

Bijwaard, Govert; Wang, Qi

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Govert E. Bijwaard
Qi Wang

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Govert E. Bijwaard

*Netherlands Interdisciplinary Demographic Institute (NIDI)
and IZA*

Qi Wang

Netherlands Interdisciplinary Demographic Institute (NIDI)

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IZA

P.O. Box 7240
53072 Bonn
Germany

Phone: +49-228-3894-0

Fax: +49-228-3894-180

E-mail: iza@iza.org

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ABSTRACT

Return Migration of Foreign Students^{*}

Using unique administrative micro panel data, this paper presents a comprehensive empirical analysis of the return of recent foreign students in The Netherlands. The life course experiences of these students in the host, both on the labour market and in marriage formation, impact their decision to leave. Using a “timing-of-events” model we estimate the impact of these processes on the return intensity. The model allows for correlated unobserved heterogeneity across the migration, the labour market and the marriage formation processes. The large size of the data permits us to stratify the analysis by five groups based on the country of birth. The empirical analyses reveal that employment induces students to stay and unemployment induces them to leave. Forming a family in The Netherlands makes the students more prone to stay. The size of the impact of these life course experiences on return differs by age at entry and gender.

JEL Classification: F22, J64, J12, C41

Keywords: student migration, timing of events method, labour dynamics, marriage

Corresponding author:

Govert E. Bijwaard
Netherlands Interdisciplinary Demographic Institute (NIDI)
PO Box 11650
NL-2502 AR The Hague
The Netherlands
E-mail: bijwaard@nidi.nl

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1 Introduction

With the advancement of globalization, migration has become an important subject. The international movement of human capital has been among the most urgent economic and political issues in Europe today. It is well known that the accumulation of human capital and the production of knowledge play a prominent role in explaining regional growth. From the late 1990s, regional economic growth, structural human resource shortages, declining fertility rates and increasing concerns about ageing populations in most OECD countries has resulted in a global competition for highly skilled human resources, more fiercely in science, technology, and health care sectors. In the European area, France, Ireland, the Netherlands, and the United Kingdom have simplified the recruitment procedure of foreign employees (see Tremblay, 2005). The rapid development of many traditional sending countries has also made it much more difficult to exploit human resources from developing world in the 21st century, (see Lowell et al., 2004).

Among the growing migration population the number of foreign students has increased most rapidly. With the increasing internationalization of educational programs, students start seeking educational opportunities outside their original country. The number of foreign tertiary students in OECD countries in 2009 was 3.7 million. The proportion of foreign students among all tertiary students in OECD countries has grown 7% annually from 2000 to 2009. For most OECD countries the net flow of student migration is positive. In 2009 the 21 European OECD members had 2.6 foreign students for each European citizen enrolled abroad. In the Netherlands the absolute number of foreign students has more than doubled from 2000 to 2009. It enrolled 1.2% of the foreign tertiary students reported to the OECD area. More than 25% of the foreign students that enter the Netherlands remain in the country. This is above the OECD average. The majority, more than 80%, of the changes in the socio-economic status of students in the Netherlands are work related, (see OECD, 2011).

The role of student migration as a key source of high-quality labour has been realized by many Western countries. The question is how to transfer the potential carried by foreign students to permanent human capital within the host country. This is especially relevant for countries facing scarcity of qualified human resources in certain fields. Different from other types of migration, foreign students are more likely temporary passengers. Foreign students also create global networks that often induce future skilled labour immigration. This has led to an increasing number of national programs aiming at obtaining and maintaining excellent foreign students. Some major host countries, like Australia, have benefited from their strategy of using special migration policies aimed at university graduates to attract specific human resources in demand, (see Mahroum, 2000; Tremblay, 2005; Vertovec, 2002).

Despite the growing importance of international student mobility there has not been much research on student migration, neither theoretically nor empirically. In most papers on migration, student migration is just regarded as an integral part of migration or as migration of the skilled. This omission is mainly due to the lack of specific data on student migration. We have a large administrative dataset at our disposal that contains

the migration motive of the migrants, and therefore allows us to focus on the behaviour of foreign students in the country. An important issue in student migration is that most students only stay temporarily in the host country. After graduation many return back to their country of origin or move on to a third country. This process of return migration is intrinsically related to the labour market behaviour of these students, especially after graduation. Another important process that also influences the return behaviour is marriage formation. As most students are in their twenties, searching for a spouse, they are likely to start a family, or at least find a partner, when they are studying abroad. Of course, with a partner in the host country you are less likely to return. However, little is known on how individual labour market changes or marriage formation affects the return decision. We will fill these gaps by analysing the impact of these lifecourse events on the return intensity of recent foreign students to the Netherlands.

We address these novel questions using a unique administrative panel for the entire population of recent immigrants to the Netherlands covering the years 1999-2007. This Dutch immigrant register is based on the legal requirement for immigrants to register with the authorities upon arrival. A feature of our data is the administrative report in the immigrant register (consistent with the visa status at entry) of the immigration motive. This enables us to focus explicitly and exclusively on 42,730 foreign students (16% of all recent (non Dutch) immigrants). The data contain information on the (day-exact) timing of migration moves to and from the Netherlands, the timing of labour market (and student status) changes and on the timing of marriage formations (while the migrant is registered in the Netherlands). Several other official registers are linked by Statistics Netherlands to this immigrant register, such as the social benefit and the income register (used by the tax authorities). The size of our data allows us to estimate models separately for distinct immigrant groups defined by their country of birth.

While modern duration analysis (see e.g. Van den Berg (2001) for a survey) is widely applied in labour economics, the limitations of available data have prevented its widescale adoption in migration studies. Among the exceptions are, Aydemir and Robinson (2008) who estimate proportional hazard models for return from Canadian, Bijwaard (2010) who estimates mover-stayer hazard models, allowing some migrants to stay permanently, for return from the Netherlands, and recently Bijwaard et al. (2012) who focus on the return of labour migrants from the Netherlands. We go beyond estimating a standard duration model for the return hazard, by considering the labour market processes, in- and out of employment and study, the family formation process and, the migration process jointly. These processes are interdependent both through observed and unobserved factors. In particular, we estimate the effects of each of the processes on the return decision of immigrants using the “timing-of-events” method, Abbring and van den Berg (2003). At the same time, we control for the correlated effects that arise from the correlation between unobservables in the migration, labour market and marriage process.

By providing estimates of the effects of labour market dynamics and family formation on the return decision of foreign students, this paper enlarges the evidence base for policy makers. As immigration has become a core public concern in most developed economies,

policy makers seek to manage immigrant stocks. Understanding the link between the labour market, family formation decisions and migration processes is fundamental to this end. In particular, identifying those students who are more likely to stay is relevant to current debates about the financial costs, in terms of attracting and retaining the right, skilled migrants, to fill (future) human capital shortage on the labour market.

Section 2 reviews previous works both theoretically and empirically that are related to the current research; The administrative data are described in Section 3. Section 4 introduces the method and model used; In particular, we specify the labour market, marriage formation and migration processes, and elucidate the role of unobservable heterogeneity. We also address the assumptions needed to allow for a causal interpretation of the estimated effect of each process on the other processes. The empirical results are presented in Section 5. Finally, Section 6 concludes.

2 Review of related literature

2.1 (Return) Migration Theories

There is an abundant amount of literature investigating the reasons and consequences of migration. The current research is focusing on individual behaviour of foreign students and how their experiences in the host country influence their next migration decision. Here we briefly discuss the micro-level theories of migration and return migration.

One of the most influential theoretical approaches to explain international movements, the neoclassical theory of labour migration, explains migration flows as a result of wage differences or through differences in unemployment levels between different countries. In a scenario of free mobility and full information people would move from countries with lower wages to those with comparatively higher wages. In cases where unemployment is taken into account the probability of finding a job has to be considered (Harris and Todaro, 1970). Given the great and persistent wage and unemployment gaps between most developing countries and the Western World, these conventional migration theories are unable to explain the small size of migration flows and the presence of extensive return-migration.

In an effort to model migration decisions more realistically, human capital theory focuses on individual decision making and highlights the influence of human capital formation in the migration process (Sjaastad, 1962). According to human-capital theory, people move when the discounted values of their expected net returns to individual capital are larger in the host than in their country of origin. In this framework individual human capital characteristics, such as education, age and work experience, essentially determine migration decisions, (see Greenwood, 1985; Massey et al., 1993). A crucial point in this context is whether education and skills acquired at home can be transferred into the host country labour markets. This is often not the case between countries with different levels of economic development. For students studying abroad who want to remain in the host

the problem of limited transferability is no longer an issue, since they are acquiring host country specific human capital. When they return the transferability plays a role again.

If migration is viewed as an investment decision to maximize human capital and/or earnings over the life-time then return and repetitive migration are not anomalies but common outcomes of a migration decision (see Dustmann, 2002). An important contribution to the theoretical explanations of return emigration of immigrants is provided by Borjas and Bratsberg (1996). They attribute return migration to an optimal residential plan over the life cycle where immigrants return to their home country due to the realization of a savings goal or due to erroneous information about economic opportunities in the host country. Other theories attribute return migration to region-specific preferences (Hill, 1987; Dustmann and Weiss, 2007), higher purchasing power of host currency in source countries (Dustmann and Weiss, 2007) or to greater returns for human capital acquired in the host country (Borjas and Bratsberg, 1996; Dustmann and Weiss, 2007).

If human capital accumulation is relatively easier in the host country this can motivate a temporary stay abroad. Human capital accumulation can take place both through formal education and work experience. As argued by Co et al. (2000) this accumulation will allow the person to enter the home country wage distribution at a relatively higher point upon return, which even though the home country could have a lower average wage level, will leave the person better off. Following this argument, spending time abroad studying, can be a way of gaining a competitive edge. This induces that students would stay temporarily for a short period in the host. On the other hand, completion of education in the host enhances the migrant's host country specific human capital, thereby facilitating the participation in the host country's labour market. This would reduce the migration rate out of the host country.

Another relevant theory of migration that view migration as a dynamic process is "cumulative causation" (Massey and Zenteno, 1999). It emphasizes network formation and path dependence. It accounts for adjustment to new conditions that arise during the time spent in the host. On the aggregate level, migrant networks spread in host communities, which facilitates the subsequent migration. On the individual level, experiences in host could change preferences and motivations of migrants.

