School results, school decisions and the transition from school to work: the role of ethnicity and language

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Stijn Baert* - Ghent University

Bart Cockx† - Ghent University, Université catholique de Louvain, CESIfo and IZA

In Flanders, school-to-work transitions are much more successful for Flemish youth than for youth of ethnic minorities. Young migrants are, not surprisingly, also much less educated. This research project aims at decomposing these observed gaps into a part that can be explained by differences in personal and family characteristics, labour market conditions and prior schooling attainment ("endowments") on the one hand and a part that is inherent to "ethnic differences", as induced by differences in behaviour and unobserved endowments or by discrimination, on the other hand. In addition, we contribute to a recent literature dealing with the role of language as a potential determinant of school and labour market success by integrating the language spoken at home among the observed personal and family background characteristics.

We develop a dynamic discrete choice model in which we both endogenise the transition to work and the preceding schooling attainments. Moreover, for each schooling year we do not only model the decision whether or not to stay in school, but also the probability of passing the grade. We find that differences in observed endowments can't explain the delay when starting the first year of secondary education. After equating observable characteristics between Flemish and minority groups, the latter group still has a probability of arriving with a grade retention experience that is substantially higher than the former group. During secondary education, however, schooling attainment gaps are eliminated once endowments are controlled for. Moreover, conditional on passing the last year of secondary schooling, foreign youth go to college with a higher probability then Flemish youth when endowments are equalized. Regarding the school-to-work transition, our simulations show that observed employment gaps at all schooling levels are to a large extent inherent to ethnic differences. Finally, concerning the role of language, we find a significant role for language in closing the labour market gap (especially for the middle and high educated) rather than in explaining the observed differences in prior schooling attainments.

JEL classification: C35, I21, J15, J24, J61, J70

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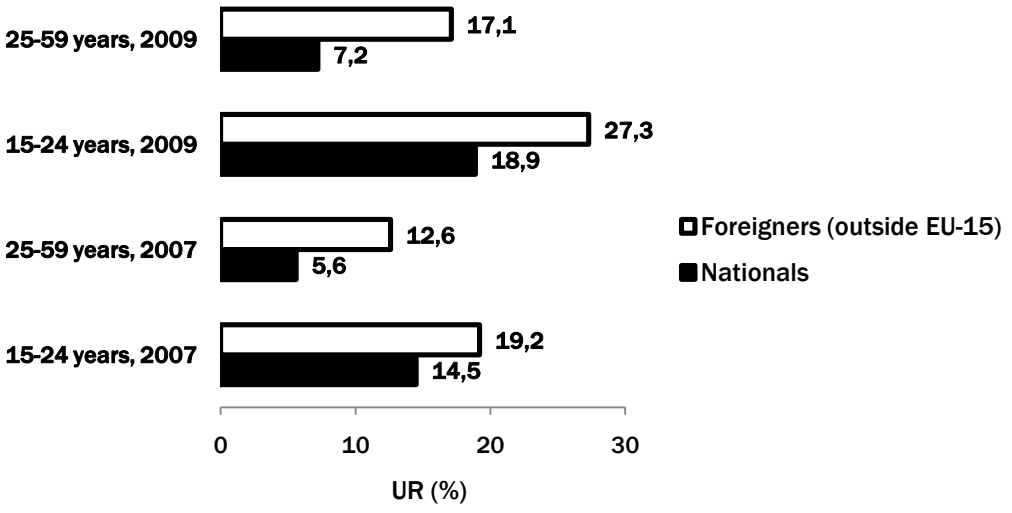
* Department of Social Economics – Ghent University, Tweekerkenstraat 2, B-9000 Gent, Belgium, Stijn.Baert@UGent.be

† Department of Social Economics – Ghent University, Tweekerkenstraat 2, B-9000 Gent, Belgium, Bart.Cockx@UGent.be

Improving the labour market performance of school-leavers is currently a key challenge in Western countries. Youth unemployment has been massive and persistent for decades. On top of this, there is a considerable body of evidence suggesting that young people are more severely hit during downturns (see, e.g., European Commission, 2010). *Figure 1* shows that young people in the EU-15 have borne much of the brunt of the recent economic and financial crises. In the OECD area as a whole, the youth unemployment rate is approaching 20%, with nearly 4 million more youth among the unemployed than at the end of 2007. On the other hand, a growing literature deals with the difficulties to catch up after an initial failure. In particular, the current job crisis is likely to leave long-lasting "scarring" effects on some of the current generation of school-leavers (see, e.g., Gregg and Tominey, 2005; Mroz and Savage, 2006; Fares and Tinongson, 2007 and Gartell, 2009).

In particular, both stylized facts seem to aggravate a fortiori the position of migrant youth in the OECD area. As shown by *Figure 1*, the unemployment rate of youth with a non-EU-15 nationality in the EU-15 increased with a colossal amount of 8 percentage points. In addition, there seem to be more evidence for scarring effects for youth coming from a foreign background (OECD, 2010). Not surprisingly the OECD calls them a "target group for intensive assistance" and Scarpetta et al. (2010) argue "actively encouraging of the mentoring of young people from immigrant backgrounds."

Figure 1: Unemployment rate (UR) in the EU - 15



Source: Eurostat (Labour Force Study: Unemployment rates by sex, age groups and nationality)

More generally, hundreds of studies in many different countries and for many time periods have confirmed that having a foreign background is an important determinant of employment outcomes and, more specifically, of school-to-work transitions. Despite the overwhelming evidence of a negative correlation between foreign ethnicity and success in the transition to work, the debate investigating the

sources of this disparity between foreign and natives is still open. Do the observed gaps mirror gaps in schooling outcomes and social background or are they inherent to ethnic differences and, for instance, related to discrimination in the labour market? Moreover, there is no consensus on when - early or late in school or in the labour market - these gaps exactly arise and grow.

This research project aims at decomposing the observed gaps in educational attainment and in successful transitions from school to the labour market between native and migrant youth into three parts related to three categories of driving forces behind these gaps. A first part is explained by differences in observable characteristics: personal and family variables such as gender and father's education level and labour market conditions as measured by the unemployment rate. A second part is related to prior educational attainment. If, after identifying these two components, the remaining gap is not zero, there is evidence for a part that is inherent to ethnic differences as induced by discrimination or differences in behaviour and unobserved endowments. In other words, this paper questions whether, after conditioning on observable characteristics and prior educational attainments, migrant youth tends to accumulate more or less education and have a higher or lower chance on a successful transition to work than natives.

This paper is structured in the following way. First we review the literature and discuss our contribution to it. Thereafter we describe the dataset of this study, and we provide some descriptive statistics that motivate our analysis. *Section 3* describes the econometric model. *Section 4* provides an assessment of the model in terms of within-sample fit. *Section 5* reports the outcome of a series of counterfactual simulations that aim at answering the main research question and in *Section 6* we elaborate on our simulation results addressing the role of language. A final section concludes.

1. Literature review and our contribution

Schooling attainment and early labour market outcomes of foreign youth have been studied amply in the literature. Researchers have mostly focused on a single educational or labour market transition in isolation from other transitions, such as the decision to enrol in higher education (see, e.g., Hagy and Staniec, 2002 and Kelchtermans and Verboven, 2010), the probability of succeeding the first year at university (see, e.g., Ortiz and Dehon, 2008) or the probability of a successful transition to work (see, e.g., Ryan, 2001 and Pozzoli, 2009). As Cameron and Heckman (2001), we believe that a more general and dynamic econometric approach that explicitly takes into account that prior school achievements are the result of endogenous decisions is more appropriate to deal with our research questions. Social background characteristics, for instance, affect the components of this chain of schooling and labour market outcomes differentially by age and by level of educational attainment. Ignoring this makes it difficult to disentangle the short-term influence of a characteristic on a particular outcome from its accumulated long-term influence via preceding economic decisions. Moreover, unobserved factors, such

as ability and motivation, influence past school and labour market decisions, so that those who have the opportunity to enrol in higher education (and later to find a job) are select members of the population: they will on average be more able and more motivated. If native and foreign youth differ in terms of these unobserved factors or if this dynamic sorting process operates differently between these subpopulations, then, as underlined by Cameron and Heckman (1998), ignoring this dynamic selection biases the comparison of schooling and labour market outcomes between natives and migrants.

Cameron and Heckman (2001) study the sources of ethnic differences in educational attainment in the U.S. In order to avoid the aforementioned dynamic selection bias, they estimate a dynamic choice model that starts analysing schooling transitions from the age of 15, which is below the age of compulsory education and therefore before the dynamic sorting starts operating. They pinpoint that foreign schooling achievement (above the age of 16) generally rises above white levels when observed characteristics are equalized. Hence, the schooling gap does originate much earlier and, as deduced by the mentioned authors, is rather a consequence of social inequality than of ethnic differences *per se* as potentially induced by discrimination. Therefore, elimination of the schooling gap requires elimination of (i) family background differences or (ii) differences in earlier school achievement (to which it's correlated).

Belzil and Poinas (2010) develop an analogous, but a-temporal[1] econometric framework to study first labour market outcomes of second-generation immigrants in France. Their findings do not support discrimination in the labour market. Observed ethnic gaps in the labour market are completely eliminated once schooling outcomes and personal and family background characteristics are accounted for. These schooling gaps are in turn reduced - but not eliminated - when observed characteristics are equalized.

