

**Early school dropouts in developing countries: An integer approach to guide intervention.
The case of Uruguay**

Rossana Patrón, Lecturer, University of Uruguay, rossana@decon.edu.uy

Abstract

Are early leavers from the education system irrational or ill informed? They might be, but this approach shows that with underperforming education sectors – typical in developing countries – early dropout may be perfectly rational and well informed, even in the absence of liquidity constraints. This paper provides an integer approach to guide intervention in developing countries, though there are no clear-cut policies. Long-term measures should be aimed at improving the productivity of the activity, for instance by improving teaching processes, qualification of human resources and organization of schools. Also, less costly measures targeting subjective factors like motivation might be as effective.

Introduction

Schooling, according to the human capital theory, is an investment that generates higher future income for individuals. More broadly, McMahon (1998) categorises returns to education as monetary and non-monetary as well as private and social. Wages are the direct private and monetary returns from education. Non-monetary private returns are health effects, human capital produced at home, more efficient household management, lifelong adaptation and continued learning at home, motivational attributes, non-monetary job satisfaction, etc. On the other hand, monetary social benefits are effects on GDP growth and effects on the earnings of others (by making them more productive). Non-monetary social benefits are, for example, the gains from living in an educated society (better citizenship, democratic stability, poverty reduction and lower crime rates).

Notwithstanding these benefits of education, early dropouts are a widespread phenomenon in developing countries. Whereas in the OECD countries, almost 100% of students enrol in secondary education and almost 80% of them finish, in Latin America, only 50% of students enrol and less than a third of them complete the level (Carlson 2002).

Are these early leavers from the education system irrational, ill informed or poorly advised? They might be, but this paper argues that with underperforming education sectors (heavy repetition rates and poor quality), early dropouts might be perfectly rational, even in the absence of liquidity constraints. This paper presents a combined approach to understand the heavy dropout rate in developing countries. It combines features of the education production function approach and of investment in human capital theory to explain early dropouts, making quality and efficacy in the provision of the service crucial to individuals' decisions. Even when there is a vast empirical literature on the etiology of school dropouts in both developed and developing countries (for instance, Hanushek et al. 2006; Lavado and Gallegos 2005; Thomas et al. 2002; Peraita and Pastor 2000; Eckstein and Wolpin 1999, among others), the mechanism leading to early dropouts in developing countries has not been the focus of research in the area. An integer approach to explain the decision to drop out early in developing countries is the novelty of this paper, providing guidance for intervention as well as a useful tool to implement ex-ante policy evaluation.

The paper discusses in detail the rationale behind the decision to stay in or exit the education system at secondary level in developing countries. It argues that when the investment under consideration is 'pursuing secondary studies', a consideration of the elements of 'uncertainty-

quality-market return' makes the decision not a straightforward one. The elements to consider are: a) Repetition risk: Repetition makes the reward of an additional year of schooling uncertain (it is zero if the student repeats), as well as uncertainty in the time required to complete a desired level of schooling; b) Education quality: When the quality of education is poor, the benefit of additional schooling deteriorates significantly; and, c) Market return: If the student is considering the option of enrolling for secondary education only (no further studies), the expected reward is low in developing countries.

An application of this approach is discussed in the paper. The rest of the paper describes the theoretical framework, exemplifies the Uruguayan case and discusses directions for policy action. A final section draws some conclusions.

Theoretical Framework

The model combines education as an investment and the education production function approaches to provide an integer interpretation to dropout decisions. The provision of education is described first, and the dropout decision is analysed later.

Education Sector

The output of education activities, assuming a Cobb-Douglas functional form, is given by:

$$Q_{jk} = A_{jk} K_{jk}^{\alpha_{jk}} E_{jk}^{1-\alpha_{jk}} \quad 0 < \alpha_{jk} < 1 \quad (1)$$

where sub-indexes j denotes level (primary, secondary and university) and k the student's type (advantaged and disadvantaged), Q_{jk} is the output of the education activity of level j using the resources allocated to it (K_{jk}) given the number and type of students currently enrolled (E_{jk}), A_{jk} is the scale parameter and α_{jk} is the elasticity of output with respect to capital input. Q_{jk} represents the amount of knowledge provided by the service but not necessarily transmitted to students (as there are students who need to repeat the year).

