

Bijwaard, Govert E.; Wang, Qi

Working Paper

Return Migration of Foreign Students

CRAM Discussion Paper Series, No. 27/14

Provided in Cooperation with:

Rockwool Foundation Berlin (RF Berlin)

Suggested Citation: Bijwaard, Govert E.; Wang, Qi (2014) : Return Migration of Foreign Students, CRAM Discussion Paper Series, No. 27/14, Centre for Research & Analysis of Migration (CRAM), Department of Economics, University College London, London

This Version is available at:

<https://hdl.handle.net/10419/295493>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



Centre for Research &
Analysis of Migration

Discussion Paper Series

CPD 27/14

- ▶ **Return Migration of Foreign Students**
- ▶ Govert E. Bijwaard and Qi Wang

Centre for Research and Analysis of Migration
Department of Economics, University College London
Drayton House, 30 Gordon Street, London WC1H 0AX

www.cream-migration.org

Return Migration of Foreign Students*

Govert E. Bijwaard[†]

Netherlands Interdisciplinary Demographic Institute (NIDI)

CReAM and IZA

Qi Wang[‡]

Towers Watson

July 2014

Abstract

Using administrative panel data, this paper presents a comprehensive empirical analysis of the return of recent foreign students in the Netherlands. We focus on how individual labour market changes and marriage formation influence their decision to leave. Our 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 hardly affects return behaviour of students and unemployment induces them to leave. Marriage in the Netherlands makes the students more prone to stay. The size of the impact of these life course experiences on return differs by income, age at entry, business cycle and gender.

Keywords: student migration, correlated hazards, labour dynamics, marriage formation, return migration.

JEL Codes: F22, J64, J12, C41

*Financial support from the NORFACE research programme on Migration in Europe – Social, Economic, Cultural and Policy Dynamics is gratefully acknowledged. We thank Statistics Netherlands, Han Nicolaas in particular, for data support. We thank Jaap Abbring and Otilia Boldea and participants at the NORFACE Migration: Global Development/New Frontiers (London) conference, AM² (Jerusalem) and IZA/SOLE (Buch am Ammersee) conference for helpful comments.

[†]Corresponding author: Netherlands Interdisciplinary Demographic Institute (NIDI-KNAW/University of Groningen), PO Box 11650, 2502 AR The Hague, the Netherlands; Phone: (+31) 70 3565 224; Fax: (+31) 70 3647187; E-mail: bijwaard@nidi.nl

[‡]This research is based on Wang's Master thesis in Econometrics at Tilburg University for which she was a research master at NIDI

1 Introduction

Among the growing migration population the number of foreign students has increased most rapidly. With the increasing internationalization of educational programs, students start seeking more and more educational opportunities outside their country of origin. The number of foreign tertiary students in OECD countries has grown 7% annually from 2000 to 2011 and has reached 4.3 million in 2011. In the Netherlands the number of foreign students has more than doubled from 2000 to 2011. Currently about 9% of all students at Dutch higher education have a foreign nationality. The inflow of foreign student constitutes about 16% of the recent total inflow of foreigners into the Netherlands, (Bijwaard, 2010).

Despite the growing importance of international student mobility there has been relatively little research on student migration. Very often student migration is just regarded as an integral part of migration or as migration of the skilled. Students are, however, a typical group of migrants. They are (very) young, mostly single and much more mobile than the ‘standard’ migrant. After graduation many return back to their country of origin. Recent data suggest that only 15% to 30% of the foreign students actually decide to stay in their host country, (OECD, 2013). In the Netherlands about 20% of the foreign students remains in the country, while 25% of the labour migrants and 70% of the family migrants stay, (Bijwaard, 2010).

The main reason for the limited research on student migration has been the lack of student specific micro data. The usual data situation is one of small samples, possibly subject to selectivity and attrition, extracted from surveys. These issues are particularly relevant in studies of migration durations since survey attrition usually confounds return migration. The data for this paper are from 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 of the immigration motive (consistent with the visa status at entry). This enables us to focus explicitly and exclusively on 42,730 foreign students. 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 to this immigrant register by Statistics Netherlands, such as the social benefit and the income register (used by the tax authorities).

When many migrations are temporary it is important to know what determines the decision to return. Return migration is intrinsically related to the labour market behaviour of the students and their family formation in the host. Labour market behaviour is important because the majority of the changes in the socio-economic status of students in the Netherlands are work related and many students find a job right after graduation. Family formation plays an important role because most students are in their (early) twenties, searching for a spouse, and they are likely to start a family, or at least find a partner, while studying abroad. The influence of labour market experience(s) and marriage formation on subsequent migration behaviour is ignored in the literature on student migration.