Our approach generalises the two last mentioned contributions in a few directions. First, we develop a sequential discrete choice model in which we both endogenise the schooling attainments and the transition to work. To our knowledge, we are the first in addressing disparity in both outcomes within such a framework in a temporal way. Second, for each year we do not only model, as the aforementioned authors, the decision whether or not to stay in school, but also the probability of passing the grade.[2] Ethnic and endowment differentials may affect these outcomes with a different magnitude or even in the opposite direction. Third, the schooling decisions are modelled from the start of secondary school. Starting the analysis at an earlier point in time allows verifying whether schooling gaps, if present, emerge in or before primary school or later in secondary school.[3]

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[1] This a-temporal aspect is due to their level-by-level (instead of year-by-year) modeling. Consequently, they don't take into account any delay issues (making abstraction of the explanatory variable "delay at primary school" as adopted by the authors). To some extent related, the mentioned authors don't introduce any time-varying explanatory variables.

[2] Sociologists Boudon (1974) and Erikson et al. (2005) advocate that observed social class schooling differentials result both from the "primary effects" of differing levels of academic performance and from the "secondary effects" in the educational choices that one makes at given levels of performance.

[3] A recent literature deals with the early origin of skill formation. See, e.g., Cunha and Heckman (2009) and Heckman and Jacobs (2010).

Fourth, in contrast to the aforementioned authors, we integrate the language spoken at home among the observed family background characteristics. Language spoken at home is reported to be an important determinant of school and labour market success. van Ours and Veenman (2003) conclude that language proficiency of migrants in the Netherlands has a positive effect on the educational attainment of their sons but no effect on the educational attainment of their daughters. Dustmann et al. (2010) indicate language as the key factor for minority youth in the UK to catch up with white pupils throughout compulsory schooling. Moreover, Dustmann and Fabbri (2003), Chiswick (2008) and Aldashev et al. (2009) elaborate on higher labour market chances for migrants who speak the language of their destination country. Therefore, language usage may be crucial to take into account in the analysis of ethnic differences.

Furthermore, we use an a-select dataset and thereby adequately control for the problem of endogenous sampling, which is present in the prior mentioned studies. Finally, to our knowledge, we are the first in investigating the relative (schooling and labour market) performance of foreign youth in Belgium within such a general framework.

2. Data and some facts

2.1 The data: retrospective survey of a representative sample

Our selected dataset for this project concerns all three cohorts, born in 1976, 1978 and 1980 and interviewed at the age of 23 (and 26 and/or 29) of a survey database ("SONAR") for Flanders, the Dutch speaking region of Belgium. The database had been created to study the transition from education to the labour market. Therefore this database is exceptionally rich on both education career information and labour market information for school-leavers in their first working experiences. The database contains monthly information on the education career and the labour market status from the moment one enters secondary school (in principle, in the year in which one reaches the age of 12),[4] until the moment of the last interview as well as a whole range of socio economic variables. In addition, an extensive questioning was conducted concerning the respondent's social background, education and labour market preferences and expectations, search strategies and well-being at first labour market experiences. The samples were randomly selected and trained interviewers performed the oral interviews at the interviewees' home address. The dataset is thus based on self-reported information of the respondents.

The SONAR group tried to investigate the representativity of the database (SONAR, 2000). The sample consists of 51% men and 49% of women, which is a similar proportion as in national population statistics.

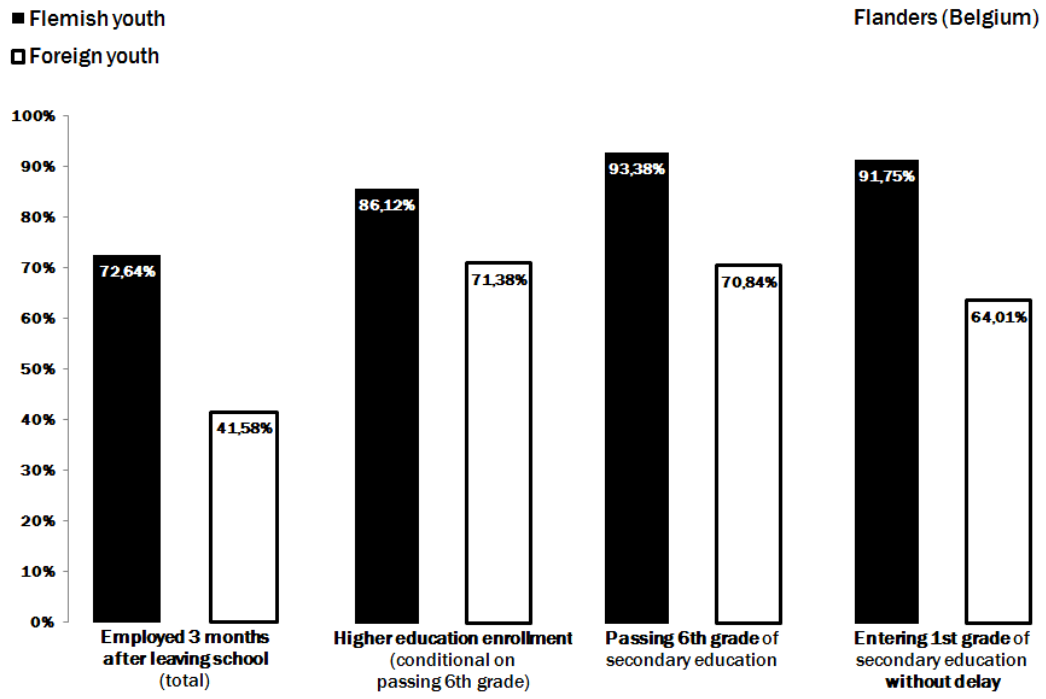
[4] We elaborate on the Flemish education system and labour market in *Appendix B*.

Comparing the sample with respect to other characteristics is more difficult because of a lack of comparable data. A cautious comparison with statistics of the Ministry of Education and the Labor Force Study (LFS) as a benchmark, reveals that the sample is representative with respect to family formation. In line with similar surveys, lower educated, unemployed and respondents from lower social classes are somewhat underrepresented.

2.2 The objects of study: two sub-populations

Throughout this paper, two sub-populations of young people living in Flanders are indexed by the nationality of their grandmother on mother's side. On the one hand we consider "Flemish" youth, i.e. youth whose grandmother on mother's side possesses the Belgian nationality. On the other hand we consider "foreign" youth (or "migrant" youth), i.e. youth whose grandmother on mother's side doesn't have either the Belgian nationality or another Western[5] nationality. 7091 respondents are Flemish and 439 respondents in our dataset are foreign with respect to these definitions.

Figure 2: Facts about schooling attainment and school-to-work transition



Source: own calculations based on SONAR database

[5] In particular, by "Western" nationality we refer to the North American, British, Scandinavian, Western European or Australian nationality.

2.3 The facts: some motivating gaps

Figure 2's first statistic convinces us of the unfavourable position of the foreign[6] youth on the Flemish labour market[7]: only 42 percent of the foreign youth is employed 3 months after leaving school while at the same time 73 percent of their Flemish counterparts are working. This 31 percentage point - gap, however, doesn't appear out of the blue. The proportion of secondary school graduates that enrol into university or college is also significantly smaller among the foreign youth (gap of 15 percentage points) and - related - the same is true for the proportion of scholars that pass the last grade of secondary education (23 pp gap). Even at the start of secondary school, this gap manifests: more than one third of the foreign youth starts with a delay while at the same moment only 8% of the Flemish youth arrives with a grade retention experience. These descriptive statistics preview, with some qualifications detailed below, a main conclusion of the econometric analysis that follows. The gap in educational attainment and therefore in labour market outcomes, between migrants and natives mirrors the gap already present at the start of secondary school, confirming the analysis of Cameron and Heckman (2001) and Belzil and Poinas (2010) that ethnical difference originates early.

3. Econometric strategy

The transition from school to work is influenced by schooling attainments: a higher education level causes a higher chance on a successful transition to the labour market (see, e.g., Keane and Wolpin, 2000; Urzua, 2008 and Bertschy, 2009). In addition, schooling outcomes (choices and results) at any age are the outcome of previous schooling outcomes (see, e.g., Keane and Wolpin, 1997 and Heckman, 1998). The probability that a young person enrols into college or university depends on secondary school graduation which in turn depends on successively passing each secondary school year and afterwards deciding to continue (versus to stop) schooling. To capture this sequential aspect of economic decisions and attainments, we estimate a dynamic discrete choice model.

