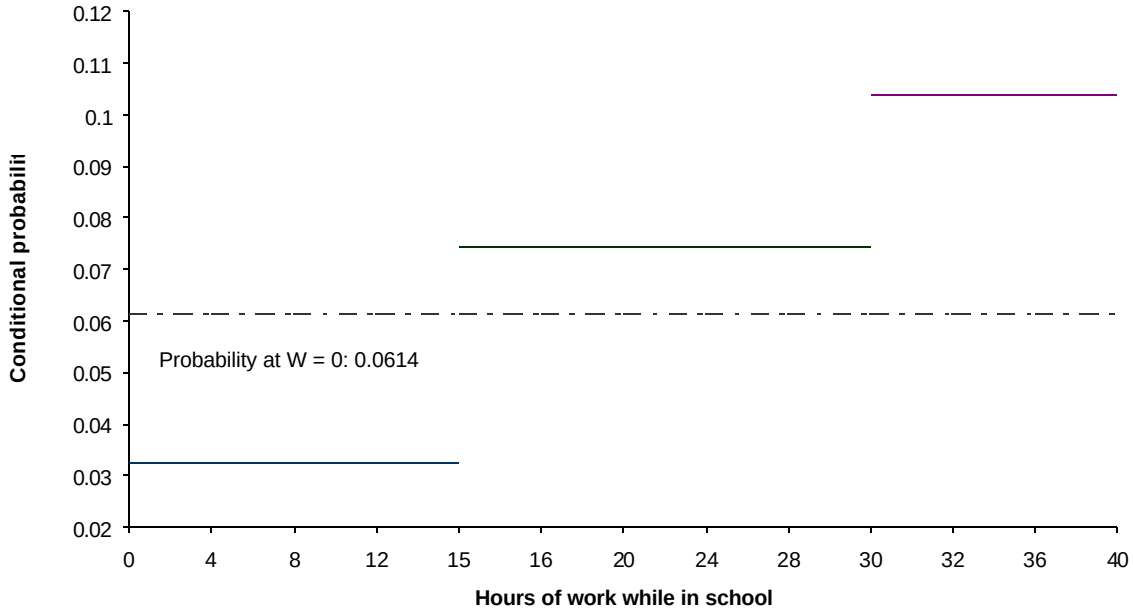
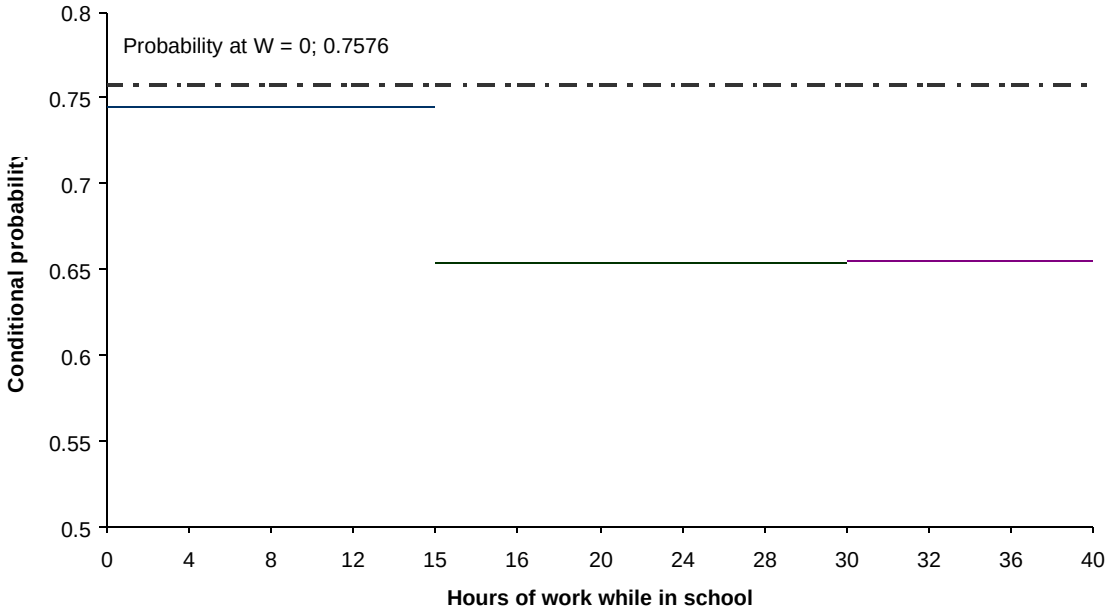