2.2 Research on Student Migration

Student migration has always been connected to human capital theory and regarded as an investment in human capital (see Mixon Jr. and Hsing, 1994). In line with the human capital theory Rosenzweig (2006) has formulated two competing models for student migration. According to the *school-constraint* model foreign students come from countries with high returns to education but with few domestic opportunities to invest in human capital. Then, students seek training in other countries with the ultimate goal of returning to their home country and reaping the rewards of the high return to education. According to the *migration* model students will acquire schooling abroad as means of entering and staying in the foreign country when the return to education are low in their home country. In this case, students are simply escaping the low wages at home in search for higher

income. In line with the latter case students choose to study abroad to gain access to the labour market opportunities in the host country. Evidence has shown that many host countries have adopted immigration policies to facilitate the immigration of former international students in it, and provide them a pathway to permanent residence, (see Tremblay, 2005).

A prominent strand of literature on skilled migration refers to “brain circulation”, “brain gain” and “brain drain”. The old brain drain view that the developed world is plundering the human resources of the poor developing world, has been abandoned. The recent theoretical and empirical brain drain literature shows that high-skill emigration do not deplete a country’s stock of human capital and can generate positive network/diaspora externalities. First and foremost, it shows that the brain drain side of globalization creates winners and losers, (see Docquier and Rapoport, 2012). Currently it is acknowledged that foreign students who settle down in the host country and can create development opportunities for the sending country through remittances, business relationships, direct investment, technological and ideological exportation, (see Lowell et al., 2004). This is related to the literature that emphasizes the potential for migrants to reduce international transaction costs and facilitate the flow of goods, factors, and knowledge between host and home countries. The sociological literature (e.g. Meyer (2001)) has long recognized that the migration of scientists can facilitate the international diffusion of knowledge and technology be it directly, through brain circulation, or indirectly through the creation and development of networks. Massey and Zenteno (1999) and Beine et al. (2012) found empirical evidence of the network effect of international students’ mobility. Dreher and Poutvaara (2005) found that the subsequent migration flow after student migration can be substantial. This suggest that hosting foreign students is an efficient way of attracting future high-skilled migrants.

The literature investigating students’ intention to study abroad and their intention to return are mainly based on survey data with subjective questions. For example, Imran et al. (2011) found that of the Pakistani students abroad, 14% intended to return to Pakistan immediately after graduation, 10% never intended to return and 37% intended to stay abroad temporarily. The most important factors for choosing training abroad were perceived the impact of the training on the future career, financial conditions in the foreign countries, and job opportunities. For the decision to stay in Pakistan to further their training, only family ties in Pakistan has significant effect.

The return rates of foreign students is a key issue analysed by Rosenzweig (2008). Bratsberg (1995) has shown that return rate of foreign students from the US depends on the education level in their home country. When the educational attainment of a student exceeds the average education level in the home country or when the return to education in the home country is higher, the more likely the student is to return to the home country. Bijwaard (2010) found high return rates of foreign students coming to the Netherland. He also found that when they leave most students hardly ever return. Gibson and McKenzie (2011) studied the migration behaviour of the best and brightest students in three Pacific countries, Tonga, Papua New Guinea(PNG) and New Zealand. In these three countries, a

very high percentage of top students chose to pursue their tertiary education in a foreign country. These students also have very high return rates. Counter-intuitively, for these most intelligent students economic benefits did not play an important role in their location decision, but were more related to family, lifestyle choice and career opportunities.

A different view on student migration is from the sending country's perspective. Oosterbeek and Webbink (2011) used applicants for a Dutch study-abroad-scholarship program, to investigate the impact of studying abroad on subsequent living abroad. They found that for those outstanding applying students, studying abroad and the length of their study experience increase their propensity to live abroad. Since the sample is limited to those very outstanding students, the extrapolation to general conclusions about student behaviour is dangerous.

To summarize, most research on student migration focusses on either what affects students' decision to study abroad or what is their decision after graduation. The experience of students in the host country and its influence on their behaviour is hardly considered. A dynamic view on the impact of lifecourse experiences, labour market dynamics and family formation, is missing. The main reason is probably the lack of sufficient data issue. For a thorough analysis of the impact of these lifecourse experiences very detailed and large individual data is needed. We can fill this gap with our unique administrative data.

3 Data

All legal immigrations of non-Dutch citizens to the Netherlands are registered in the Central Register Foreigners (Centraal Register Vreemdelingen, CRV), combining information from the Immigration Police (Vreemdelingen Politie) and the Immigration and Naturalization Service (Immigratie en Naturalisatie Dienst, IND). For those immigrants who want to stay longer than two thirds of the next 6 months, they must notify local population register after their arrival in the Netherlands. Besides, all immigrants have to register at one municipality. The administration also records the migration motive of every migrant. The motive is usually coded according to one's visa status; otherwise it is reported by the immigrant during registration in the population register. Here we focus on migrants who report to migrate as students. We restrict the data to those reported students who had started studying within 3 months after their arrival. Finally, we excluded the students who were married at arrival, about 2%, to avoid initial selection problems in the effect of marriage on return. We end up with 42,730 who entered the Netherlands from 1999 till 2007.

Statistics Netherlands has linked the immigration register to the Municipal Register of Population (Gemeentelijke Basisadministratie, GBA) and the Social Statistical Database (SSD). The GBA contains basic demographic information of every immigrant, like birth-date, gender, marital status and country of origin. The SSD records monthly information of the individual's labour market status, income, industry sector, housing and household situation.

The labour market status is defined by the Social Economic Category (SEC), a classification used by Statistics Netherlands based on the main source of income. For somebody with multiple sources of income, like a student with a part time job or doing an internship, this classification can be misleading. Note that many (non-EU) students are only allowed, implied by their visa, to do small jobs during their studies. When the earnings of such a small (student) job exceeds the amount of student grant/scholarship the student receives, his/her SEC status will change from student to employee even when the student is still studying.

To correct for these spurious labour market status changes we made some data adjustments on short term employment spells in between study spells. It is reasonable to assume that these short employment spells are just spare-time jobs done by students while studying. These very short employment spells would confound our estimations by assuming a very dynamic labour market behaviour. Hence, we remove these spurious employment spells by assuming the migrant remains studying during such a spell.

We group our data based on the country of birth of the foreign student. Students from different countries face different visa restrictions. For students from EU/EFTA and Switzerland it is relatively easy to study in the Netherlands. For students from other countries a MVV (Machtinging tot Voorlopig Verblijf) is needed before a student can stay for more than three months in the country. Student from many (non-EU) developed countries are exempted from applying a MVV before entry but still need a residence permit¹. Students from the countries that joined the EU in 2004 or 2006 are also exempted. So, we distinguish students from (1) EU 15 (including EFTA); (2) new EU, joined the EU in 2004 or 2006; (3) Developed countries (DC) and (4) Less developed countries (LDC). Finally, we consider students from the former Dutch colonies Surinam and the (Dutch) Antilles separately. Students from LDC's are the largest group with 39% of the students. The distribution over the other groups is: 28% from EU and EFTA countries, 8% from New EU countries, 5% from developed countries, and 20% from Surinam and Netherlands Antilles. See Appendix A for the distribution over the countries of birth.

3.1 Descriptive Results

Table 1 provides some descriptive statistics by country group. A slight majority of the students is female. The average age of the students at entry is 22, with students from developed countries on average older and from Surinam/Antilles on average younger. Around two to four percent get a child during their stay in The Netherlands, but students from the former Dutch colonies much more often. For most groups we see an increasing inflow of students over the years. The students from Surinam and the Antilles differ substantially from the other students, with two-thirds of the students younger than twenty, 13% of the students getting a child and a decreasing inflow over the years.

¹Exemption of MVV applies to nationals from: Australia, Canada, Japan, New Zealand, Norway, South Korea and USA

Table 1: Data description

	Non-EU				
	EU 15	New EU	DC	LDC	Surinam & Antilles
Female	57.6%	59.4%	53.0%	49.2%	54.4%
	<i>Age at entry</i>				
Aged 18-20	33.2%	26.6%	18.2%	28.5%	66.5%
Aged 21-24	47.9%	54.8%	40.9%	40.7%	27.8%
Aged 25-29	16.7%	16.4%	30.6%	22.0%	4.6%
Aged 30-34	1.7%	1.9%	7.5%	6.2%	0.6%
Aged ≥ 35	0.6%	0.3%	2.7%	2.6%	0.5%
Average age	22.2	22.4	24.4	23.3	20.2
Ever children (in NL)	2.0%	2.5%	2.6%	4.8%	12.6%
	<i>Year of entry</i>				
1999	3.3%	1.5%	2.0%	2.3%	12.4%
2000	3.4%	1.7%	3.0%	4.2%	13.1%
2001	4.5%	3.2%	3.8%	7.4%	13.5%
2002	5.5%	7.5%	6.5%	11.0%	13.2%
2003	9.1%	9.9%	10.6%	14.4%	12.2%
2004	14.1%	14.8%	15.8%	13.4%	9.1%
2005	16.7%	19.7%	20.4%	14.4%	7.4%
2006	20.5%	19.8%	19.9%	15.8%	9.3%
2007	22.9%	21.9%	18.0%	17.2%	9.8%
N	12,124	3,375	1,998	16,695	8,538

For all immigration spells, 37% end in out-migration. The detailed distribution over the country groups are listed in Table 2. The percentage of stayers, a student who is still in the country at the end of the observation period, varies between 55% and 69% for the 5 groups. Since our data include all student migrants who entered the Netherlands between 1999 and 2007, those censored spells involve many spells starting late in the period and therefore overestimate how many students remain in the country, see the Kaplan-Meier survival curves in Figure 1. About half of the students (46%) are still studying when they leave the country. The students have substantial labour market experience during their stay in The Netherlands with 14% to 45% is ever employed and 25% to 44% is ever unemployed. Students from the former Dutch colonies, Surinam and Netherlands Antilles, have employment experience and students from DC and LDC countries have more unemployment experience. Most students remain single while in the country; 2% (EU) to 5% (LDC) get married in The Netherlands.