Figure 3 shows a graphical representation of our modelling strategy. In brief, from the 1th grade of secondary school on[8], we model for each schooling year[9] of each individual the chance of passing (P)

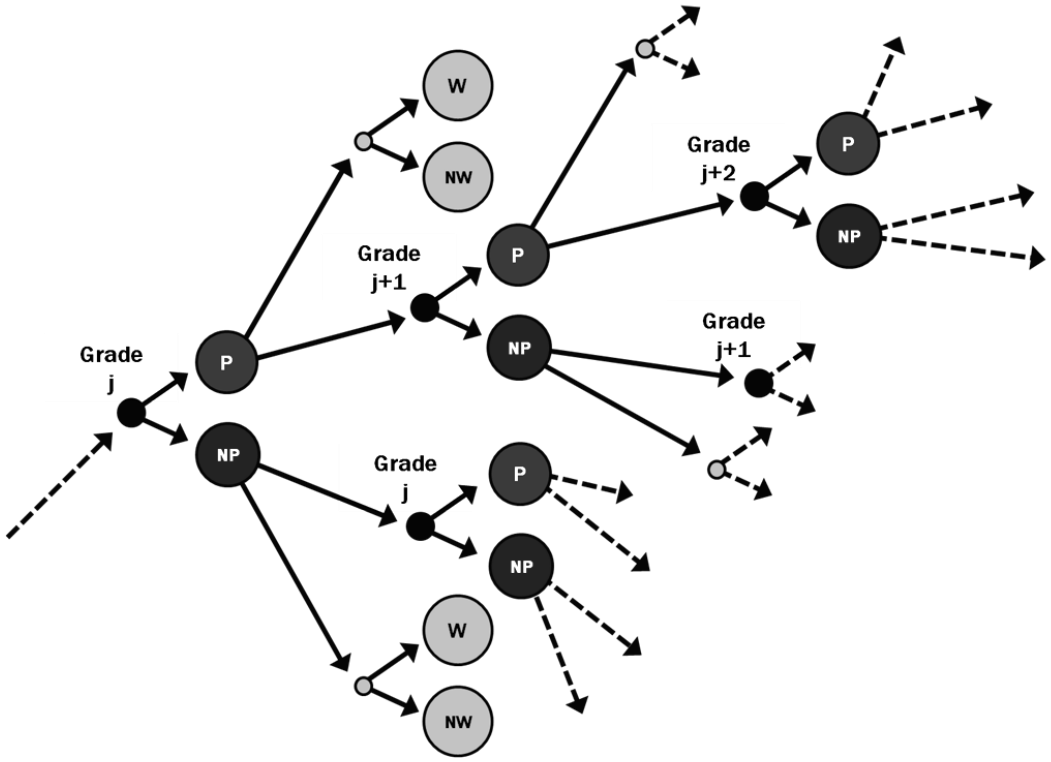
[6] If, in what follows, we refer to "Flemish" or "foreign" ("migrant") youth, in all cases we point to the definitions stated in *Section 2.2*.

[7] Also generally speaking, in Flanders - and by extension in Belgium - the labour market gap between Belgians and migrants is among the largest in Europe (OECD, 2008).

[8] If one has no delay, the 1th grade starts in September of the year that one becomes 12 years old. We continue counting when one completes mainstream secondary school after the 6th grade (without delay, this is at the school leaving age of 18) and pursues a higher education. Consequently, "grade 7" stands for the first year at a vocational specialisation grade or at college or university. As mentioned before, we elaborate on the Flemish education system and labour market in *Appendix B*.

resp. not passing (NP) the grade under investigation and afterwards the chance of deciding to continue schooling (at a higher grade when passing or at the same grade when not passing), both conditional on explanatory variables and the prior school trajectory. When leaving school we model the chance of being employed 3 months[10] later (W/NW). Each decision in turn affects the likelihood of each later outcome. A key advantage of this approach is that it decomposes an outcome that results from a sequence of past decisions in its components (Cameron and Heckman, 1998, 2001). Moreover, it allows accounting for the aforementioned dynamic selectivity induced by unobservables (since education is compulsory until the age of 18).

Figure 3: Transition model



3.1 Sequential dynamic discrete choice

Our model is specified as a sequence of logistic probabilities. Rationale and forward looking agents *i* with a schooling status determined at each moment of time *t* by their obtained schooling level and their

[9] Some of the modeled transitions occur only seldom, which results in the need for a limitation on the number of estimated parameters as described in *Section 4*.

[10] In a second version of our model (cf. infra) we adopt being employed with a permanent contract 2 years after leaving school as the labour market outcome.

accumulated years of school delay V_{it} [11] make their "choices"[12] from a feasible choice set. Let $c^{O}_{g,it}$ be the set of choices for a specific outcome *O* at grade *g* of agent *i* at time *t*. The optimal choice $c^{O}_{g,it}$ for this individual is the following:

$$c^{O}_{g,it} = arg \max_{c \in C^{O}_{g,it}} \left\{ U^{O}_{g,it,c} \right\}, \tag{1}$$

where $U^{O}_{g,it,c}$ is the latent utility of choice *c* for outcome *O* at grade *g* for agent *i* at time *t*. We approximate this $U^{O}_{g,it,c}$ as advocated by, e.g., Heckman (1981) and adopted by other authors, by a linear index:

$$U^{O}_{g,it,c} = \boldsymbol{Z'}_{it}\, \boldsymbol{\beta}^{O}_{g,c} + V_{it}\gamma^{O}_{g,c} + \nu^{O}_{g,it,c}, \tag{2}$$

where $\boldsymbol{Z'}_{it}$ is a vector of possibly time-varying observable variables, including the intercept, $\boldsymbol{\beta}^{O}_{g,c}$ is a vector of parameters measuring the effect of these variables, $\gamma^{O}_{g,c}$ is a parameter measuring the effect of accumulated years of school delay and $\nu^{O}_{g,it,c}$ is unobservable from the point of view of the researcher. Analogously to Cameron and Heckman (2001) and Belzil and Poinas (2010) we assume that $\nu^{O}_{g,it,c}$ is characterized by the following factor structure:

$$\nu^{O}_{g,it,c} = \alpha^{O}_{g,c}\, \vartheta_i + \varepsilon^{O}_{g,it,c}, \tag{3}$$

where ϑ_i is a constant individual specific effect and $\alpha^{O}_{g,c}$ is an outcome specific coefficient. $\varepsilon^{O}_{g,it,c}$ is the i.i.d. error term. We assume that this error term is an i.i.d. extreme value, independent of ϑ_i for all *g*, *i*, *t* and *c* and therefore can write the probability of an outcome as an extension of McFadden's (1974) conditional logit model.

More concretely, let $c^{P}_{g,it} = c^{P}_{g} = \{0,1\}$ be the set of choices for the school result at grade *g* ('0' means not passing and '1' means passing). The choice sets for the decision to continue schooling after this schooling year are defined analogously: $c^{DP}_{g,it} = c^{DP}_{g} = \{0,1\}$ (decision after passing grade *g*) and $c^{DNP}_{g,it} = c^{DNP}_{g} = \{0,1\}$ (decision after not passing grade *g*). In both cases '0' stands for stop schooling and '1' for continue schooling. After dropping out $c^{W}_{g,it} = c^{W}_{g} = \{0,1\}$ is the set of choices for the transition to work after leaving school ('0' means not successful and '1' means successful) conditional on leaving after passing grade *g*.

[11] This variable can be thought of as the memory of our model, increasing at every experience of grade retention and therefore a result of the (endogenous) former school outcomes.

[12] We use quotation marks here as, properly speaking, passing resp. not passing a grade on the one hand and being employed 3 months after leaving school on the other hand aren't outcomes under full control of the modelled youth.

$c_{it}^{IN} = c^{IN} = \{0,1\}$ denotes the initial schooling attainment set of choices (i.e. '0' if delay and '1' if on time at the start of secondary schooling) of agent *i* who enters the model at moment *t*. For each of these binary transitions, we obtain simple logistic probabilities, for instance for the probability of passing resp. not passing grade *g*:

$$\begin{cases} Pr(c_{g,it}^{P} = 1 | \mathbf{Z'}_{it}, V_{it}, \vartheta_i) = \dfrac{exp(\mathbf{Z'}_{it}\,\boldsymbol{\beta}_g^P + V_{it}\gamma_g^P + \alpha_g^P \vartheta_i)}{1 + exp(\mathbf{Z'}_{it}\,\boldsymbol{\beta}_g^P + V_{it}\gamma_g^P + \alpha_g^P \vartheta_i)} \\ Pr(c_{g,it}^{P} = 0 | \mathbf{Z'}_{it}, V_{it}, \vartheta_i) = 1 - \dfrac{exp(\mathbf{Z'}_{it}\,\boldsymbol{\beta}_g^P + V_{it}\gamma_g^P + \alpha_g^P \vartheta_i)}{1 + exp(\mathbf{Z'}_{it}\,\boldsymbol{\beta}_g^P + V_{it}\gamma_g^P + \alpha_g^P \vartheta_i)} \end{cases}. \quad (4)$$