Figure 5
Conditional probability of grades superior to 70%



Appendix A: Elements of the likelihood function of the model with heterogeneous groups

Consider, for example, a student working while in school less than or equal to 15 hours, reporting a grade-point average superior to 70%, and who has not drop out. Also consider the probability this student belongs to models WGD and GDW. The individual contribution to the likelihood of observing this student in our sample is:

$$P(W_i = 1, G_i = 2, D_i = 0) = \int_{-\infty}^{-S_i l} \int_{-x_i b}^{e_1 - x_i b} \int_{q_1 - F}^{\infty} \int_{-\infty}^{-B} f4(m_i, u_i, v_i, n_i, r_{m_i u_i}, r_{m_i v_i}, r_{m_i n_i}, r_{u_i v_i}, r_{u_i n_i}, r_{v_i n_i})$$

$$dn_i dv_i du_i dm_i + \int_{-S_i l}^{\infty} \int_{\Omega_1 - y_i a}^{\infty} \int_{-E}^{z_1 - E} \int_{-\infty}^{-H} f4(m_i, m_i, J_i, y_i, r_{m_i m_i}, r_{m_i J_i}, r_{m_i y_i}, r_{u_i J_i}, r_{m_i y_i}, r_{J_i y_i}) dy_i dJ_i dm_i dm_i$$

Where $-F = -z_i g - \sum_{j=0}^{3} l_j A_j$; $-B = -w_i d - \sum_{j=0}^{3} \Pi_j A_j - \sum_{k=0}^{2} \Phi_k M_k$;

$-E = -t_i t - \sum_{k=0}^{2} l_k M_k$; $-H = -p_i x - \sum_{j=0}^{3} j_j A_j - \sum_{k=0}^{2} k_k M_k$;

f_4 corresponds to the density function of a quadrivariate standard normal and the r's are the correlation coefficients between error terms. Finally, e_1, q_1, Ω_1, z_1 are threshold parameters of the ordered probits.

The other 47 terms of the likelihood function are similar in nature. The full likelihood (log) function weighted for the oversampling of school leavers and including correction for heteroskedastic error terms is available upon request.

Appendix B: The Data – Definition and Construction

Grades: Course average of the last complete trimester of high school studies. There are 3 categories: less than 60%, between 60 and 70%, and more than 70%.

Work while is school: Number of hours worked during the last year of high school frequentation. 4 categories: none, between 1 and 15 hours, between 15 and 30 hours, and more than 30 hours worked per week.

Dropout: =1 if the student has dropped out of high school; 0 otherwise.

Woman: =1; 0 otherwise.

Woman with at least one child: =1 ; 0 otherwise.

Repeater: = 1 if the student has repeated at least a year in primary school; 0 otherwise.

Family with two parents: = 1 if the student lived with both parents; 0 otherwise.

Number of schools attended: Number of school changes in primary to high school, transition included.

Private school: = 1 if attended a private school during primary or high school; 0 otherwise.

Parents education: = 1 if one of the parents followed (completed or no) a collegial or university diploma; 0 otherwise.

Legal age: Provincial compulsory school attendance age laws. =1 if 16 years; 0 if 15 years.

Minimum wage: Real minimum wage in constant 1996 dollars applying to the student in his last year of study. If the student has studied in a metropolitan census region (MCR), the minimum wage is deflated by the appropriate regional consumer price index; otherwise the minimum wage is deflated by the appropriate provincial consumer price index.

Unemployment rate: Unemployment rate for the 15 year olds or more in the MCR or in the appropriate province for the student considered.

Provincial dummies: Binary variables indicating in which province the high school studies were held.

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