When students are heterogeneous, it may be educationally convenient to treat them differently. Students from the disadvantaged group may be more costly to educate (e.g., they may require materials, equipment, school meals or counselling services), so the production of knowledge is assumed lower for this group relative to the advantaged, for a given level of resources. It is also assumed, similarly, as in Sautu (1999), that school may compensate for the negative effects of poverty, or more generally, a disadvantaged condition, thus, a further assumption is that the responsiveness of this group to increased resources is higher. The above considerations imply the assumptions $A_D < A_A$ and $\alpha_D > \alpha_A$.

The educational output per student, q_{jk} , can be written as:

$$q_{jk} = A_{jk} \left(\frac{K_{jk}}{E_{jk}} \right)^{\alpha_{jk}}$$

where q_{jk} is the amount of knowledge embodied in upon successful completion of studies. Following Hanushek (1979), students' acquired knowledge defines 'school quality', therefore the *output per student* (q_{jk}) *measures school quality*. The specification used for the production of

education implies that as the service provided is assimilated differently by heterogeneous students, school quality differs across student types.

Previous achievement enables future success, or as Heckman and Masterov (2004) put it, skills beget skills. Therefore, as progress inside the system depends on school quality, then repetition rates may be formulated as:

$$\gamma_{jk} = \gamma_{jk}(q_{jk}) \quad 0 < \gamma_{jk} < 1$$

$$\text{where } \frac{\partial \gamma_{jk}}{\partial q_{jk}} < 0 \text{ and } \frac{\partial^2 \gamma_{jk}}{\partial^2 q_{jk}} > 0.$$

Successful students accumulate knowledge while repeaters do not. The cumulative nature of the learning process by the accumulation of q_{jk} during the years of schooling can be described using the indicator:

$$f_{mk} = \sum_{j=1}^m q_{jk}$$

where f_{mk} is the total endowment of knowledge accumulated per student in group k who has completed up to level m . The indicator f_{mk} measures the number of efficiency units of skills that a student of group k has accumulated up to level m , and equates to the concept of human capital.

Mechanics of Students' Decisions

Suppose an individual who is planning ahead two periods: in period one, he/she decides on working or studying; in period two, he/she works. A student type k will choose additional schooling (level $j+1$) if expected income (EI_{j+1k}) exceeds the certain income (IW_{jk}) of going to work immediately, i.e. when:

$$EI_{j+1k} > IW_{jk}$$

$$EI_{j+1k} = (1 - a_{j+1k}) IS_{j+1k} + a_{j+1k} IR_{j+1k}$$

where a_{j+1k} is the probability of repetition at level $j+1$ for students of type k (computed on observed rates γ_{j+1k}). IS_{j+1k} and IR_{j+1k} are lifetime income for successful students and repeaters, respectively, and IW_{jk} is income for those who decide to work immediately. As it is a two-period model, these incomes are defined as:

$$IW_{jk} = \sum_{t=1}^2 f_{jk} w \beta^t$$

$$IS_{j+1k} = f_{j+1k} w \beta^2$$

$$IR_{j+1k} = f_{jk} w \beta^2$$

where index t indicates the period, f_{jk} the qualification accumulated at school, w the wage rate per efficiency unit (assumed constant), the discount factor $\beta^t = 1/(1+d)^t$, wherein d is the discount rate.

It holds that $IS_{j+1k} > IR_{j+1k}$ as long as the qualification received in additional schooling is positive, and also that $IW_{jk} > IR_{j+1k}$, while $IS_{j+1k} > IW_{jk}$ or $IS_{j+1k} < IW_{jk}$ depending on the additional qualification received. If the value (real or perceived) of additional qualification is zero, then $IS_{j+1k} = IR_{j+1k} = EI_{j+1k} < IW_{jk}$ will always hold.

Therefore, students enrol in additional schooling when:

$$(1 - a_{j+1k}) q_{j+1k} w \beta > f_{jk} w$$

where $q_{j+1k} = f_{j+1k} - f_{jk}$. In the above expression, the left hand side is the expected present value of additional schooling and the right hand side is the forgone income while in school.

Thus, the individual considers at all times during schooling the opportunity to invest in additional education. As in Manski (1989), though with different mechanics, this approach considers schooling as an experiment: the student initially enrolls without knowing a priori how far he/she will progress inside the system, a progress that will depend on several factors. Suppose a student after primary education has to decide whether to enrol at secondary level. He/she will be more likely to enrol:

- 1- the higher is the qualification to be acquired (q_{j+1k})
- 2- the lower is the probability of repetition (a_{j+1k})
- 3- the lower is the discount rate or the longer is the time horizon of the decision maker

Therefore, high rates of early exit may be caused by:

- 1- poor quality of education: with a poorly working education system (due, for instance, to scarce resources or inefficient processes), the qualification to be acquired with additional schooling is low.
- 2- high repetition rates: the prevalence of the repetition phenomenon increases the uncertainty of the investment, discouraging further studies.