The individual likelihood $L_i(Z_i, V_i, \vartheta_i)$ is then the probability of any sequence of life cycle school histories and transition to the labour market, built by a multiplication of the expressed probabilities of sequential outcomes which are realized by agent *i*. For instance, an individual indexed *1*, born in 1976, that arrives with no delay at the 1th grade of secondary education (i.e. in 1988, when aged 12), leaves school after the 5th grade with a grade retention experience at the 4th grade and finds a job within 3 months after school leaving, will contribute to our model's total likelihood as follows:

$$\begin{aligned} &Pr(c_{1,1988}^{IN} = 1 | \mathbf{Z'}_{1,1988}, \vartheta_1) \cdot Pr(c_{1,1,1989}^{P} = 1 | \mathbf{Z'}_{1,1989}, V_{1,1989}, \vartheta_1) \cdot \\ &Pr(c_{1,1,1989}^{DP} = 1 | \mathbf{Z'}_{1,1989}, V_{1,1989}, \vartheta_1) \cdot Pr(c_{2,1,1990}^{P} = 1 | \mathbf{Z'}_{1,1990}, V_{1,1990}, \vartheta_1) \cdot \\ &Pr(c_{2,1,1990}^{DP} = 1 | \mathbf{Z'}_{1,1990}, V_{1,1990}, \vartheta_1) \cdot Pr(c_{3,1,1991}^{P} = 1 | \mathbf{Z'}_{1,1991}, V_{1,1991}, \vartheta_1) \cdot \\ &Pr(c_{3,1,1991}^{DP} = 1 | \mathbf{Z'}_{1,1991}, V_{1,1991}, \vartheta_1) \cdot Pr(c_{4,1,1992}^{P} = 0 | \mathbf{Z'}_{1,1992}, V_{1,1992}, \vartheta_1) \cdot \cdot \\ &Pr(c_{4,1,1992}^{DNP} = 1 | \mathbf{Z'}_{1,1992}, V_{1,1992}, \vartheta_1) \cdot Pr(c_{4,1,1993}^{P} = 1 | \mathbf{Z'}_{1,1993}, V_{1,1993}, \vartheta_1) \cdot \\ &Pr(c_{4,1,1993}^{DP} = 1 | \mathbf{Z'}_{1,1993}, V_{1,1993}, \vartheta_1) \cdot Pr(c_{5,1,1994}^{P} = 1 | \mathbf{Z'}_{1,1994}, V_{1,1994}, \vartheta_1) \cdot \\ &Pr(c_{5,1,1994}^{DP} = 0 | \mathbf{Z'}_{1,1994}, V_{1,1994}, \vartheta_1) \cdot Pr(c_{1,1994}^{W} = 1 | \mathbf{Z'}_{1,1994}, V_{1,1994}, \vartheta_1) \end{aligned} \quad (5)$$

We adopt a non-parametric discrete distribution to control further for the dynamic selection that is induced by unobserved heterogeneity, by analogy with Heckman and Singer (1984). Assume that there are *K* types in the population under investigation and their proportions are specified as logistic transforms:

$$p_k = \frac{exp(q_k)}{\sum_{j=1}^{K} exp(q_j)}, \text{ with } k = [1, K] \text{ and } q_k \text{ parameters to estimate } (q_1 \text{ is normalized to 0}). \quad (6)$$

Besides the estimation of these proportions, this approach induces the estimation of one coefficient $\alpha_{g,c}^{O}$ for each outcome[13] and *K-1* mass points ϑ_k for *K-1* types as we normalize ϑ_1 on 0. Hence, the mixed likelihood for an agent *i* is:[14]

[13] This coefficient is normalized to 1 for the transition for which we estimate mass points ϑ_k, i.e. the school result at the first modeled grade. Consequently, in the case we model 2 types we measure 1 parameter (outcome specific coefficient) per transition.

$$L_i(Z_i, V_i) = \sum_{k=1}^{K} p_k \cdot L_{i,k}(Z_i, V_i), \quad (7)$$

where $L_{i,k}(Z_i, V_i)$ is the contribution to the likelihood for individual i being of type k (with type specific mass point ϑ_k).

3.2 Explanatory variables[15]

A vast literature deals with the determinants of graduating in school and the demand for (higher) education on the one hand and a successful transition to the labour market on the other hand. These determinants can be classified into 5 groups. The first one is (prior) accumulated human capital. Bertschy et al. (2009) find that performance at secondary education, as captured by PISA scores, is positive correlated with the demand for further education and that a higher education level has a positive impact on the transition to the labour market. The latter result is confirmed by Franz et al. (1997). In addition, Pinquart et al. (2003), van der Klaauw et al. (2005) and Pozzoli (2009) find mixed evidence for the impact of high grades on a successful transition. In our approach, the control for human capital is inherent to the recursive manner of our school results endogenizing model. Ability, positively correlated with graduating and the demand for higher education (Kodde, 1988 and Eckstein and Wolpin, 1999) and with a successful transition to the labour market (Bertschy et al., 2009) is captured by our control for unobserved factors (to the extent that this variable is not correlated to the modelled observables).

Second, another group of authors deal with the impact of the costs of education on the demand for (higher) education. A higher regional diffusion of the universities (Duchesne and Nonneman, 1998), financial support (Canton and De Jong, 2005) and lower foregone earnings (Duchesne and Nonneman, 1998 and Dellas and Sakellaris, 2003) are found as positive determinants. Dellas and Sakellaris (2003) and Canton and De Jong (2005) find no clear evidence for an influence of tuition fees. As our dataset's individuals are living in the same region, with a stable financial support system, there is no heterogeneity with respect to these variables.[16]

On the one hand, the returns of education as controlled for by college wage or employment premiums (positive effect on demand for higher education found by Duchesne and Nonneman (1998), Dellas and Sakellaris (2003) and Canton and De Jong (2005)) are captured by the fact that we endogenise the first labour market outcome. On the other hand, we control for the unemployment rate at the moment of each modelled outcome. More precisely, we control for the annual average unemployment rate for the 15 - 24

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[14] Z'_i and V_i are the collections of the Z'_{it} resp. V_{it}.

[15] The adopted covariates must be strictly exogenous. This restricts our choice of explanatory variables.

[16] No tuition fee has to be paid at nursery, primary and secondary school and very low and stable tuition fees (from €80 to €567.80, depending on the student's family wealth) at college and university. 22 colleges and 7 universities are spread over less than 14000 km² resulting in a high regional diffusion of the providers of higher education.

aged in Flanders in the year of the outcome (e.g. for the school year that starts in 1991 and ends in 1992, we use the average of 1992). The used unemployment data is described in *Table A- 1*. Franz et al. (1997) and van der Klaauw et al. (2005) give evidence for a positive effect of a boom resp. a low unemployment rate on the transition to work. The evidence concerning the effect of business cycle and unemployment rate on schooling decisions is ambivalent (Betts and McFarland, 1995; Duchesne and Nonneman, 1998 and Canton and De Jong, 2005) due to a similar effect on both the costs of education and the returns of education.

Table 1: Summary statistics by ethnic groups

	Flemish youth		Foreign youth	
	Mean	Standard deviation	Mean	Standard deviation
A. No delay when starting secondary school	0.9175	0.2751	0.6401	0.4805
B. Passing first year at secondary school	0.9630	0.1889	0.9112	0.2848
C. Passing 6th grade	0.9338	0.2487	0.7084	0.4550
D. Starting a HE after 6th grade				
unconditional on passing 6th grade	0.8041	0.3969	0.5057	0.5005
conditional on passing 6th grade	0.8612	0.3458	0.7138	0.4527
E. Employed 3 months after leaving school				
low educated[17]	0.5754	0.4948	0.3125	0.4653
middle educated	0.6872	0.4638	0.4318	0.4972
high educated	0.7627	0.4255	0.5000	0.5019
F. Employed with a permanent contract 2 years after leaving school[18]				
low educated	0.5000	0.5005	0.2302	0.4226
middle educated	0.6320	0.4824	0.3140	0.4661
high educated	0.6468	0.4780	0.4955	0.5022
G. Female gender	0.4822	0.4997	0.5489	0.4982
H. # siblings	1.5289	1.1740	3.8314	2.6524
I. Father's education level	18.0191	3.4595	14.4396	3.4277
J. Dutch at home	0.9848	0.1225	0.7358	0.4414

Making abstraction of ethnicity related variables, social background - a fourth group - can be controlled for by parental education level, as done by Carneiro (2008), Spruyt and Laurijssen (2010) and Björklund and

[17] In all cases, by "low educated" we mean leaving school without secondary education (6th grade of secondary school) completion; by "high educated" we mean leaving school after at least one successful year of higher education; by "middle educated" we mean leaving school after completion of the 6th grade of secondary school but without a successful higher education experience. These definitions, which probably to some extent don't square with the current ones, are a pragmatic choice given the particular obtained education level distribution within the foreign population (only a few foreign youngsters obtain a university degree).

[18] Self-employed workers are included within this group, all contracts with limited duration (temporary employment, subsidized contracts, apprenticeship…) are not included.

Salvanes (2010) or by parental occupation, as done by Franz et al. (1997), Ryan (2001) and Pozzoli (2009). We control for this aspect by a father's schooling level variable for each outcome.[19] To be more specific, this variable captures the (theoretical) age at which the respondent's father would have left school in the case of a school career without delay. Fathers of foreign respondents are much less educated than their Flemish counterparts as can be seen in *Table 1*: a gap of more than three and a half years exists. In addition, we control for the number of siblings, in analogy with Cameron and Heckman (2001) who find a modest positive correlation of this number with the demand for schooling. *Table 1* demonstrates that the number of siblings at foreign families is more than two times the number of siblings at Flemish families.

Another investigated determinant is gender. Ryan (2001) and Pozzoli (2009) give evidence for a lower chance on a transition to work for females. By contrast, van der Klaauw et al. (2005) find higher job arrival rates for female school-leavers but lower wage offers. We select the variable female sex as an explanatory variable. Moreover, as a main research goal of this study is to investigate the role of language spoken at home in explaining schooling attainment and labour market outcomes, we control for speaking Dutch (possibly among other languages) at parental home. Finally, a higher graduation age conditional on a certain education level, as captured by our delay variable at each stage, is predicted to have a negative effect on the transition to work (Franz et al., 1997 and Pozzoli, 2009).