To get a rough idea of the different processes in our data we depict the Kaplan-Meier estimates of remaining in the country, Figure 1, of remaining single, Figure 2, and of remaining studying, Figure 3. Figure 1 clearly shows that students from Surinam and the

Table 2: Descriptive Dynamics

	Non-EU				
	EU 15	New EU	DC	LDC	Surinam & Antilles
Stayer ¹	68.6%	57.9%	55.9%	54.6%	58.2%
	<i>Labour market Dynamics</i>				
ever employed ²	18.7%	21.0%	14.0%	23.2%	45.0%
ever unemployed ³	26.0%	37.1%	43.8%	42.0%	25.1%
	<i>Relationship Dynamics</i>				
always single ⁴	98.3%	96.2%	96.0%	94.6%	95.3%
ever married	1.7%	3.8%	4.0%	5.4%	4.7%
Married at departure ⁵	0.8%	1.1%	2.4%	1.9%	2.7%

¹ Stayers are migrants who remain in the country till the end of the observation period.

² Percentage of migrants that is ever employed during their stay in the country.

³ Percentage of migrants that is ever unemployed during their stay in the country.

⁴ Percentage of migrants that is single through the whole stay in the country.

⁵ As percentage of migrants that leave.

Netherlands Antilles stay more often, with slightly more than half of those students still in the country nine years after arrival. About 60% of the students from the other groups have left the country within nine years. Many students from the new EU countries leave rather fast, after around two years in the country.

The probability of getting married is much lower for students from the EU or Surinam and the Netherlands Antilles, see Figure 2. About 15% of those students get married (in The Netherlands) within nine years of arrival. The other students marry more often, with students from new EU and LDC countries the most often (around 27%). Figure 3 clearly shows, as expected, that in the long run all students enter the labour market. Students from Surinam and Netherlands Antilles start this entry earlier and the students from developed countries the latest.

Figure 1: Kaplan-Meier return rates, leaving The Netherlands.

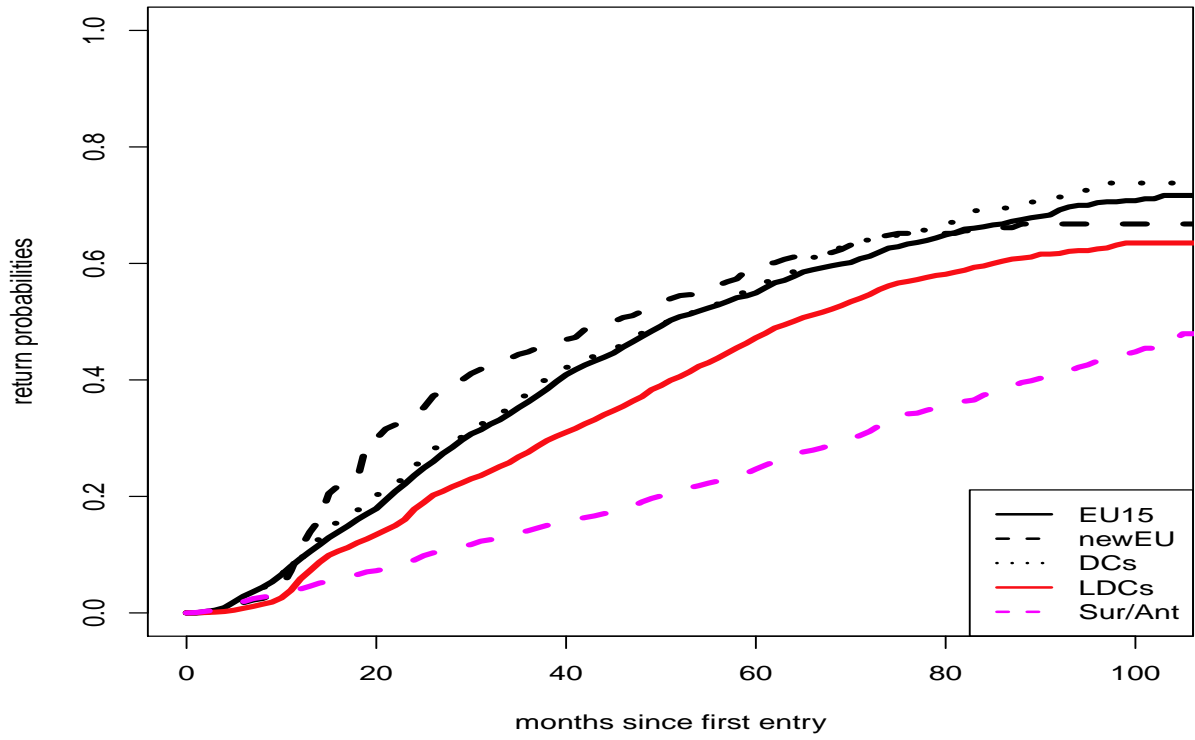


Figure 2: Kaplan-Meier estimates of getting married (in the Netherlands).

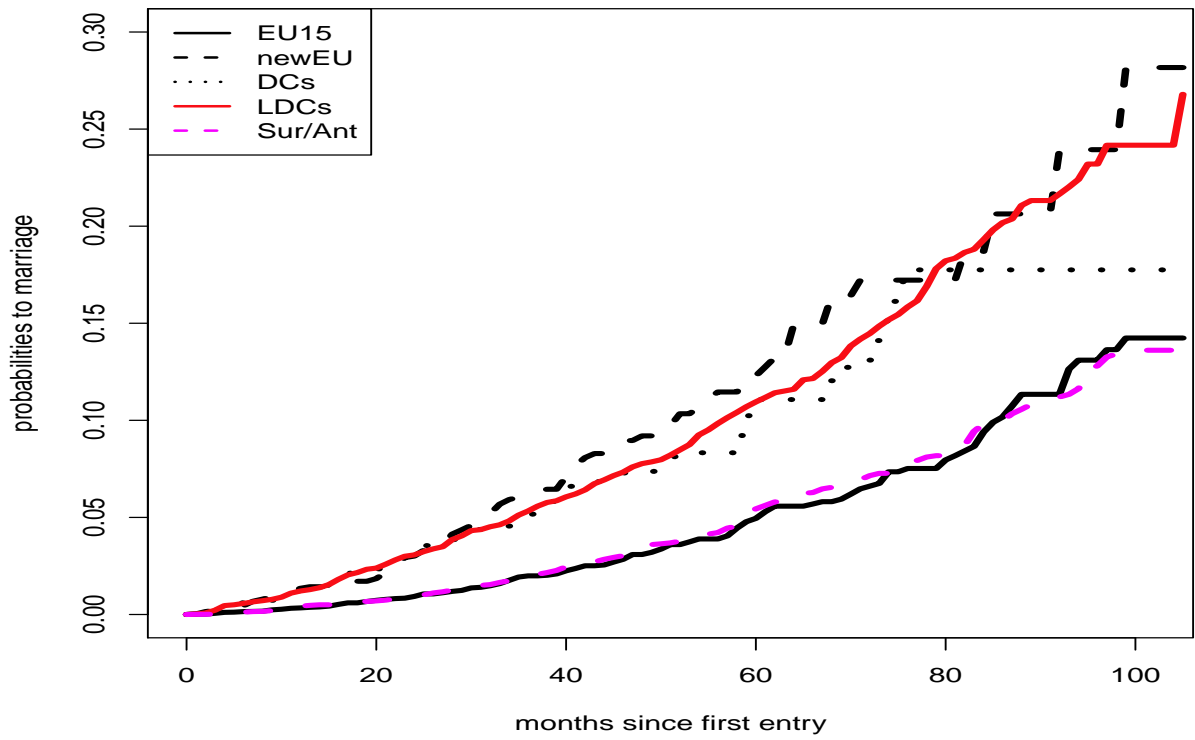
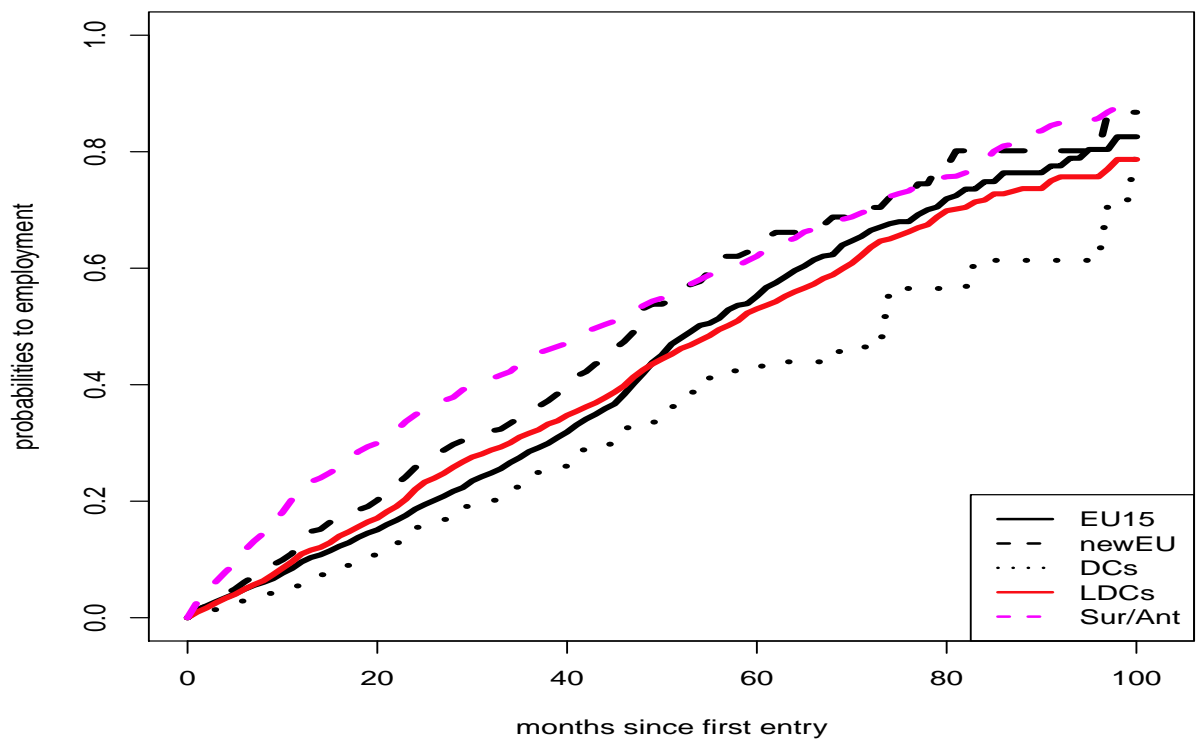


Figure 3: Kaplan-Meier estimates of entering the labour market.