In addition, subjective factors contribute to excessively high rates of early exit:

- 1- Information/valuation problem. Students may be ill informed about the rewards of staying in school or have low expectations about the value of education.
- 2- 'Short-termism'. Low aspirations and the interest in immediate rewards may lead to early dropout. If the decision maker is too anxious (high discount rate) or too short-sighted, the relevant time horizon may be too short. For an extremely short time horizon (e.g., less than one year), EI_{j+1k} is zero.

Finally, the effects of changes in the labour market on dropout decisions are ambiguous. An increase in the market wage, for instance, improves both expected income and the opportunity cost. The actual result depends heavily on the impatience of the decision maker: if the discount rate is too high or the time horizon is too short, the effect on the opportunity cost tends to dominate, leading to early exit.

Evaluating the Uruguayan Case

The examination of the Uruguayan case may help shed light on the scope of the framework developed in Section 2. The situation of secondary education in Uruguay is vastly documented; however, the framework to understand heavy dropouts at this level is not yet well established in the literature. For instance, an official report (MEMFOD 2002a, 90) concludes:

‘... the (dropout) decision process involves personal characteristics as well as those of students’ environment (...). All this leads, through mechanisms that are not easy to understand from the data of this research, to a situation where the majority of those who drop out come from low-income families and those with low-education capital’.

The previous section provides a framework to understand the current situation. Additionally, some basic computations for assessing the Uruguayan situation are presented below. Finally, routes for policy action are discussed.

The Current Situation

The situation of secondary education in Uruguay is critical; this has been well documented, in particular by official institutions. Dropouts at the primary level are not significant, but they become considerable after completion of primary and during secondary school. In fact, 12% of students drop out after primary school. For those who enter secondary school, average repetition is nearly 30% and 27% drop out without completing it (MEMFOD 1999a, 12; 2004, 12-13). For lower secondary education, deficiencies in terms of coverage are noteworthy, especially given the fact that it is a compulsory level.

Research from MEMFOD (2000b, 13; 2003b, 35) has found that repetition is an important contributory factor in the occurrence of dropouts. Repetition and dropouts seem to be associated phenomena, given that repeaters are about seven times more likely to drop out than non-repeaters (MEMFOD 1999a, 14). This may suggest that a record of failure undermines students’ expectations. Repetition rates also severely affect other systemic indicators, as for instance, rates of on-time completion. For example, MEMFOD (2002c, 12) shows that for a cohort starting lower secondary in 1998, on average only 45% completed the level on time (3 years), while over 30% exited before completing the level, and over 20% were repeaters still in the system after 3 years.

Besides this, in Uruguay, there is also a general perception that education quality at secondary level has been deteriorating over time. During the 1980s, massification of secondary education without the provision of adequate human and physical resources led to deterioration in quality and, as a consequence, also led to the deterioration of performance indicators, i.e., repetition and completion rates (ANEP 2000, 186, 2005, 32-34). Massification of secondary studies also implied an increase in diversity of student population, with a higher participation of students from the disadvantaged group (ANEP 2000, 32); at present, about half of the students in secondary school come from unfavourable backgrounds. Future universalisation of secondary education would further increase considerably the diversity inside the system (ANEP 2000, 189).

Performance indicators for this group of disadvantaged students are significantly worse. For instance, tests in 1999 show that more than 80% of students from favourable backgrounds obtained high marks in math and language, but the percentage was only half or less for students from poor socio-economic backgrounds (MEMFOD 1999b, 14). Dropout also affects income groups differently: 63% of dropouts come from the poorest 25% of the population (MEMFOD 2003b, 7).

Moreover, students from the richest families start dropping out at the age of 17, while those from the poorest families start at 13 (ANEP 2005, 135). Bucheli and Casacuberta (1999) also found evidence that the probability of dropping out is associated with low socio-economic background.

Finally, it should be noted that there is a premium on schooling but it is low at the secondary level in Uruguay. In fact, wages for workers with lower secondary qualification is a mere 12.8% higher than those who only completed primary (INE 2005), making the investment at this level scarcely attractive. In sum, there are economic rewards to qualification; however, at secondary level, the qualification received is low or not very much valued by the market. This fact, coupled with the high probability of repetition, provides rationality to the decision of an early exit.