4. Goodness of Fit

We estimate our econometric model separately for migrants and natives. We do this for two versions with respect to the labour market outcome variable (first the version with the employment status after 3 months, then the one with the employment status after 2 years as the outcome). Due to the fact that there are only few observations for some of the modelled transitions[20] (i.e. the agents' school and labour market outcomes), some judgment has to be made and, consequently, the number of estimated parameters has to be limited. In fact, we estimate our model for four aggregated groups of registrations. More precisely, first, we estimate only one set of parameters for all transitions of (i) the 1st, 2nd and 3rd grade, (ii) the 4th and 5th grade, (iii) the 6th grade and (iv) higher grades[21]. We compensate by introducing the particular grade as a linear regressor. Second, we further aggregate groups (i) and (ii) except for the school results during these years. As a result, for each of both versions of our model, 14 bifurcations are measured as stated in *Section 3.1*.

[19] Further control for social background by the adoption of mother's education level as an explanatory variable was not empirically important as judged by model selection criteria.

[20] For instance, we observe only few youngsters dropping out from secondary school at the first grades as this is only possible after several years of grade retention.

[21] *In concreto*: college or university grades or vocational specialization grades after passing the 6th grade of secondary education.

Concerning the unobserved heterogeneity factor structure, *Table A- 2* reports the log-likelihood, the Bayesian Information Criterion (BIC) and the Hannan-Quinn Information Criterion (HQIC) values when the model is estimated for a different number of heterogeneity types. Both information criteria are lower for the models that control for unobserved heterogeneity than for a simpler scheme that ignores serially correlated unobserved characteristics. Moreover, we obtain substantial differences in parameter estimates for the model with resp. without controlling for unobserved heterogeneity: the impact of father's education level is, by analogy with Cameron and Heckman (1998), generally stronger at each grade once the selective nature of schooling is taken into account. The lowest BIC and HQIC values are for both versions (related to both employment outcomes) obtained with a 4 type distribution for the Flemish youth and with a 2 type distribution for the foreign youth.

Table 2: Simulated outcomes by ethnic groups

	Flemish youth		Foreign youth	
	Observed proportion	Simulated proportion	Observed proportion	Simulated proportion
Model 1 (labour market outcome: employment status 3 months after leaving school)				
A. No delay when starting secondary school	0.9175	0.9184	0.6401	0.6410
B. Passing first year at secondary school	0.9630	0.9645	0.9112	0.9158
C. Passing 6th grade	0.9338	0.9318	0.7084	0.6942
D. Starting a HE after 6th grade				
unconditional on passing 6th grade	0.8041	0.8120	0.5057	0.4874
conditional on passing 6th grade	0.8612	0.8545	0.7138	0.7274
E. Employed 3 months after leaving school				
low educated	0.5754	0.5631	0.3125	0.3080
middle educated	0.6872	0.6887	0.4318	0.4352
high educated	0.7627	0.7706	0.5000	0.5078
Model 2 (labour market outcome: employment status 2 years after leaving school)[22]				
F. Employed with a permanent contract 2 years after leaving school				
low educated	0.5000	0.4923	0.2302	0.2302
middle educated	0.6320	0.6333	0.3140	0.3153
high educated	0.6468	0.6430	0.4955	0.4994

- All outcomes except for the delay at the start of secondary school itself are (unless stated otherwise) conditional on the initial delay at the start of secondary school.

From the parameter estimates for both models, as described in *Table A- 3*, we compute a variety of (simulated) predictions of schooling attainment and labour outcome probabilities. *Table 2* reports the simulated outcomes as a weighted average over the unobserved heterogeneity types. For both ethnic

[22] The schooling outcomes are essentially the same for the second model.

groups, the observed and by simulation predicted proportions are close to each other. In all cases, the actual outcome falls within the 95% confidence intervals of the simulated outcome. Thus, although the limitations as discussed above, our model captures the dynamics in educational attainments and labour market outcomes extremely well.

5. Gaps due to endowments or ethnic differences?

Given the sets of parameters, one per sub-population for each of both versions (related to both employment outcomes) of our well-performing model, we can now tackle the central questions of this project, as described in the introduction. To this end, we develop a "counterfactual" decomposition strategy in the spirit of Machado and Mata (2005) to disentangle the respective importance of ethnic differences *per se* ("behavioural differences" as captured by parameter differences) versus differences in observable characteristics at each moment such as gender, number of siblings, father's education level, language at home, the present unemployment rate and prior schooling attainment ("endowment differences" as captured by covariate differences).

5.1 Decomposition strategy

Let $\boldsymbol{Z}_{Fl}$ and $\boldsymbol{Z}_{Fo}$ be random draws from the Flemish resp. foreign youth covariate distributions. And let $\hat{\boldsymbol{\beta}}_{Fl}$ and $\hat{\boldsymbol{\beta}}_{Fo}$ symbolize all Flemish resp. foreign parameter estimates including all intercepts, particularly the type specific mass points and the outcome-specific intercepts of the factor structure controlling for unobserved heterogeneity. The observed gap in a particular outcome (say for instance the overall probability of passing the 6th grade) can then be approximated by simulation as follows:

$$E_{\boldsymbol{Z}_{Fl}} Pr\left(\boldsymbol{Z}'_{Fl}\hat{\boldsymbol{\beta}}_{Fl}\right) - E_{\boldsymbol{Z}_{Fo}} Pr\left(\boldsymbol{Z}'_{Fo}\hat{\boldsymbol{\beta}}_{Fo}\right), \tag{8}$$

where $Pr(\cdot)$ is the simulated proportion of a particular outcome as predicted by our model and $E_{\boldsymbol{Z}_{Fl}}$ and $E_{\boldsymbol{Z}_{Fo}}$ the expectations over the distributions of $\boldsymbol{Z}_{Fl}$ resp. $\boldsymbol{Z}_{Fo}$. Expression (8) can be decomposed in:

$$E_{\boldsymbol{Z}_{Fl}} Pr\left(\boldsymbol{Z}'_{Fl}\hat{\boldsymbol{\beta}}_{Fl}\right) - E_{\boldsymbol{Z}_{Fo}} Pr\left(\boldsymbol{Z}'_{Fo}\hat{\boldsymbol{\beta}}_{Fl}\right) + E_{\boldsymbol{Z}_{Fo}}\left[Pr\left(\boldsymbol{Z}'_{Fo}\hat{\boldsymbol{\beta}}_{Fl}\right) - Pr\left(\boldsymbol{Z}'_{Fo}\hat{\boldsymbol{\beta}}_{Fo}\right)\right]. \tag{9}$$

Taken together, the first two terms of (9) can be thought of as the "endowment gap" between the Flemish and foreign youth due to differences in observable characteristics $\boldsymbol{Z}_{Fl}$ and $\boldsymbol{Z}_{Fo}$ evaluated by using the Flemish parameter estimates. The last term of (9), the key to addressing our research questions, reveals

then the "behavioural gap" (or "pure ethnic gap") between the Flemish and foreign youth as reflected by their parameter estimate differentials. This term evaluates whether Flemish youth individuals tend to have a higher or a lower probability on a certain outcome after conditioning on observed characteristics of the foreign youth. This term reveals the size of the gap under investigation if Flemish youngsters were given the foreign observable characteristics distribution.[23]

If observable characteristics fully explain particular schooling and labour market gaps, behavioural differences are unimportant, and - so called "counterfactual" - simulation results for the last term of (9) will not be significantly different from 0, asserting that there is no role for discrimination in explaining this gap. However, if this last term is significantly different from 0, conclusions have to be drawn with caution. Considering the behavioural gap as being entirely caused by discrimination would be too simplistic. Of course, first, discrimination in school or in the labour market (see, e.g. Carlsson and Rooth, 2007; Pager et al., 2009 and Kaas and Manger, 2010, for evidence) is one of the potential sources inducing a behavioural gap. Beside a direct effect of discrimination in the labour market leading to lower job arrival rates for foreign youth, an indirect effect may occur as examined by Keane and Wolpin (2000). Discrimination-induced lower skill rental prices faced by foreign youngsters may affect education investment decisions as made by the parents and the youngsters themselves. Discrimination in school may produce analogous direct and indirect effects. Second, the behavioural gap may partly be caused by ethnic differences in preferences or expectations. Constant et al. (2010) provide evidence for divergence in economic preferences and attitudes between natives and second generation migrants in Germany. Migrants are found to be, for instance, less risk-averse. Moreover, they conclude that these differentials matter in terms of employment probability 2 months after unemployment entry. More evidence for the importance of preferences and expectations in explaining schooling attainment and labour market outcome gaps is provided by, e.g., Hennessey et al. (2008), Filippin (2009) and Zaiceva and Zimmermann (2010). Third, a part of the behavioural gap is related to differentials in outcome-specific intercepts of the factor structure controlling for unobserved heterogeneity. Differences in serially correlated unobserved factors that are not correlated with the observed characteristics may account for a part of the observed disparity. As a result, the simulated behavioural gaps, as examined in *Section 5.2*, reveal an upper-bound for the impact of discrimination effects. As examined in greater detail by Aeberhardt et al. (2010), interpreting unexplained parts as discrimination components, in the spirit of Oaxaca (1973), may result in overestimating discrimination. However, our model precisely corrects for the major two sources of overestimation according to Aeberhardt et al. (2010): unobserved heterogeneity and selectivity bias.

[23] The alternative decomposition strategy concerns evaluating the endowment gap at the foreign parameter estimates and the behavioural gap at the Flemish covariate registrations. By conditioning on the endowments of the foreign youth, as we do, we focus to some extent on the youth segment with typical foreign characteristics, i.e. the lower end of the socioeconomic scale.