4 Methodology

4.1 Modeling the processes

We seek to identify the effect of labour market and family formation dynamics on student migrants' decision to leave. So the random outcome variable of interest is the time spent in the Netherlands, denoted by T_m . Generically, let T denote the random time since first entry into the Netherlands that an event takes place. In particular, T_m is the time the immigrant emigrates from the host country, T_s the time a study spell ends in the host country, T_e the time an employment spell ends, T_u the time an unemployment spell ends, and T_{mar} the time a migrant marries in the host country. A study spell can end in employment or unemployment (or return). This is a typical competing risks situation. The durations of the study ending in employment and unemployment spells are denoted by $\delta_{se}(t)$ and $\delta_{su}(t)$. Similarly, the durations from employment to study or unemployment are denoted by $\delta_{es}(t)$ and $\delta_{eu}(t)$ and from unemployment to study or employment by $\delta_{us}(t)$ and $\delta_{ue}(t)$. In order to keep track of labour market and marriage events, we also define the associated time-varying indicators: the indicator $I_u(t)$ takes value one if the migrant is unemployed at time t , $I_e(t)$ indicates that the immigrant is employed, and $I_{mar}(t)$ indicates that the immigrant is married (all students are single at entry).

We consider three different processes: (i) the labour market process, including studying; (ii) the process of getting married and the main process (iii) of leaving the country. As the migrant is either studying, employed or unemployed, the labour market process has six possible transitions: study to employment (se), study to unemployment (su), employment to study (es), employment to unemployment (eu), unemployment to study (us) and unemployment to employment (ue). Note that all the students are, by definition studying at entry. So there is no need to model any initial conditions to enter the first state. The conditional hazards for these transitions all follow MPH models and are allowed to be correlated through unobservable heterogeneity terms:

$$\theta_k(\delta_k(t)|t_{mar}, x_k(t), v_k) = v_k \lambda_k(\delta_k(t)) \exp\left(x_k(t)\beta_x^k + I_{mar}(t)[\gamma_{mar,k} + z_{mar}(t)\phi_{mar,k}]\right), \quad (1)$$

with $k = \{se, su, es, eu, ue, us\}$. $I_{mar}(t)$ indicates that a student is married at t and $(\gamma_{mar,k} + z_{mar}(t)\phi_{mar,k})$ captures the effect of marriage on these labour market hazards; a constant effect $\gamma_{mar,k}$ and $z_{mar}(t)\phi_{mar,k}$ capture the impact of observed characteristics on this effect.

Most students are in their 20s and this age is generally the onset of family formation. Students at campus or starting their career are prone to find their lifelong partner then. The hazard of marrying is also of the MPH form and we allow for a direct effect of

(un)employment on this transition:²

$$\begin{aligned} \theta_{mar}(t|t_e, t_u, x_{mar}(t), v_{mar}) = & v_{mar} \lambda_{mar}(t) \exp\left(x_{mar}(t) \beta_x^{mar} \right. \\ & \left. + I_e(t) [\gamma_{e,mar} + z_e(t) \phi_{e,mar}] + I_u(t) [\gamma_{u,mar} + z_u(t) \phi_{u,mar}]\right), \end{aligned} \quad (2)$$

with $I_u(t)$ and $I_e(t)$ are the indicators of (un)employment of the student and $\gamma_{e,mar} + z_e(t) \phi_{e,mar}$ and $\gamma_{u,mar} + z_u(t) \phi_{u,mar}$ capture the effect of these labour market changes on the hazard to get married. All the labour market dynamics hazards are allowed to be correlated with the hazard of forming a marriage, either through unobserved heterogeneity or through a direct effect of marriage.

Finally for our main hazard of interest, the return migration hazard, also has an MPH form. We allow this hazard, all labour market transition hazards and the hazard to marry all be correlated through unobservable heterogeneity terms and through a possible direct effect of labour market dynamics and marriage on the migration hazard. The return hazard is a function of control variables x , labour market changes, $I_u(t)$ and $I_e(t)$, and getting married $I_{mar}(t)$

$$\begin{aligned} \theta_m(t|t_u, t_e, t_{mar}, x_m(t), z(t), v_m) = & v_m \lambda_m(t) \exp\left(x_m(t) \beta_x^m + I_u(t) \left\{ \gamma_u + z_u(t) \phi_u \right\} \right. \\ & \left. + I_e(t) \left\{ \gamma_e + z_e(t) \phi_e \right\} + I_{mar}(t) \left\{ \gamma_{mar} + z_{mar}(t) \phi_{mar} \right\}\right). \end{aligned} \quad (3)$$

Hence, $\gamma_e + z_e(t) \phi_e$ represent the effect of employment on the return hazard, $\gamma_u + z_u(t) \phi_u$ represent the effect of unemployment on the return hazard, and $\gamma_{mar} + z_{mar}(t) \phi_{mar}$ represent the effect marriage on the return hazard, where z_k ($k = e, u, mar$) are time-varying covariates that capture possible heterogeneity in the effects.

It is well known that, due to dynamic sorting effects, the distribution of the unobserved heterogeneity among those students who become (un)employed or married at a particular time will differ from its population distribution. Consider, for example, the student to employment process. Students with high v_{se} , i.e. high motivation to become employed, will tend to enter employment earlier than individuals with low v_{se} . If v_{se} and v_m , the unobserved heterogeneity of the return migration hazard, are dependent, then the distribution v_m for employed students at a given time in the country will differ from the distribution of v_m for students still studying. Similarly, if v_m and v_{mar} are not independent, then the distribution of v_m among married students will differ from its population distribution. Therefore, one cannot infer the causal effect of (un)employment and marriage on the return-migration from a comparison of the realised durations of those who became (un)employed/married at a particular time with the rest of the population, because one would then mix the causal effect of (un)employment/marriage on the duration with the difference in the distribution of v_m between these migrants. In this case $I_e(t)$, $I_u(t)$

²We ignore possible divorce as only a few students first marry and then divorce.

and $I_{mar}(t)$ will be endogenous. The same holds for the inclusion of the marriage in the labour market processes and for the inclusion of (un)employment in the marriage process, and therefore all the durations T_{se}, \dots, T_{mar} and T_m should be modelled jointly to account for dependence of the unobserved heterogeneity terms. Therefore, we allow $v = (v_{se}, v_{su}, v_{es}, v_{eu}, v_{ue}, v_{us}, v_{mar}, v_m)$ to be correlated.

For the sake of parsimoniousness, we assume that each of the unobserved heterogeneity terms remains the same for recurrent durations of the same type, and we adopt a discrete distribution, i.e. v has discrete support (v_1, \dots, v_K) , with $v_r = (v_{se,r}, \dots, v_{m,r})$ and $p_r = \Pr(v = v_r)$.³

We have data for $i = 1, \dots, n$ students entering the Netherlands in our observation window. Let L_{ie}, L_{iu} and L_{is} denote the number of the observed (un)employment and students spells of individual i . Note that for some migrants $L_{iu} = L_{ie} = 0$ (e.g. a student who remains studying till the end of the observation window). We consider the first migration spell only. The six indicators Δ_{il}^k signal that l^{th} transition is uncensored, $k = \{se, su, es, eu, ue, us, mar, m\}$. Thus the likelihood contribution of migrant i conditional on the unobserved heterogeneity v is, in the light of the preceding discussions:

$$\begin{aligned}
L_i(v) &= \prod_{l=1}^{L_{iu}} \left[\theta_{ue}(\delta_{ue}(t_{il}) | \cdot, v_{ue})^{\Delta_{il}^{ue}} \exp\left(-\int_0^{\delta_{ue}(t_{il})} \theta_{ue}(\tau | \cdot, v_{ue}) d\tau\right) \right. \\
&\quad \cdot \theta_{us}(\delta_{us}(t_{il}) | \cdot, v_{us})^{\Delta_{il}^{us}} \exp\left(-\int_0^{\delta_{us}(t_{il})} \theta_{us}(\tau | \cdot, v_{us}) d\tau\right) \left. \right]^{I_u(t_{il}^-)} \\
&\quad \times \prod_{j=1}^{L_{ie}} \left[\theta_{eu}(\theta_{eu}(\delta_{eu}(t_{ij}) | \cdot, v_{eu})^{\Delta_{ij}^{eu}} \exp\left(-\int_0^{\delta_{eu}(t_{ij})} \theta_{eu}(\tau | \cdot, v_{eu}) d\tau\right) \right. \\
&\quad \cdot \theta_{es}(\delta_{es}(t_{ij}) | \cdot, v_{es})^{\Delta_{ij}^{es}} \exp\left(-\int_0^{\delta_{es}(t_{ij})} \theta_{es}(\tau | \cdot, v_{es}) d\tau\right) \left. \right]^{I_e(t_{ij}^-)} \quad (4) \\
&\quad \times \prod_{g=1}^{L_{is}} \left[\theta_{su}(\theta_{su}(\delta_{su}(t_{ig}) | \cdot, v_{su})^{\Delta_{ig}^{su}} \exp\left(-\int_0^{\delta_{su}(t_{ig})} \theta_{su}(\tau | \cdot, v_{su}) d\tau\right) \right. \\
&\quad \cdot \theta_{se}(\delta_{se}(t_{ig}) | \cdot, v_{se})^{\Delta_{ig}^{se}} \exp\left(-\int_0^{\delta_{se}(t_{ig})} \theta_{se}(\tau | \cdot, v_{se}) d\tau\right) \left. \right]^{I_s(t_{ig}^-)} \\
&\quad \times \theta_{mar}(t_{i,mar} | \cdot, v_{mar})^{\Delta_i^{mar}} \exp\left(-\int_0^{t_{i,mar}} \theta_{mar}(\tau | \cdot, v_{mar}) d\tau\right) \\
&\quad \times \theta_m(t_{i,m} | \cdot, v_m)^{\Delta_i^m} \exp\left(-\int_0^{t_{i,m}} \theta_m(\tau | \cdot, v_m) d\tau\right)
\end{aligned}$$

This likelihood naturally separates the labour market, marriage, and migration spells. To simplify notation, we have suppressed the dependence on observed characteristics in the hazard rates. $I_u(t_{il}^-)$ indicates that the migrant is unemployed just before t_{ik} and similarly

³To assure that the probability is between zero and one we estimate q_r with $p_r = e^{q_r} / (1 + \sum e^{q_j})$.

for $I_e(t_{ij}^-)$ and $I_s(t_{ig}^-)$. When $L_{iu} = 0$ or $L_{ie} = 0$ the relevant term becomes 1. Note that the last, and only the last, labour market spell is censored. This is either because the student is still in the country at the end of the observation period, or has left.