Basic computations

A back-of-the-envelope calculation can provide a partial evaluation of the situation of an average qualified student/worker in Uruguay. Non-observable variables q_j and f_j for the average qualified student can be proxied by information on workers remuneration by schooling (r_j) as:

$$r_{j+1} - r_j = f_{j+1}w - f_jw = q_{j+1}$$

Using this expression and data from remunerations, the indicators q_j and f_j are computed as shown in Table I, normalizing remuneration for workers without qualification to one and setting $w=1$.

Table I Remuneration by qualification and market value of education

| Level | remuneration* | f_j | q_j |
|-------------------------------|---------------|-------|-------|
| Without primary or incomplete | 3901 | 1.00 | |
| Primary | 5075 | 1.30 | 0.30 |
| Lower Secondary | 5723 | 1.47 | 0.17 |
| Upper secondary | 8047 | 2.06 | 0.60 |
| University | 15372 | 3.94 | 1.88 |

* Data for 2005 from INE (2005) in Uruguayan pesos

The implicit rate of return for lower secondary, i.e., that for which $EI_s = IW_s$, is 0.9%. Table II shows the evaluation of the decision rule for alternative discount rates (d equal to 0.03 and 0.1), and a time horizon of 50 years, for lower and upper secondary and university. This table shows private economic benefits ($B_j = EI_j - IW_j$).

Table II Evaluating benefits (B_j) of additional schooling (average student/worker)

| | 3% | 10% |
|-----------------|-------|-------|
| Lower secondary | -1.19 | -2.38 |
| Upper secondary | 4.43 | -0.65 |
| University | 16.59 | 2.05 |

Lower secondary education is an inconvenient investment even for students with low discount rates, but upper secondary and university education are worth pursuing. Thus, even when secondary schooling has a negative return, the completion of this level has an option value as it allows one to pursue more lucrative studies at higher levels. However, for students with low aspirations, this would not be a powerful enough reason to enrol in lower secondary studies.

Scope for Policy Action

The framework developed in this paper allows the identification of routes for policy action based on the fundamentals underlying the decision of staying on at school. In the case of Uruguay, four main areas for action are identified:

a) Policy should aim at improving quality (real and perceived).

Quality measured by students' achievements is poor, according to Pisa 2006 tests. For instance, Uruguay scores 14% below OECD countries in math subjects (ANEP 2007). A critical view of the quality of secondary education expressed by parents is also found in MEMFOD (2003c, 51). Besides, there is a need to improve the relevance of the curriculum: The current humanistic (not scientific) curriculum, encyclopaedic (not specialised) orientation, and non-labour market related knowledge are often cited as possible shortcomings in the provision of secondary education (a critical view of contents is found in ANEP 2005, 32; MEMFOD 2003c, 21). Thus, the system may be providing knowledge that has little market value.

There is a need also to improve the perceived value of education by providing better information of the rewards to education (economic and non-economic). If *perceived* value of additional schooling (q) is zero, then $EI < IW$ always, and there would be no reason to study; thus anything else, even inactivity, would be better. This may explain why 55.1% of dropouts aged 14-17 are economically inactive (Katzman and Rodriguez 2007, 34). MEMFOD (2002b, 13) also found that students' valuation of education as 'useful to find a job' reduces the risk of early dropout.

In the valuation of education, it is not only the perception of students that matter but also that of parents, as they can influence students' decisions. Research from MEMFOD (2002b, 13) found evidence that parents' expectations about students' future schooling is a good predictor of dropouts. But it has been shown that parents' expectations are not always high. In parents interviews, it has been revealed that many think that secondary education is so bad that it '*de-accumulates*' knowledge in children (i.e., *perceived* $q < 0$) (MEMFOD 2003c, 18), and that the labour market does not reward studies (i.e., *perceived* $q = 0$) (MEMFOD 2003c, 43-45; ANEP 2000, 37).

b) Policy should aim at reducing repetition rates.

Improving the productivity of the activity in terms of fostering successful students is a rather complex aim that may be composed of, at least the following:

- Qualification of teachers: there is a deficit of human capital in secondary education (ANEP 2000, 123) and the perceived quality of teachers is low (MEMFOD 2003c, 55).
- Improvement of the school organization: massification has deteriorated organization and control procedures in secondary institutions (ANEP 2005, 123). Parents' critical views of the organization of schools can be found in MEMFOD (2003c, 63).
- Re-thinking of teaching/learning processes in an increasingly heterogeneous environment: massification has increased diversity at the secondary level, putting pressure on the traditional teaching approach aimed at a more homogenous population (ANEP 2000, 186).
- Re-thinking teaching methods for slow learners or searching for creative alternatives to repetition, e.g., introducing tutoring, additional support, or complementary schemes.

c) Policy should provide incentives/motivation.