5.2 Simulation results

Table 3 summarizes our research results for some outcomes of interest. The column "Simulated total gap" (col. 1) indicates the simulated total difference between the outcome proportions of Flemish resp. foreign youth, an accurate prediction of the total observed gaps in the data.[24] A positive number means that Flemish youngsters are more likely to achieve the outcome under investigation. All these gaps are significant at the 5% level. The last column of *Table 3* (col. 2) presents our counterfactual simulation results as obtained by computing the last term of (9).

In panels A - D simulated schooling gaps are presented for four outcomes of interest: (i) the initial delay at the start of the 1th grade of secondary school, (ii) the school result at the end of the (first year in the) 1th grade, (iii) completion of the 6th grade and (iv) the decision to stay in school (and start a higher education) after the 6th grade. The latter three are conditional on the initial delay at the start of this 1th grade unless stated otherwise. In brief, once we control for this initial delay, we hardly find any evidence of further disparities emerging in the following schooling years.

Table 3: Simulated decomposition of the observed total gap

	(col. 1) Simulated total gap	(col. 2) Simulated gap due to parameter differences
A. No delay when starting secondary school	0.2774**	0.1969** (0.0333)
B. Passing first year at secondary school	0.0487**	0.0200 (0.0161)
C. Passing 6th grade	0.2376**	0.0363 (0.0359)
D. Starting a HE after 6th grade		
unconditional on passing 6th grade	0.3246**	0.0640** (0.0319)
conditional on passing 6th grade	0.1274**	-0.0670** (0.0294)
E. Employed 3 months after leaving school		
low educated	0.2551**	0.1824** (0.0715)
middle educated	0.2535**	0.1861** (0.0568)
high educated	0.2628**	0.2292** (0.0636)
F. Employed with a permanent contract 2 years after leaving school		
low educated	0.2621**	0.2209** (0.1048)
middle educated	0.3180**	0.1837** (0.0769)
high educated	0.1436**	0.1262* (0.0769)

- ** (*): Significant at the 5 (10) percent level or less.
- The standard errors, presented at the last column (between brackets), were calculated using 999 random draws from the distributions of the underlying model's estimated parameters.
- All outcomes except for the delay at the start of secondary school itself are (unless stated otherwise) conditional on the initial delay at the start of secondary school.

[24] This difference can be recalculated by the reader using *Table 2*.

First, column 1 of Panel A shows the percentage point differences between Flemish and foreign youth concerning the initial delay: the foreign proportion being on time at the start of secondary education is 28 percentage points smaller. Column 2 shows that equating endowments reduces this initial gap. However, ethnic differences remain important. If a Flemish and a foreign child, equal in terms of personal and family characteristics, start nursery education together, the latter child has a 20 percentage point higher chance (significant at the 5% level) on arriving with delay at the start of the 1th grade of secondary school.

Second, Panel B and C indicate that there is no significant role for behavioural differences in explaining the observed 5 percentage point gap in passing the first year at secondary school and the 24 percentage point gap in 6th grade completion between Flemish and foreign pupils. Hence, a foreign child will complete the 6th grade with a chance that is not significantly different from the corresponding chance of a Flemish child with the same observable characteristics who starts the 1th grade with the same initial delay. In contrast, as shown by the first line of Panel D, we find evidence for a different probability for these two pupils concerning their enrolment into a higher education. A 6 percentage point gap of the simulated (and observed) total 32 percentage point gap remains after equating observables. However, if we focus on secondary school completers[25], we find a higher probability for these graduates to invest in further education among the foreign youth when endowments are controlled for. Thus, assigning foreign endowments to both Flemish and foreign 6th grade completers gives the foreign an advantage of 7 percentage points over Flemish in higher education entry.

These findings complement those reported by Cameron and Heckman (2001) and Clotfelter et al. (2009) for the US, Dustmann et al. (2010) and Wilson et al. (2010) for the UK[26] and Belzil and Poinas (2010) for France as we conclude that schoolings gaps are markedly reduced - or even eliminated - after controlling for observable characteristics and initial delay. Cameron and Heckman present similar foreign higher education advantages given secondary school completion when natives have minority covariates. One key difference, however, between Cameron and Heckman and the present study is that we find evidence for a role of ethnic differences, as induced by discrimination or differences in behaviour and unobserved endowments, in explaining school attainments before the 1th grade.

Panel E decomposes the probability of being employed 3 months after school leaving conditional on leaving school before the 6th grade, immediately after passing the 6th grade or after passing at least one successful year of higher education. For all of these school leaving times, the actual gap concerning this outcome is around 26 percentage points. As can be seen in column 2 for this panel, and in contrast with Belzil and Poinas (2010), equating endowments between Flemish and foreign groups doesn't eliminate the significance of this gap. The observed (and simulated) total gaps are to a large extent explained by pure ethnic differences for all education levels. For instance, a foreign 6th grade completer who leaves school is 18 percentage point more likely to be unemployed 3 months afterwards compared with a

[25] In other words: if we condition on 6th grade completion instead of on accumulated delay at the start of secondary education. The select endowments for 6th grade completers drive the different simulation results with respect to both conditions.

[26] Both studies for the UK even find that, controlling for personal characteristics, some (Dustmann et al., 2010) or al (Wilson et al., 2010) foreign groups make greater progress than native students over secondary schooling.

Flemish school leaver with the same endowments and the same prior schooling attainment. Similar reflections can be made with regard to Panel F, presenting our simulation results based on the alternative model with being employed with a permanent contract 2 years after leaving school as labour market outcome. Notwithstanding the interpretation limitations noted in *Section 5.1*, we cannot exclude that these gaps on the labour market for the higher educated are induced by discrimination.

6. Gap closing role for language?

Table 4 presents evidence on language spoken at parental home as a source of schooling and first labour market differences between Flemish and foreign youth. Again, column 1 indicates the simulated total differences between both groups with respect to the set of key outcomes. Column 2 shows the changes in these gaps when the language variable (speaking Dutch at home) is adjusted to the Flemish mean level while other variables are held fixed at minority sample values.

Table 4: Simulated gap due to Dutch speaking at home

	(col. 1) Simulated total gap	(col. 2) Simulated gap due to differences in variable Dutch speaking at home
A. No delay when starting secondary school	0.2774**	-0.0010 (0.0140)
B. Passing first year at secondary school	0.0487**	-0.0003 (0.0040)
C. Passing 6th grade	0.2376**	0.0046 (0.0119)
D. Starting a HE after 6th grade		
unconditional on passing 6th grade	0.3246**	0.0262** (0.0133)
conditional on passing 6th grade	0.1274**	0.0301** (0.0148)
E. Employed 3 months after leaving school		
low educated	0.2551**	0.0102 (0.0255)
middle educated	0.2535**	0.0405* (0.0207)
high educated	0.2628**	0.0493** (0.0218)
F. Employed with a permanent contract 2 years after leaving school		
low educated	0.2621**	0.0093 (0.0215)
middle educated	0.3180**	0.0494* (0.0234)
high educated	0.1436**	0.0163* (0.0104)

- ** (*): Significant at the 5 (10) percent level or less.

On the one hand - and to some extent in contrast with the former cited studies by van Ours and Veenman (2003) and Dustmann et al. (2010) - we find no significant role for speaking the region's official language

in explaining the schooling attainment differences prior to and during secondary schooling. On the other hand equalizing this variable affects the higher education enrolment rate by foreign youngsters significant positively. Giving the foreign youth the Flemish language usage characteristics reduces the enrolment gap with about 3 percentage points (no matter whether we condition on 6th grade completion or not).

Furthermore, official language usage at home affects transition success with respect to both labour market outcomes except for the pupils that leave school before secondary school completion. Indeed, taking the results of *Table 3* and *Table 4* together, speaking Dutch at home accounts to a large extent for the part of ethnic labour market gaps explained by covariate differences for all youngsters who graduated from secondary school. The more pronounced importance of language usage for the middle and high educated contrasts modestly with the research results by Aldashev et al. (2009) who find higher employment chances by language proficiency especially for the low- and medium-skilled.

7. Conclusions

This paper aimed at answering the question whether the actual disparity in schooling attainment and first labour market outcomes between native and migrant youth is due to observed "endowments" or to ethnic differences. We made explicit the dynamic relationship between the outcomes under investigation: the transition from school to work is influenced by schooling attainments which are in turn determined by previous schooling outcomes. To capture these dynamics, we built a dynamic discrete choice model that is more general than previous contributions in that it jointly models schooling and early labour market outcomes on the one hand and school results and the decision to continue or stop schooling on the other hand.

Even if observed endowments reduce the gap in schooling attainments at the beginning of 1th grade in secondary school, we conclude that ethnic differences, as induced by discrimination or differences in behaviour and unobserved endowments, remain important. More crucially, once we control for this initial difference, we hardly find any evidence of further differences emerging in the following schooling years. These results suggest that policies that aim at reducing the ethnic gaps in schooling outcomes should target early in the school career and should address the differences induced by the initial endowments. By contrast, observed endowments and prior educational attainment don't fully explain the important ethnic gap in the job finding rate. Whether this is a consequence of discrimination remains an open question. Concerning the role of language in closing the observed schooling and labour market gaps, we find a significant role for language in closing the labour market gap (especially for the middle and high educated) rather than in explaining the observed differences in prior schooling attainments.