Integrating out the unobserved heterogeneity we obtain the likelihood function

$$L = \prod_{i=1}^n \int \dots \int L_i(v) dG(v) \quad (5)$$

where $G(v)$ is the joint distribution of the unobserved heterogeneity terms.

4.2 Causal interpretation in a Timing of Events Model

The “timing-of-events” method of Abbring and van den Berg (2003) implies that the effects of the labour market and marriage process on the hazards, i.e all the $\gamma + z(t)\phi$'s in our framework, have a causal interpretation. This requires that all hazards are modelled parametrically as mixed proportional hazards, as we have. Identification of the causal effect additionally requires that the so-called “no-anticipation”-assumption holds. We explain this for the return migration hazard. Similar argumentation holds for the other hazards. Denote by t_a the time a student would first enter any of the following states employment, unemployment or marriage, and consider first the migration hazard at a time t *before* the particular event. The (untestable) no-anticipation assumption requires that students do not anticipate this event by migrating before the anticipated event would occur. The migration intensity $\theta_m(t|t_u, t_e, t_{mar}, x_m(t), z(t), v_m)$ is assumed to be affected only for $t > t_a$:

$$\theta_m(t|t_{a_1}, \cdot) = \theta_m(t|t_{a_2}, \cdot) \quad \text{for all } t < \min\{t_{a_1}, t_{a_2}\}. \quad (6)$$

A possible threat to the validity of the no-anticipation assumption is that students often anticipate events that happen after they leave school. Even though students can react in advance, the time span between their action and the realization of the event is short compared to the duration of the processes of interest. So, we are cautious in giving a causal interpretation to the obtained effects of labour market changes or marriage.

5 Estimation Results

Before we turn to the discussion of our main results, the impact of labour market and marriage formation processes on the return hazard, we briefly mention the impact of included control variables on the return hazard. We reckon that the demographic factors gender, age at entry, inter-ethnicity and having a Dutch parent influence the decision to return. To capture the effect of labour market environment of the host country, the (quarterly) national unemployment rate of the Netherlands is included. We control for cohort effect by including both the year of entry and the unemployment rate at entry. We assume a piecewise constant baseline hazard on five intervals, 0-6 months, 6-12 months,

1-2 years, 2-3 years and more than 3 years, with the first 6 months as reference. We also observe whether the student has children and the income of the student. We do not, directly, include this information in the controls, because their value depends on the (possible) endogenous processes of labour market changes and marriage formation. Only married students get children and therefore the information whether a student has children is only included conditional on being married (i.e. $I_{mar}(t) = 1$). Similarly, only when employed students receive (substantial) income and the (monthly) amount of income a student earns is only included while being employed, i.e. $I_e(t) = 1$.

We assume a piecewise constant baseline hazards. Let the intervals $I_m(t) = I(t_{m-1} \leq t < t_m)$ for $m = 1, \dots, M+1$ with $t_0 = 0$ and $t_{M+1} = \infty$ be the intervals on which we define the piecewise constant intensity. Then, the baseline intensity is $\lambda_0(t) = \left(\sum_{m=1}^{M+1} e^{\alpha_m} I_m(t) \right)$. For identification we assume that the baseline hazard for each transition is one in the first interval. The α 's determine the difference in intensity at each interval compared to the first interval. The baseline intensity for a duration of $t \in [t_{m-1}, t_m)$ is higher than the baseline intensity to leave for a duration of $t < t_1$ if $\alpha_m > 0$ and lower if $\alpha_m < 0$.

5.1 Impact of Control Variables on Return

Table 3 presents the estimated coefficients of these control variables on the return hazard.⁴ Gender does not seem to influence the pace students return. Older (beyond 20) students are more prone to leave. Not surprisingly, students with a Dutch parent stay more often (only significant for Surinam/Antiles). We find rather large cohort effects, especially for students from new EU countries, indicating that the most recent cohorts leave (much) faster. A high (national) unemployment rate at the moment of entry has a negative effect on the return rate of students from new EU and LDC countries and a positive effect on the return rate of students from developed countries. The economic cycle during their stay in the Netherlands only influence the return of students from new EU countries, with a higher unemployment rate inducing them to leave. We also find a strong positive duration dependence, the longer the students are in the country the higher the hazard to return, especially for students from new EU countries. The results also indicate that the behaviour of students from Surinam/Antilles is very different from the other foreign students, as was already shown in Figure 1. These migrants only show moderate cohort effect and duration dependence.

5.2 Effect of Labour Market Dynamics and Marriage on Return

First we assume constant endogenous effects, i.e. the ϕ 's in equation (3) are all zero. The results for the second model, in which we allow for heterogeneous effect, can be found in section 5.5. The estimated effects of labour market spells and marriage on return migration hazards are reported in Table 4. Finding employment is a positive labour market event

⁴Because our focus is on the return migration of students we do not discuss the impact of control variables on the other hazards. These results are available in appendix B.

Table 3: Estimated impact of control variables on the return migration hazard

	EU 15	new EU	DC	LDC	Surinam/Antilles
Female	0.029 (0.046)	-0.080 (0.074)	-0.273 ⁺ (0.119)	0.027 (0.037)	-0.009 (0.060)
age 21-24	0.524** (0.052)	1.711** (0.122)	0.204 (0.168)	0.562** (0.047)	0.177** (0.068)
age 25-29	0.620** (0.068)	1.310** (0.159)	0.043 (0.186)	0.690** (0.053)	0.597** (0.143)
age 30-34	0.386 ⁺ (0.186)	0.794** (0.304)	0.217 (0.253)	0.885** (0.086)	-0.524 (0.296)
age >35	1.020** (0.294)		0.595 (0.368)	0.933** (0.118)	0.275 (0.350)
interethnic	0.167 (0.168)		0.208 (0.279)	-0.171 (0.252)	0.153 (0.137)
NLparent	-0.272 (0.185)		-0.390 (0.361)	-0.308 (0.296)	-0.728** (0.251)
Unemployment (nat)	0.046 (0.027)	0.497** (0.065)	-0.078 (0.069)	-0.001 (0.023)	0.044 (0.026)
U at entry	-0.021 (0.104)	-0.810** (0.312)	0.661 ⁺ (0.282)	-0.207 ⁺ (0.101)	0.368 (0.199)
year2000	0.120 (0.150)	-1.515** (0.562)	2.207** (0.395)	0.137 (0.127)	0.302 ⁺ (0.148)
year2001	0.273 (0.180)	-0.350 (0.651)	2.482** (0.430)	0.138 (0.155)	0.904** (0.251)
year2002	0.388 ⁺ (0.151)	1.698** (0.512)	1.348** (0.345)	0.537** (0.127)	1.039** (0.183)
year2003	0.964** (0.132)	2.153** (0.378)	1.698** (0.416)	1.321** (0.120)	0.643** (0.150)
year2004	1.382** (0.174)	3.102** (0.436)	1.606** (0.460)	2.019** (0.170)	0.249 (0.283)
year2005	1.560** (0.164)	4.012** (0.421)	2.278** (0.449)	2.103** (0.161)	0.780** (0.265)
year2006	1.709** (0.128)	4.117** (0.431)	2.840** (0.356)	2.316** (0.126)	0.690** (0.171)
year2007	1.131** (0.179)	3.546** (0.605)	2.436** (0.517)	1.533** (0.217)	1.549** (0.252)
<i>duration dependence</i>					
α_2 (6-12 mos)	0.494** (0.062)	1.649** (0.134)	0.766** (0.151)	1.425** (0.082)	-0.160 (0.100)
α_3 (1-2 yrs)	1.088** (0.062)	3.590** (0.144)	1.660** (0.151)	2.182** (0.081)	0.127 (0.086)
α_4 (2-3 yrs)	1.756** (0.076)	4.816** (0.198)	2.578** (0.194)	2.776** (0.088)	0.446** (0.091)
α_5 (> 3 yrs)	2.813** (0.084)	5.751** (0.228)	3.857** (0.232)	3.993** (0.092)	1.345** (0.089)

⁺ $p < 0.05$ and ** $p < 0.01$

which is likely to impact migration durations. For almost all student groups the effect of having found a job delays the return of the foreign student. The effect of employment is very similar for the non EU groups. The only student group that deviates from this pattern of extended migration durations are the students from Suriname and Netherlands Antilles. We have mentioned already that these students are a special group from a (former) Dutch colony. They still have a special connection to the Netherlands and it seems that these students only use their employment to save some money to return.

For three of the five student groups we confirm that unemployment leads to return. This effect is particularly strong for students from Surinam and Netherlands Antilles. For students from developed countries unemployment make them more prone to stay. It seems that these students use their unemployment period to search for (another) job in the country.

Across all groups it is evident that marriage extends the duration of stay. This effect is particularly strong for students from new EU countries.