The provision of incentives (monetary or non-monetary) may modify the cost-benefit evaluation of pursuing further studies, for instance:

- Teachers should provide guidance and advice in order to motivate students to raise their aspirations and develop a more long-term perspective. Research from MEMFOD (2003b, 21) has revealed that 26% of those who exited the education system with only complete primary education declared as the reason for the decision that they had 'lost interest in studies', while 4% declared that they were 'satisfied with the level reached'. Therefore, teachers' advice may be useful, in particular considering that Thomas et al. (2002) found that teachers' advice is a significant influence on students' intentions to leave the system. Teachers' advice is most relevant in the absence of sound advice from parents, as compulsory laws do not seem to affect parents' opinions. Indeed, information revealed by official institutions (ANEP 2000, 225) that have interviewed parents of students who drop out in the first year of secondary school shows that only a third of parents opposed students' decisions to drop out, and 23.6% even encouraged the decision.

- Subsidies in the form of cash transfers can make secondary studies more attractive as the market return of secondary studies is low. Subsidies are also a compensatory policy for individuals with different opportunities and may help to ease liquidity constraints, but subsidies would increase enrolments from the risky population (lower f and higher repetition rates), further increasing heterogeneity. But for the subsidy to be effective, in the absence of other measures, it would need to be enough to roughly cover the income foregone while in school, as students are seldom aware of the future returns to schooling. Notwithstanding this, with low quality education and high repetition rates, a policy like this may be effective in raising enrolments, but scarce real benefit would be derived from the scheme.

d) Policy should be tailor-made to deal with diversity.

Under the framework developed in Section 2, students from disadvantaged conditions ticked off all the wrong boxes, leading to early exits from the education system. Their performances tend to be characterized by:

- Lower f : achievement is linked to socio-economic background of students (ANEP 2005, 174; MEMFOD 2003a, 14).

- Higher a : repetition rates are higher for students of low-socio economic background (ANEP 2005, 155).

- Subjective evaluation of education tends to be low: education capital is associated with income, and valuation of education is low for families with low education capital (MEMFOD 2003b, 25; MEMFOD 2002b, 14).

- Market return for disadvantaged students is lower: average income for youngsters of equal qualification (more than 12 years of schooling) differs according to family background (CEPAL 1998, 85).

Besides, students from the disadvantaged condition are more likely to not be able to afford the opportunity cost of studies: 41% of exits after primary are for economic reasons (MEMFOD 2003b, 21); school dropouts aged 14-19 make a contribution to household income of about 20% (MEMFOD 2002a, 87).

Conclusions

This paper contributes to the existing literature, by combining elements of human capital theory and of education production function approach to explain the heavy rate of early dropouts in countries with poorly working education systems, typically those in developing countries. This modelisation regards quality and efficiency in the provision of the service as crucial to individuals' decisions.

Early dropout is a multi-causal phenomenon, as systemic (education quality and repetition rates) and subjective (information, valuation of education and discount rate) factors have a role in the mechanics of schooling decision, thus a combined approach is best. This paper argues that when the investment under consideration is pursuing secondary studies, the consideration of the elements of 'uncertainty-quality-market return' make the decision not a straightforward one. The Uruguayan case has been examined using this framework and routes for policy action have been identified. In Uruguay, expected income does not cover opportunity cost of studies at secondary level, probably explaining heavy dropouts even when secondary studies are compulsory. Also using this framework, it has been noted that, students from a disadvantaged condition are more at risk of early exit from the education system, making the consideration of dropouts an equity issue. Compulsory laws in Uruguay are not effective, as there are heavy dropouts during secondary education. Yet the enforcement of such laws would pose an excessive burden on less advantaged students.

There is room for policy action, but there are no clear-cut policies. Budget increases have limited impact on maintaining enrolments, as such effects are indirect (depending on the responsiveness of quality to resources). A more effective alternative, at least in the short term, appears to be direct cash transfers. However, such measure would be of little real benefit if systemic performance remained poor. More long-term measures should be aimed at improving the productivity of the activity in terms of increasing the number of successful students, by improving teaching processes, qualification of human resources and organization of schools. Less costly measures targeting subjective factors such as motivation and valuation of education may be as effective, as often students and parents do not see any advantage from schooling.

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