We are planning some further sensitivity analysis related to the heterogeneity in ethnic identity among the group of foreign youth as a recent literature (see, e.g., Chiswick and DebBurman, 2004; van Ours and Veenman, 2006; Constant and Zimmerman, 2008; Battu and Zenou, 2009; Booth et al., 2010; Constant et al., 2010 and Euwals et al., 2010) deals with factors as particular origin, immigrant generation, attachment to culture of origin and naturalization in explaining schooling attainment and labour market gaps between native and foreign youngsters.

Appendix A: Additional tables

Table A- 1: Unemployment rate (UR) in Flanders for the 15-24 aged (1990-2005)

1990	1991	1992	1993	1994	1995	1996	1997
8.8%	8.7%	7.5%	11.7%	13.8%	12.5%	11.6%	11.7%
1998	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
11.0%	13.5%	11.3%	10.0%	11.6%	15.5%	13.6%	14.2%

Source: Steunpunt WSE (based on Labour Force Study: Unemployment rates by sex)

Table A- 2: Model selection (information criteria values)

	Flemish youth				Foreign youth			
	# param.	Log(L)	BIC	HQIC	# param.	Log(L)	BIC	HQIC
Model 1 (labour market outcome: employment status 3 months after leaving school)								
1 type	105	-37749.03	76427.98	75956.10	105	-2688.61	6016.10	5756.43
2 types	114	-37392.85	75795.33	75283.01	114	-2658.10	6009.83	5727.91
3 types	116	-36987.20	75001.75	74480.43	116	-2654.52	6014.85	5727.98
4 types	118	-36967.20	74979.45	74449.15	118	-2653.99	6025.95	5734.14
5 types	120	-36964.36	74991.49	74452.19	120	-2652.46	6035.06	5738.30
Model 2 (labour market outcome: employment status 2 years after leaving school)								
1 type	105	-37787.49	76504.90	76033.02	105	-2653.11	5945,10	5685,43
2 types	115	-37442,27	75903,01	75386,19	114	-2621,50	5936,63	5654,71
3 types	117	-37017,57	75071,34	74545,53	116	-2618,49	5942,78	5655,91
4 types	119	-36972,00	74997,91	74463,11	118	-2618,49	5954,95	5663,14
5 types	121	-36970,55	75012,72	74468,93	120	-2618,49	5967,12	5670,36

- BIC: Bayesian Information Criterion.
- HQIC: Hannan-Quinn Information Criterion.
- Sometimes, a heterogeneity parameter (or a constant) is estimated as a large number causing a 0 or 1 probability for a particular type with respect to the related outcome (whatever the explanatory values are). When we encounter this, in the spirit of Gaure et al. (2007), we mark the offending parameter and keep it out of further estimation, resulting in the number of estimated parameters of each specification as shown in this table. The mark is kept when we increase the number of heterogeneity types.

Table A- 3: Model estimation

Variable	Flemish youth			Foreign youth		
	Parameter estimate	Standard error	p-value	Parameter estimate	Standard error	p-value
Model 1 (labour market outcome: employment status 3 months after leaving school)						
Outcome: no delay when starting secondary school						
Constant	-0.0926	0.4590	0.8401	-0.1788	0.7109	0.8016
Woman	0.3740	0.0912	0.0000	-0.0025	0.2320	0.9914
# siblings	-0.1120	0.0339	0.0010	-0.0928	0.0506	0.0675
Father's education level	0.1362	0.0134	0.0000	0.0917	0.0398	0.0220
Dutch at home	0.1287	0.3859	0.7387	-0.0240	0.2722	0.9298
Coefficient unobs. heterog.	1.2278	0.2417	0.0000	1.9190	1.0343	0.0645
Outcome: passing year at 1st, 2nd or 3rd grade of secondary school						
Constant	2.0837	0.3299	0.0000	1.9154	0.8223	0.0205
Woman	0.5461	0.0612	0.0000	0.3913	0.1863	0.0364
# siblings	-0.0963	0.0218	0.0000	-0.0641	0.0377	0.0899
Father's education level	0.0532	0.0086	0.0000	0.0398	0.0405	0.3267
Dutch at home	0.5146	0.2453	0.0359	-0.0172	0.2027	0.9324
Unemployment rate	0.0061	0.0153	0.6895	0.0476	0.0472	0.3141
Cumulated years of delay	-0.1950	0.0462	0.0000	-0.1730	0.0945	0.0682
Particular grade	-0.3777	0.0413	0.0000	-0.3405	0.1219	0.0055
Mass point heterog. type 2	-0.2808	0.0087	0.0000	-0.3019	0.0544	0.0000
Mass point heterog. type 3	0.1697	0.0062	0.0000			
Mass point heterog. type 4	0.3336	0.0157	0.0000			
Outcome: passing year at 4th or 5th grade of secondary school						
Constant	2.8741	0.4115	0.0000	-0.4162	1.6836	0.8049
Woman	0.6288	0.0605	0.0000	0.7464	0.2102	0.0004
# siblings	-0.0452	0.0250	0.0705	0.0070	0.0401	0.8614
Father's education level	0.0348	0.0087	0.0001	0.0486	0.0383	0.2051
Dutch at home	0.0525	0.2306	0.8200	0.1146	0.2451	0.6403
Unemployment rate	0.0065	0.0180	0.7187	-0.0081	0.0932	0.9309
Cumulated years of delay	-0.3916	0.0379	0.0000	-0.2377	0.1161	0.0413
Particular grade	-0.3160	0.0595	0.0000	0.2307	0.2534	0.3632
Coefficient unobs. heterog.	0.1806	0.1997	0.3660	-2.9563	1.7205	0.0867
Outcome: continue schooling after passing year in 1st, 2nd, 3rd, 4th or 5th grade of secondary school						
Constant	13.9144			21.7374		
Woman	0.3283	0.2764	0.2350	-0.8553	0.4689	0.0691
# siblings	-0.2500	0.0973	0.0102	-0.1718	0.0962	0.0751
Father's education level	0.3078	0.0509	0.0000	-0.0545	0.0824	0.5086
Dutch at home	1.0137	1.0377	0.3287	-0.2022	0.4786	0.6730
Unemployment rate	-0.0019	0.0874	0.9826	-0.4815	0.1529	0.0018
Cumulated years of delay	-3.0404	0.2799	0.0000	-1.2675	0.2429	0.0000
Particular grade	-1.8501	0.2099	0.0000	-1.2672	0.2183	0.0000
Coefficient unobs. heterog.	-17.1501	2.4022	0.0000	16.7666	6.1882	0.0071
Outcome: continue schooling after not passing year in 1st, 2nd, 3rd, 4th or 5th grade of secondary school						
Constant	10.1870			5.4595	3.2114	0.0901
Woman	-0.4058	0.3058	0.1845	-0.4860	0.5182	0.3490
# siblings	-0.2476	0.0976	0.0112	0.1128	0.1031	0.2748

Father's education level	0.2570	0.0517	0.0000	0.0981	0.0746	0.1896
Dutch at home	0.6026	0.9147	0.5100	0.3327	0.6067	0.5838
Unemployment rate	0.0616	0.0997	0.5365	0.0894	0.1730	0.6057
Cumulated years of delay	-3.2599	0.3966	0.0000	-1.8158	0.2948	0.0000
Particular grade	-1.8567	0.2305	0.0000	-1.1228	0.4010	0.0054
Coefficient unobs. heterog.	-10.6067	2.3533	0.0000	-0.2899	5.5365	0.9583
Outcome: passing year at 6th grade of secondary school						
Constant	1.6178	0.8131	0.0467	2.6671	2.7909	0.3400
Woman	0.7221	0.1133	0.0000	1.1633	0.4620	0.0123
# siblings	-0.0265	0.0422	0.5297	0.0007	0.0894	0.9937
Father's education level	0.0713	0.0174	0.0000	0.0452	0.0657	0.4919
Dutch at home	0.3946	0.3897	0.3112	-0.4267	0.5129	0.4061
Unemployment rate	-0.0264	0.0499	0.5970	-0.1393	0.1947	0.4748
Cumulated years of delay	-0.6513	0.0662	0.0000	-0.1570	0.2369	0.5081
Coefficient unobs. heterog.	-0.8024	0.3663	0.0285	-3.9374	2.5172	0.1187
Outcome: continue schooling after passing 6th grade of secondary school						
Constant	-2.4021	0.9249	0.0094	-1.8481	2.1132	0.3825
Woman	0.9896	0.1254	0.0000	-0.1769	0.3375	0.6006
# siblings	-0.0634	0.0471	0.1776	-0.1462	0.0716	0.0421
Father's education level	0.4421	0.0226	0.0000	0.1836	0.0540	0.0008
Dutch at home	0.2067	0.5005	0.6797	0.9332	0.4422	0.0356
Unemployment rate	-0.0141	0.0549	0.7969	-0.0202	0.1465	0.8905
Cumulated years of delay	-2.1027	0.1018	0.0000	-0.1032	0.1754	0.5567
Coefficient unobs. heterog.	-15.9352			-19.4815		
Outcome: continue schooling after not passing 6th grade of secondary school						
Constant	-4.4872	2.3823	0.0597	-1.3841	8.7834	0.8749
Woman	-0.3365	0.3827	0.3792	-0.2267	1.1012	0.8370
# siblings	0.1853	0.1393	0.1833	0.0544	0.2178	0.8029
Father's education level	0.2833	0.0548	0.0000	0.5297	0.3183	0.0970
Dutch at home	-0.9357	1.3035	0.4729	4.6939	4.3612	0.2826
Unemployment rate	0.2955	0.1446	0.0411	-0.7268	0.6701	0.2789
Cumulated years of delay	-1.4899	0.1603	0.0000	-1.5271	0.7180	0.0342
Coefficient unobs. heterog.	-9.0441			-18.6304		
Outcome: passing year in a higher grade						
Constant	-4.7409	0.3395	0.0000	-4.4627	1.5022	0.0032
Woman	0.3376	0.0387	0.0000	0.4084	0.2647	0.1238
# siblings	0.0163	0.0167	0.3301	-0.0580	0.0573	0.3126
Father's education level	-0.0109	0.0059	0.0664	-0.0019	0.0370	0.9596
Dutch at home	0.2171	0.1606	0.1766	-0.3182	0.3352	0.3432
Unemployment rate	-0.0643	0.0159	0.0001	-0.0170	0.0751	0.8212
Cumulated years of delay	-0.0432	0.0213	0.0424	-0.1098	0.1256	0.3828
Particular grade	0.8313	0.0248	0.0000	0.7041	0.1295	0.0000
Coefficient unobs. heterog.	1.1247	0.2616	0.0000	-10.5890	3.2205	0.0011
Outcome: continue schooling after passing year in a higher grade						
Constant	44.9706	1.9697	0.0000	13.5387	3.1868	0.0000
Woman	-1.0006	0.1530	0.0000	-0.3826	0.4433	0.3888
# siblings	0.0465	0.0679	0.4934	0.4125	0.1134	0.0003
Father's education level	0.2287	0.0229	0.0000	0.1887	0.0706	0.0079
Dutch at home	-1.1414	0.6087	0.0608	-2.5542	0.6294	0.0001
Unemployment rate	-0.0782	0.0365	0.0325	-0.1709	0.1410	0.2264
Cumulated years of delay	-0.4975	0.0984	0.0000	-0.3838	0.3437	0.2650