Table 4: Effect of labour market dynamics and marriage on return

	EU 15	new EU	DC	LDC	Surinam/Antilles
Employment	-0.273** (0.085)	-0.545** (0.199)	-0.541** (0.209)	-0.589** (0.077)	0.457** (0.065)
Unemployment	0.152** (0.054)	-0.064 (0.084)	-0.491** (0.102)	0.359** (0.037)	1.298** (0.064)
Marriage	-1.846** (0.296)	-2.200** (0.491)	-0.735 (0.393)	-1.698** (0.246)	-0.464 ⁺ (0.191)

⁺ $p < 0.05$ and $**p < 0.01$

5.3 Effect of marriage on labour market dynamics

Our model not only allows for a direct impact of the labour market changes and marriage on return, but it also includes a direct impact of marriage on the labour market dynamics, see equation (1). A change in marital status is possibly endogenous to the other processes and the model accounts for that. Table 5 reports these effects. Across all groups marriage increases the probability that a student becomes employed (both from studying and from unemployment). It reduces the chance that a student moves back from employment to study again. The impact of marriage on becoming unemployed is less clear, with LDC and Surinamese students more prone to leave for unemployment when married and EU-students less prone to become unemployed from employed when married.

Table 5: Marriage effects on labour market dynamics.

	EU 15	new EU	DC	LDC	Surinam/Antilles
<i>Student to employed</i> Marriage	0.509** (0.138)	0.194 (0.206)	0.228 (0.307)	0.384** (0.075)	0.524** (0.091)
<i>Student to unemployed</i> Marriage	0.233 (0.173)	0.282 (0.203)	0.060 (0.223)	0.294** (0.071)	0.583** (0.175)
<i>Employed to Student</i> Marriage	-0.569** (0.205)	0.569 ⁺ (0.258)	-1.466** (0.492)	-1.155** (0.122)	-0.720** (0.114)
<i>Employed to Unemployed</i> Marriage	-0.499** (0.182)	-0.205 (0.299)	0.078 (0.300)	-0.149 (0.099)	0.015 (0.114)
<i>Unemployed to Student</i> Marriage	0.714 ⁺ (0.307)	-0.514 (0.429)	-0.969 (0.609)	-0.085 (0.153)	-0.035 (0.216)
<i>Unemployed to Employed</i> Marriage	0.341 (0.189)	0.682** (0.297)	0.691 ⁺ (0.335)	1.005** (0.150)	0.145 (0.103)

⁺ $p < 0.05$ and $**p < 0.01$

5.4 Effect of labour market dynamics on marriage formation

Finally, the model tells us whether labour market changes affects marriage formation, see equation (2). On the one hand, finding a job is for most students beneficial on the marriage market (but only significant for students from developed countries and from Surinam and the Antilles), while on the other hand, losing a job reduces the chance to get married substantially.

Table 6: Labour market effects on marriage

	EU 15	new EU	DC	LDC	Surinam/Antilles
Employment	0.375 (0.224)	0.334 (0.342)	0.799 ⁺ (0.398)	0.138 (0.126)	0.459 ^{**} (0.145)
Unemployment	-0.866 ^{**} (0.296)	-0.273 (0.300)	-1.277 ^{**} (0.487)	-0.331 ^{**} (0.104)	0.254 (0.197)

⁺ $p < 0.05$ and ^{**} $p < 0.01$

5.5 Heterogeneous effects

Next we permit the main effects of the life-course processes on the return to vary across characteristics. We allow these effects to vary by gender, age, income, the business cycle and children. The income of a student only (substantially) differs when they are employed and, therefore we expect the income level to affect the impact of employment on return. Both the impact of employment and unemployment might change when the business cycle in the Netherlands changes. We also expect that older students are more affected by (un)employment, because older students are more often at a new stage in their life in which they settle and start a (real) job. As most children are born in a marriage we only expect children to affect the return through a marriage. Table 7 reports this heterogeneity in the impact of labour market changes and marriage formation on the return migration hazard. The tables with the heterogeneity in the impact of marriage on labour market dynamics, Table 16, and in the impact of labour market dynamics on marriage formations, Table 17, can be found in Appendix C.

The impact of employment on return, the first panel of the table, is larger for older (above 25 at arrival) students. These students are more likely to enter the labour market (see Table 9 and 10 in Appendix B), because they are closer to the end of their studies. Note that for students from new EU countries the old age effect captures most of the impact of employment on return. A higher age at arrival also reduces the impact of unemployment, inducing the older migrants to stay more often after they become unemployed, see the second panel of Table 7. Students in (small) low paid jobs from LDC's, and from EU & EFTA, are more prone to stay. It seems that these migrants remain in the country to search for a better job. With a tighter labour market in an economic downturn we would expect that finding a job in a high unemployment period has a negative effect,

making students more prone to stay, on the impact of employment on return. We find, however, that the national unemployment rate only significantly influences this impact for EU and Surinamese students, and the first group leaving more often employed in a period of higher unemployment. These students might then see better opportunities back home. For impact of unemployment on return we found that the business cycle has an accelerating effect, with higher unemployment inducing faster return. This effect is particularly strong for students from the new EU countries. This is in line with the reduction of job opportunities during an economic crisis.

Female students are more affected by unemployment. After allowing for heterogeneous impact the baseline (constant) effect of unemployment on return is negligible or negative for three of the five groups, indicating that for students from these, developed, countries unemployment may induce them to remain in the country to search for a job.

We find less heterogeneity in the impact of marriage on return. For students from the EU and non EU developed countries females are more affected by marriage. In fact, for students from DC's marriage has only (and a rather large) effect on females. The existence of children only influences the marriage effect of LDC's.

The impact of marriage on the labour market processes hardly differs (significantly) by gender or by the existence of children, see Table 16 in Appendix C. A few exceptions are the negative effect of children on the the transition from studying to employment and the positive effect of children on the transition from unemployment to employment and from unemployment to studying (LDC students only). We found some heterogeneity in the impact of labour market changes on marriage formation, see Table 17 in Appendix C. For students who arrive at a higher age employment has a negative impact on getting married (within the Netherlands). Low income employed students have a higher change to get married (only significant for LDC students). For some groups the impact of labour market changes on marriage differs by gender. The business cycle also shows some impact on marriage formation.

Table 7: Heterogeneity in effect of labour market dynamics and marriage on return

	EU 15	new EU	DC	LDC	Surinam/Antilles
	<i>Effect of Employment</i>				
Female	0.266 (0.137)	-0.160 (0.313)	0.515 (0.403)	0.118 (0.130)	-0.100 (0.116)
Income < 1000	-0.256 ⁺ (0.124)	-0.065 (0.293)	0.672 (0.393)	-0.848** (0.125)	-0.158 (0.105)
Age at entry > 25	-0.383 ⁺ (0.154)	-1.226** (0.416)	-0.489 (0.412)	-0.876** (0.153)	-0.600** (0.209)
Unemployment (nat)	0.221** (0.085)	-0.232 (0.185)	0.174 (0.216)	-0.041 (0.074)	-0.162** (0.061)
Constant	-0.376 ⁺ (0.151)	0.014 (0.310)	-1.114 ⁺ (0.465)	-0.080 (0.121)	0.704** (0.112)
	<i>Effect of Unemployment</i>				
Female	0.187 ⁺ (0.090)	0.300 ⁺ (0.133)	0.654** (0.188)	0.024 (0.066)	0.284 ⁺ (0.114)
Age at entry > 25	-0.570** (0.110)	-0.185 (0.224)	0.354 (0.187)	-1.126** (0.074)	-0.837** (0.219)
Unemployment (nat)	0.237** (0.050)	0.750** (0.100)	0.070 (0.112)	0.095 ⁺ (0.040)	-0.095 (0.058)
Constant	0.021 (0.086)	-0.716** (0.136)	-1.048** (0.181)	0.638** (0.060)	1.219** (0.099)
	<i>Effect of Marriage</i>				
Female	-0.151** (0.522)		-1.458 ⁺ (0.682)	-0.144 (0.277)	-0.330 (0.340)
Children	0.063 (0.528)			-0.862 ⁺ (0.362)	0.072 (0.327)
Constant	-1.769** (0.490)	-2.569** (0.490)	0.133 (0.513)	-1.568** (0.250)	-0.304 (0.282)

⁺ $p < 0.05$ and ^{**} $p < 0.01$

6 Conclusions and Discussion

Despite that international student mobility has increasingly become important, little research has focussed on migration behaviour of students. An important issue in student migration is that most students only stay temporarily in the host country. This process of return migration is intrinsically related to the labour market behaviour and family formation of these students. Understanding the link between the labour market, family formation decisions and migration processes assists both researchers and policy makers. The labour market-, marriage formation- and migration processes are likely to be interdependent. Assessing the impact of (un)employment spells and marriage on the intensity to leave the country without taking this interdependence into account would bias the results.

We have addressed these issues using a unique Dutch administrative panel of the entire population of the recent (1999-2007) inflow of foreign students to The Netherlands, for which we observe entry, exit, marriage and complete labour market histories. The large size of the data permitted us to stratify the analysis by five distinct student groups, based on their country of birth. The timing of events method enabled us to estimate the effects of (un)employment and marriage histories on migration durations, while we controlled for unobserved heterogeneity. At the same time the method also provides estimates of the impact of marriage on labour market changes and the impact of labour market histories on the marriage formation, all controlled for (correlated) unobserved heterogeneity.

Overall, the estimation results indicate that, when students find a job they are more prone to stay. This effect is stronger for students who enter at a later stage in life. When students become unemployed they leave faster, especially female students, but older students are less affected by unemployment. Confirming common sense, students who find a partner in The Netherlands are much less inclined to leave. We found some exceptions to these general finding. First, students from the former Dutch colonies Surinam and Netherlands Antilles leave faster when becoming employed. This can be explained by target saving behaviour, that suggests that migrants leave when their accumulated saving exceeds some threshold. Second, students from (non-EU) developed countries are more prone to stay after they become unemployed and marriage has only a small effect on their return decision. For these students it is rather easy to remain in the country unemployed while searching for a job. The small marriage effect can be explained by students marrying other foreign students and moving together to a third country.

Return behaviour of students is closely related to the immigration and integration policy of the host. Immigration of students often turns into skilled labour migration, when the student remains in the country working in a highly skilled job. When the Dutch government facilitates that foreign students can stay more easily this increases the number of high-skilled labour migrants in the country, especially in the long-run. The recent (beyond the observation period) introduction of a more extensive job search period in which foreign students are allowed to stay in the country a few months after graduation will probably reduce the effect of becoming unemployed on return of these students. Other possible policies to retain foreign students are providing them better access to affordable real estate, ease labour market access for sectors in demand such as ITC and technology

industries and, for those students with a non-Dutch spouse, ease immigration and labour market entry of their spouse.