Particular grade	-5.2883	0.2112	0.0000	-1.3169	0.3456	0.0002
Coefficient unobs. heterog.	43.9203			24.0582		
Outcome: continue schooling after not passing year in a higher grade						
Constant	4.7307	0.9054	0.0000	2.0391	2.4598	0.4077
Woman	-0.0311	0.0971	0.7486	-0.5180	0.4214	0.2199
# siblings	0.0624	0.0429	0.1455	0.0522	0.1246	0.6754
Father's education level	0.1169	0.0150	0.0000	0.1557	0.0689	0.0245
Dutch at home	-0.8860	0.3982	0.0261	0.1789	0.7343	0.8077
Unemployment rate	0.0993	0.0352	0.0048	-0.1999	0.1540	0.1953
Cumulated years of delay	-0.7667	0.0592	0.0000	-0.8271	0.2160	0.0002
Particular grade	-0.7006	0.0884	0.0000	-0.0233	0.2769	0.9330
Coefficient unobs. heterog.	7.3488	0.8002	0.0000	-4.9194		
Outcome: being employed 3 months after school leaving when leaving school before 6th grade graduation						
Constant	-5.7800	1.6833	0.0006	2.5890	3.8046	0.4967
Woman	-0.7206	0.2485	0.0037	-1.4492	0.5422	0.0079
# siblings	-0.0119	0.0783	0.8792	-0.1121	0.0890	0.2086
Father's education level	-0.0416	0.0371	0.2620	-0.1037	0.1209	0.3915
Dutch at home	0.5479	0.7165	0.4445	0.2293	0.5544	0.6794
Unemployment rate	0.0364	0.0915	0.6909	-0.2669	0.2313	0.2494
Cumulated years of delay	1.0492	0.1295	0.0000	0.3658	0.3049	0.2312
Particular (obtained) grade	0.7872	0.1721	0.0000	0.2983	0.3162	0.3461
Coefficient unobs. heterog.	5.6025			-0.9772	2.5239	0.6989
Outcome: being employed 3 months after school leaving when leaving immediately after 6th grade graduation						
Constant	1.3712	0.8802	0.1193	4.4296	2.6362	0.0939
Woman	-0.8627	0.1138	0.0000	-0.7388	0.4440	0.0971
# siblings	-0.0685	0.0420	0.1031	-0.0915	0.0900	0.3101
Father's education level	-0.0284	0.0184	0.1235	-0.0574	0.0853	0.5015
Dutch at home	0.1620	0.4657	0.7280	0.9813	0.5523	0.0765
Unemployment rate	0.0104	0.0525	0.8436	-0.3323	0.1727	0.0552
Cumulated years of delay	0.0536	0.0655	0.4134	0.2254	0.1655	0.1741
Coefficient unobs. heterog.	-0.3907	0.3865	0.3121	3.5825		
Outcome: being employed 3 months after school leaving when leaving after at least one successful higher education year						
Constant	4.0074	0.8135	0.0000	2.7470	3.4777	0.4302
Woman	-0.1096	0.0827	0.1850	-0.1083	0.4522	0.8109
# siblings	-0.0160	0.0349	0.6470	-0.0880	0.0968	0.3642
Father's education level	0.0019	0.0125	0.8782	0.0290	0.0813	0.7215
Dutch at home	0.5154	0.3527	0.1440	1.1941	0.5536	0.0317
Unemployment rate	-0.2006	0.0243	0.0000	-0.1377	0.1405	0.3279
Cumulated years of delay	-0.1670	0.0549	0.0023	-0.4006	0.2922	0.1714
Particular (obtained) grade	-0.0842	0.0752	0.2629	-0.2013	0.3093	0.5157
Coefficient unobs. heterog.	1.9088	0.6234	0.0022	0.5333	2.6308	0.8395
Heterogeneity type proportions						
Proportion type 1	0.4394			0.7372		
Proportion type 2	0.1694			0.2628		
Proportion type 3	0.2188					
Proportion type 4	0.1723					

Model 2 (labour market outcome: employment status 2 years after leaving school)

Available on request.

- Sometimes, a heterogeneity parameter (or a constant) is estimated as a large number causing a 0 or 1 probability for a particular type with respect to the related outcome (whatever the explanatory values are). When we encounter this, in the spirit of Gaure et al. (2007), we mark the offending parameter and keep it out of further estimation, resulting in missing standard errors and p-values in this table.

Appendix B: Education and youth labour market in Flanders

A broad view of the Flemish education landscape is described in De Ro (2008). In summary, in Flanders, as in other Belgian regions, there is compulsory education which starts in September 1st of the year in which a child reaches the age of 6 and lasts until his/her 18th anniversary or June 30th of the year in which he/she reaches the age of 18. Even though a regular student graduates from (the 6th grade of) secondary school at the age of 18, this is not the case for an important share (40%) of the population, since students who do not attain a certain competency level are required to repeat a school year. This repetition may already take place in primary school. All Flemish schools are mixed in that they cannot refuse children on grounds of gender or ethnicity.

Between the ages of 2.5 and 3 years, children can start mainstream nursery education. Although nursery education is not compulsory, 98% of the kids attend nursery education in Flanders. A child usually starts primary education at the age of 6. Mainstream primary education comprises 6 consecutive years of study. When graduating from primary school, students enter secondary education. Without grade retention at primary school they enter secondary education in the year in which they reach the age of 12. The Flemish secondary education system grants the pupils more choice as they enter a higher cycle. In brief, there are four different types of education: general secondary education ("aso"), technical secondary education ("tso"), secondary arts education ("kso") and vocational secondary education ("bso"). It is possible, although constrained, to switch between education types. A pupil is granted the diploma of general, technical or arts secondary education after successfully completing six years ("grades"). Without grade retention, this is at the compulsory schooling age of 18. Afterwards he/she can choose to start a 7th specialisation grade or to enrol immediately into college or university. Completing a 7th specialisation grade is compulsory for vocational secondary students before enrolling into university or college. However, a lot of bso students leave school after the 6th grade. Except for medicine, which requires passing an entry exam, each youngster with a secondary education diploma can start each college / university program. Our data concerns education registrations prior to adoption of the Bologna process. Three sorts of higher degrees at college or university could be obtained: (i) non-university of the "short type" (typically vocational oriented and lasting 3 years), (ii) non-university of the "long type" (typically 4 years mixing a vocational and a more academic curriculum) and (iii) academic higher education (4 years or more).

Special (nursery, primary or secondary) education is aimed at children who need special help, temporarily or permanently. This may be due to physical or mental disability, serious behavioural or emotional problems, or serious learning difficulties. In our research project, this kind of registrations (1% of the total number) is ignored.

There is no obligatory military service in Flanders and school-leavers enter the labour market directly after school leaving. Moreover - and different from other countries and regions - school-leavers can claim unemployment benefits after a "waiting period" of 9 months. This period starts with the registration at the

employment office after leaving school. Throughout this paper, we consider a youngster to be employed when holding a job of at least one hour a week and tenure of at least one month. We do not consider the jobs during vocational as they are part of the education career. Labour regulation distinguishes two types of labour contracts: with time stipulation (temporary employment contracts) and without time stipulation (permanent employment contracts). A finite number of successive temporary employment contracts, between the same employee and employer, are permitted for a maximum of 3 years.

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