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A Main countries of birth

Table 8: Major country of birth

EU 15		new EU			
Germany	51.6%	Poland	31.6%		
Belgium	8.5%	Bulgaria	23.7%		
France	7.1%	Hungary	15.9%		
Spain	6.0%	Rumania	10.9%		
Greece	5.5%	Czechoslovakia	9.5%		
Italy	4.4%	Latvia	3.5%		
UK	2.5%				
<i>N</i>	12,124		3,375		
DC		non-EU LDC		Surinam/Antilles	
USA	43.9%	China	33.2%	Antilles	80.1%
Japan	15.9%	Indonesia	9.6%	Surinam	16.8%
South Korea	15.0%	Russia	7.3%	Aruba	3.1%
Canada	14.7%	Turkey	2.9%		
Australia	5.2%	Yugoslavia	2.9%		
Singapore	3.0%	India	2.7%		
		Vietnam	2.7%		
<i>N</i>	1,998		16,695		8,538

B Coefficients of other intensities

Table 9: Control variables Student to Employed

	EU 15	new EU	DC	LDC	Surinam/Antilles
Female	0.094 ⁺	-0.298**	0.101	-0.242**	-0.126**
age 21–24	0.390**	0.160	0.819**	0.155**	0.146**
age 25–29	0.826**	0.264 ⁺	1.225**	0.340**	0.516**
age 30–34	1.499**	0.803**	1.501**	0.418**	1.556**
age >35	1.686**		1.946**	0.200	1.277**
log(income)	0.253**	0.339**	0.373**	0.314**	-0.338**
log(income) ²	-0.002	-0.008	0.008	-0.006	0.063**
interethnic	-0.107		-0.073	-0.083	-0.177 ⁺
NLparent	0.036		0.029	-0.689**	-0.154
Unemployment (nat)	-0.001	-0.044	0.036	-0.139**	-0.115**
U at entry	0.154	0.144	0.409	0.028	0.085
year 2000	-0.067	-0.064	0.300	-0.015	-0.089
year 2001	-0.052	-0.159	0.239	-0.074	-0.256 ⁺
year 2002	-0.192	-0.256	0.428	-0.246**	-0.572**
year 2003	-0.385**	-0.208	-0.697 ⁺	-0.336**	-0.869**
year 2004	-0.764**	-0.630 ⁺	-1.032 ⁺	-0.390**	-0.958**
year 2005	-0.671**	-0.355	-0.790	-0.518**	-1.223**
year 2006	-0.832**	-0.477 ⁺	-1.134**	-1.078**	-1.251**
year 2007	-1.248**	-0.194	-1.343	-1.968**	-2.000**
<i>duration dependence</i>					
α_2 (3-6 mos)	0.375**	0.850**	0.778**	0.677**	0.571**
α_3 (6-12 mos)	-0.315**	0.184	0.062	0.174**	0.195**
α_4 (1-2 yr)	-0.463**	-0.156	0.027	-0.010	-0.208**
α_5 (2-3 yr)	-0.449**	-0.322	-0.091	-0.211**	-0.251**
α_6 (> 3 yr)	-0.150	0.004	-0.256	-0.054	-0.145**

⁺ $p < 0.05$ and ** $p < 0.01$

Table 10: Control variables Student to Unemployed

	EU 15	new EU	DC	LDC	Surinam/Antilles
Female	-0.103**	-0.185**	-0.288**	0.040	-0.031
age 21-24	0.621**	1.214**	0.324**	0.496**	0.226**
age 25-29	0.934**	1.031**	0.102	0.701**	0.536**
age 30-34	0.839**	1.059**	0.148	0.897**	0.753**
age >35	0.986**		0.648**	1.275**	0.526
log(income)	-0.049	-0.352**	-0.247	-0.224**	0.585**
log(income) ²	-0.029**	0.017	0.003	0.006	-0.112**
interethnic	0.267		-0.139	-0.076	0.036
NLparent	0.035		-0.161	0.102	-0.073
Unemployment (nat)	0.024	-0.158**	-0.140**	-0.065**	0.119**
U at entry	0.337**	0.520**	0.711**	0.255**	0.133
year 2000	0.293 ⁺	-0.017	0.785**	0.118	0.120
year 2001	0.426**	0.766 ⁺	1.452**	0.322**	0.258
year 2002	0.393**	0.966**	0.840**	0.413**	0.169
year 2003	0.103	-0.085	0.317	0.226**	-0.183
year 2004	-0.134	0.016	-0.130	-0.014	-0.615 ⁺
year 2005	-0.286 ⁺	0.109	-0.223	0.104	-0.417
year 2006	-0.103	-0.126	0.109	-0.108	-0.142
year 2007	-0.477**	-0.839 ⁺	0.360	-0.805**	0.425
<i>duration dependence</i>					
α_2 (3-6 mos)	2.160**	2.515**	2.737**	2.004**	1.083**
α_3 (6-12 mos)	1.292**	2.019**	1.856**	1.102**	0.115
α_4 (1-2 yr)	1.145**	1.304**	1.831**	1.216**	-0.041
α_5 (2-3 yr)	1.350**	1.693**	1.981**	1.109**	-0.175
α_6 (> 3 yr)	1.986**	2.407**	2.226**	1.683**	0.394**

⁺ $p < 0.05$ and ** $p < 0.01$

Table 11: Control variables Employed to Student

	EU 15	new EU	DC	LDC	Surinam/Antilles
Female	-0.102	-0.200	0.032	-0.099 ⁺	0.178**
age 21-24	-0.438**	-0.552**	-0.382	-0.403**	-0.258**
age 25-29	-0.810**	-0.518**	-0.593 ⁺	-0.435**	-0.481**
age 30-34	-0.963**	1.015 ⁺	-0.932 ⁺	-0.543**	-0.989**
age >35	-0.973 ⁺		-0.767	-0.606 ⁺	-1.035**
log(income)	1.269**	1.613**	0.890**	3.555**	1.156**
log(income) ²	-0.083**	-0.126**	-0.063 ⁺	-0.260**	-0.060**
interethnic	-0.136		0.448	0.134	0.002
NLparent	-0.147		-0.582	-0.576**	-0.081
Unemployment (nat)	0.120**	0.372**	0.055	0.125**	-0.005
U at entry	0.345 ⁺	-0.216	0.916	0.031	0.034
year 2000	0.359 ⁺	-0.114	0.713	-0.042	0.069
year 2001	0.532**	-0.058	1.449 ⁺	0.091	0.170
year 2002	0.456**	-0.120	0.863	-0.034	0.232 ⁺
year 2003	0.119	0.649**	-0.378	-0.067	0.278**
year 2004	-0.111	0.825 ⁺	-1.090	-0.151	0.337
year 2005	0.155	1.124**	-0.697	0.065	0.092
year 2006	0.460**	1.116**	-0.264	0.150	0.227
year 2007	-0.004	1.413**	1.648	0.208	0.064
<i>duration dependence</i>					
α_2 (3-6 mos)	-0.324**	-0.019	-0.386	-0.105	-0.189**
α_3 (6-12 mos)	-0.887**	-0.184	-0.554 ⁺	-0.368**	-0.613**
α_4 (> 1 yr)	-2.024**	-1.112**	-2.126**	-1.321**	-1.917**

⁺ $p < 0.05$ and ** $p < 0.01$

Table 12: Control variables Employed to Unemployed

	EU 15	new EU	DC	LDC	Surinam/Antilles
Female	0.086	0.092	0.528 ⁺	0.021	-0.118 ⁺
age 21-24	0.294**	0.134	-0.170	0.177 ⁺	0.070
age 25-29	0.252 ⁺	-0.249	-0.892**	0.240**	0.085
age 30-34	0.056	0.059	-0.063	0.299 ⁺	-0.282
age >35	0.403		-0.745	0.154	0.319
log(income)	0.744**	.453**	0.854**	0.627**	1.196**
log(income) ²	-0.106**	-0.074**	-0.115**	-0.102**	-0.157**
interethnic	-0.034		0.604	-0.109	0.260
NLparent	-0.169		-0.766	0.279	-0.485
Unemployment (nat)	0.041	-0.051	-0.232	0.133**	0.133**
U at entry	-0.426 ⁺	0.601	-0.554	-0.011	-0.191
year 2000	-0.432**	1.260**	-0.156	0.055	-0.198
year 2001	-0.419	0.777	-0.921	0.078	-0.203
year 2002	-0.302	0.998 ⁺	-0.331	0.055	-0.311
year 2003	0.194	-0.010	0.149	-0.077	-0.006
year 2004	0.603 ⁺	-0.903	0.819	-0.016	0.095
year 2005	0.237	-0.309	0.452	0.095	-0.016
year 2006	-0.443	-0.224	-0.020	0.078	0.328
year 2007	-0.250	0.002	-	-	-
<i>duration dependence</i>					
α_2 (3-6 mos)	-0.060	0.164	0.288	-0.217**	0.069
α_3 (6-12 mos)	0.009	0.096	0.019	-0.183 ⁺	-0.008
α_4 (> 1 yr)	-0.408**	-0.742**	-0.612	-0.465**	-0.267**

⁺ $p < 0.05$ and ** $p < 0.01$

Table 13: Control variables Unemployed to Student

	EU 15	new EU	DC	LDC	Surinam/Antilles
Female	0.045	0.448**	0.412	0.049	0.304**
age 21–24	−0.601**	−0.905**	−0.398	−0.500**	−0.401**
age 25–29	−0.500**	−0.772**	−0.155	−0.824**	−0.551**
age 30–34	−0.575	−0.762	−1.100 ⁺	−1.083**	−0.367
age >35	−0.128		−1.006	−1.446**	−0.425
log(income)	−0.550**	−0.721	−1.062	−0.352**	−1.355**
log(income) ²	0.079**	0.109	0.129	0.075**	0.186**
interethnic	0.123		0.885 ⁺	0.461	−0.314
NLparent	−0.962		0.010	−0.115	0.204
Unemployment (nat)	−0.113	−0.342**	−0.002	0.178**	−0.069
U at entry	0.775**	−1.023**	−0.292	0.178	−0.668 ⁺
year 2000	0.422	−0.885	−0.758	0.018	−0.001
year 2001	0.674	−0.986	−1.037	0.235	−0.260
year 2002	0.635 ⁺	−1.302**	−0.539	−0.328	0.015
year 2003	−0.467 ⁺	−1.094 ⁺	−0.502	−0.726**	1.219**
year 2004	−1.381**	−0.560	−0.434	−0.533 ⁺	1.909**
year 2005	−0.452	−0.084	−0.162	0.371	1.926**
year 2006	0.462 ⁺	−0.856 ⁺	−0.950	−0.383	1.597**
year 2007	0.374	−1.698	−	0.194	2.951**
<i>duration dependence</i>					
α_2 (3-6 mos)	−0.615**	−0.088	−0.850**	−0.576**	0.192
α_3 (6-12 mos)	−0.540**	−0.341	−0.691**	−0.384**	−0.247
α_4 (> 1 yr)	−1.483**	−1.661**	−1.532**	−1.189**	−0.674**

⁺ $p < 0.05$ and ** $p < 0.01$

Table 14: Control variables Unemployed to Employed

	EU 15	new EU	DC	LDC	Surinam/Antilles
Female	0.220 ⁺	0.594**	0.466	-0.167**	-0.333**
age 21-24	0.187	0.145	-0.113	0.045	0.155**
age 25-29	0.643**	0.206	0.112	-0.118	0.279**
age 30-34	0.350	0.432	-0.387	-0.071	0.234
age >35	0.199		-0.277	-1.032**	-0.070
log(income)	-0.955**	-0.577	-2.776**	-0.615**	-0.772**
log(income) ²	0.119**	0.060	0.370**	0.077**	0.092**
interethnic	-0.164		0.641	0.516 ⁺	-0.082
NLparent	0.700**		1.334 ⁺	1.286**	-0.136
Unemployment (nat)	0.070	-0.150	0.169	0.046	-0.026
U at entry	-0.376 ⁺	0.440	-0.719	-0.189	-0.417**
year 2000	-0.114	0.536	-1.615**	-0.430**	-0.445**
year 2001	-0.561 ⁺	0.257	-1.810**	-0.671**	-0.659**
year 2002	-0.473 ⁺	-0.886	-1.677**	-1.223**	-0.724**
year 2003	-0.579**	-1.022 ⁺	-1.129 ⁺	-1.220**	-0.341**
year 2004	-0.281	-1.845**	-1.362	-0.660**	0.325
year 2005	-0.789**	-1.614**	-1.341	-0.905**	-0.341
year 2006	-1.426**	-1.190**	-2.347**	-1.394**	-0.271
year 2007	-1.532**	0.157	-2.014	-1.598**	-2.242 ⁺
<i>duration dependence</i>					
α_2 (3-6 mos)	-0.288**	-0.386	-0.332	-0.410**	-0.174**
α_3 (6-12 mos)	-0.548**	-0.475 ⁺	-0.276	-0.656**	-0.440**
α_4 (> 1 yr)	-1.381**	-1.151**	-0.649	-1.197**	-1.265**

⁺ $p < 0.05$ and ** $p < 0.01$

Table 15: Control variables Single to Married

	EU 15	new EU	DC	LDC	Surinam/Antilles
Female	0.423**	1.260**	0.928**	0.624**	0.235 ⁺
age 21–24	0.688**	0.608 ⁺	0.597	0.831**	0.580**
age 25–29	1.462**	1.110**	1.549**	1.342**	0.852**
age 30–34	1.657**	1.898**	1.689**	1.397**	0.428
age >35	1.830**		2.738**	0.977**	−1.271
Children	1.162**	0.885 ⁺	1.154 ⁺	0.416**	0.084
log(income)	−0.472**	−0.336	−0.002	−0.443**	−0.660**
log(income) ²	0.071**	0.058 ⁺	0.008	0.073**	0.089**
interethnic	−0.311		0.249	−0.004	0.204
NLparent	0.063		−0.891	−0.581	−0.331
Unemployment (nat)	0.170 ⁺	0.128	0.132	0.160**	0.062
U at entry	0.068	−0.421	0.397	0.068	0.137
year 2000	0.494	0.073	−0.742	−0.136	0.199
year 2001	0.006	−1.117	−0.080	−0.359	0.075
year 2002	−0.250	−0.853	−0.144	−0.448 ⁺	0.165
year 2003	−0.613 ⁺	−0.207	−1.073 ⁺	−1.008**	−0.221
year 2004	−0.485	−0.069	−1.534	−0.639 ⁺	−0.409
year 2005	−1.148 ⁺	−0.925	−1.503	−0.828**	−1.448 ⁺
year 2006	−0.735	−1.296 ⁺	−2.028**	−0.974**	−0.634
year 2007	−1.905	−1.755 ⁺	−	−2.823**	−0.745
<i>duration dependence</i>					
α_3 (1-2 yr)	0.099	−0.135	−0.363	−0.215 ⁺	−0.169
α_4 (> 2 yr)	0.431	−0.315	−0.275	−0.105	0.448 ⁺

⁺ $p < 0.05$ and ** $p < 0.01$

C Additional heterogeneity of effects

Table 16: Heterogeneity in marriage effects on labour market dynamics.

	EU 15	new EU	DC	LDC	Surinam/Antilles
<i>Student to employed</i>					
Female	0.177 (0.288)	-0.609 (0.448)	-0.982 (0.697)	-0.085 (0.136)	-0.112 (0.175)
Children	-0.850 ⁺ (0.384)			-0.294 ⁺ (0.153)	-0.301 (0.217)
Constant	0.548 ⁺ (0.243)	0.895 ⁺ (0.421)	1.046 (0.605)	0.505** (0.111)	0.627** (0.133)
<i>Student to unemployed</i>					
Female	0.544 (0.381)	-0.162 (0.622)	0.885 (0.503)	0.143 (0.140)	0.174 (0.361)
Children	-0.592 (0.489)	0.504 (0.560)	0.424 (0.632)	-0.281 (0.179)	-0.045 (0.378)
Constant	-0.038 (0.325)	0.216 (0.588)	-0.540 (0.444)	-0.239 ⁺ (0.118)	0.498 (0.299)
<i>Employed to Student</i>					
Female	-0.377 (0.332)	0.475 (0.585)		-0.189 (0.212)	-0.066 (0.223)
Children	-0.233 (0.503)	-0.123 (0.582)		-0.233 (0.237)	-0.261 (0.256)
Constant	-0.313 (0.332)	-1.150 ⁺ (0.548)	-1.443** (0.492)	-1.021** (0.170)	-0.634** (0.182)
<i>Employed to Unemployed</i>					
Female	0.668 (0.421)	0.390 (0.558)	-0.968 (0.741)	0.235 (0.180)	0.184 (0.218)
Children	-0.278 (0.388)	0.598 (0.473)	0.663 (0.554)	0.200 (0.173)	0.019 (0.203)
Constant	-0.884 ⁺ (0.378)	-1.141 ⁺ (0.569)	0.731 (0.681)	-0.374 ⁺ (0.159)	-0.067 (0.188)

⁺ $p < 0.05$ and ** $p < 0.01$

Table 16: Heterogeneity in marriage effects on labour market dynamics (cont.).

	EU 15	new EU	DC	LDC	Surinam/Antilles
<i>Unemployed to Student</i>					
Female	-0.291 (0.701)			0.254 (0.333)	0.691 (0.630)
Children	0.211 (0.609)			0.046 ⁺ (0.306)	0.417 (0.416)
Constant	0.862 (0.609)	-0.483 (0.441)	-1.002 (0.610)	-0.232 (0.305)	-0.805 (0.629)
<i>Unemployed to Employed</i>					
Female	-0.627 (0.471)	-0.756 (0.3595)	0.133 (0.752)	-0.191 (0.206)	-0.301 (0.204)
Children	-0.559 (0.351)	-0.524 (0.458)	-0.575 (0.628)	0.283 ⁺ (0.179)	0.070 (0.195)
Constant	1.121 ⁺ (0.454)	2.991 ^{**} (0.628)	0.612 (0.693)	1.128 ^{**} (0.192)	0.286 (0.175)

⁺ $p < 0.05$ and ^{**} $p < 0.01$

Table 17: Heterogeneity in labour market effects on marriage

	EU 15	new EU	DC	LDC	Surinam/Antilles
<i>Effect of Employment</i>					
Female	-0.432 (0.309)	-1.240 ⁺ (0.560)	1.251 (0.709)	-0.123 (0.161)	-0.005 (0.209)
Income < 1000	0.179 (0.386)	0.873 (0.651)	1.280 (0.735)	0.418 ^{**} (0.239)	0.433 (0.318)
Age at entry > 25	-0.879 ^{**} (0.314)	-0.330 (0.463)	-0.016 (0.562)	-0.661 ^{**} (0.164)	-1.273 ^{**} (0.330)
Unemployment (nat)	0.221 ^{**} (0.085)	-0.105 (0.248)	0.503 (0.308)	0.144 (0.094)	0.091 (0.118)
Constant	0.912 ⁺ (0.401)	1.278 (0.768)	-0.731 (0.903)	0.136 (0.231)	0.258 (0.305)
<i>Effect of Unemployment</i>					
Female	-0.112 (0.590)	0.524 (0.836)	1.036 (1.170)	0.269 (0.205)	1.177 ^{**} (0.443)
Age at entry > 25	-0.321 ^{**} (0.572)	1.158 ⁺ (0.549)	0.946 (1.173)	-0.527 ^{**} (0.195)	0.026 (0.472)
Unemployment (nat)	-0.269 (0.319)	0.610 (0.339)	-0.127 (0.543)	0.231 ⁺ (0.113)	-0.300 (0.204)
Constant	-0.595 (0.594)	-1.850 ⁺ (0.920)	-2.717 (1.469)	-0.391 (0.210)	-0.430 (0.411)

⁺ $p < 0.05$ and ^{**} $p < 0.01$