We address the impact of labour market experience and family formation on migration duration in a novel way that takes the individual timing of labour market changes and (possible) family formation into account, and that controls for the correlation between the potential endogenous labour market and marital status of the migrant and the return decision. To this end we extend the model of Bijwaard et al. (2014), who consider the impact of the individual labour market processes on return, to include (1) a third (studying) status and, (2) the family formation process. These processes are interdependent both through observed and unobserved factors. In particular, we estimate the effects of the timing of (un)employment and marriage formation on the hazard of return migration. Given the substantial heterogeneity among foreign students from different origins and the corresponding variation in the immigration policies that influence the movement of students, we separate the students by country of origin groups: (1) EU 15 (including EFTA); (2) new EU, joined the EU in 2004 or 2006; (3) Developed countries (DC); (4) Less developed countries (LDC) and, (5) the former Dutch colonies (Dutch) Antilles and

Surinam.

In our empirical analyses we find that unemployment and marriage formation have a large impact on return. Students who become unemployed leave up to twelve times faster. A marriage in the Netherlands makes students up to four times less prone to leave. The effect of employment on return is less pronounced and, for students from the EU and Antilles/Surinam contrary to intuition. These students leave the country faster when they get a job. For students from Antilles/Surinam this behaviour can be explained by the *constrained domestic schooling model* of Rosenzweig (2006) which assumes that these students only come to the Netherlands to acquire education they cannot get at home and then return. For students from the EU the positive impact of employment on return can be explained by target saving behaviour, implying that these students work (only temporary) to save some money to use back home. We find that the impact of employment and unemployment differ by age at entry, income, business cycle and gender.

Section 2 reviews previous literature on student and return migration. In Section 3 we present some background information regarding studying and entry into the Netherlands. The administrative data we are using for our empirical analyses are described in Section 4. The econometric model is set out in detail in Section 5. In particular, we specify the labour market, marriage formation and migration processes, and elucidate the role of unobservable heterogeneity. The empirical results are presented in Section 6. Finally, Section 7 concludes.

2 Research on Student Migration and return

There is an abundant amount of literature investigating the reasons and consequences of migration, but little on student migration. Student migration is connected to human capital theory and regarded as an investment in human capital (Mixon Jr. and Hsing, 1994). 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, (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 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 would induce students only to stay 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, which reduces the migration rate of students out of the host country.

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. This is already

envisaged by many host countries as they have adopted immigration policies to facilitate the immigration of international students, and to provide them a pathway to permanent residence (Tremblay, 2005).

A prominent strand of literature on skilled migration refers to “brain circulation”, “brain gain” and “brain drain”. The recent brain drain literature shows that high-skill emigration do not deplete a country’s stock of human capital and instead may generate positive network/diaspora externalities (Docquier and Rapoport, 2012). Currently it is acknowledged that foreign students who settle in the host country can create development opportunities for the sending country through remittances, business relationships, direct investment, technological and ideological exportation (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 (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) provide empirical evidence of the network effect of international students’ mobility. Dreher and Poutvaara (2011) find 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.

However, when foreign students mainly stay temporarily attracting more students does not diminish the shortage of high-skilled labour supply. Surveys of students abroad found very high rates of return intentions. Imran et al. (2011) show that of the Pakistani students abroad about 50% intended to stay temporary. Baruch et al. (2007) find that the return intentions of students to the UK and US are influenced by the perceptions of the ethnic differences and labour markets, the adjustment process of the students in the host country, and their family ties in host and home countries. An issue using return intentions is that, as with all intentions, they might change during the stay in the host. A student

who intended to leave may stay because (s)he found a spouse in the host country or a student who intended to stay may leave after graduation because (s)he cannot find a job.

The return rates of foreign students is a key issue analysed by Rosenzweig (2008). He finds that the mobility of students can be explained by the same factors that explain international migration in general, higher wages. Bratsberg (1995) provides evidence 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) finds high return rates of foreign students coming to the Netherland. He also finds that when they leave most students hardly ever return. Gibson and McKenzie (2011), who study the migration behaviour of the best and brightest students in three Pacific countries, find, rather counter-intuitively, that for these most intelligent students economic benefits hardly play a role in their location decision. These decisions were more related to family, lifestyle choice and career opportunities.

Enrollment in education affects the timing and occurrence of marriage formation. On the one hand longer enrollment decreases women's gain from marriage (Becker, 1991) and delays the transition to economic stability typically needed for establishing a union (Oppenheimer, 1988; Liefbroer and Corijn, 1999). While on the other hand individuals who continue to enhance their human capital have better economic prospects and are therefore more attractive on the marriage market. According to Becker (1991) it could be argued that people marry to maximise their expected well-being. They decide to marry when it brings them higher utility than remaining single. This helps to explain why partners tend to come from similar socio-economic backgrounds. Consequently, students are likely to marry with fellow students, who have similar age, intelligence and education. Thus, international students are very likely to find their spouse while staying in the host. Union formation also affects schooling behaviour and labour market dynamics. In a marriage individual choices regarding ending school or changing jobs are, in principle,

based also on the implications of this decision on the well-being of the spouse. In fact, both the marriage formation process and the schooling/labour market process are most likely mutually dependent (Boulier and Rosenzweig, 1984; Coppola, 2004), in the sense that both observed and unobserved characteristics simultaneously determine individual choice concerning union formation, educational attainment and labour market status. It is very likely that return migration decisions are also affected by marriage formation and labour market changes and that all these processes are mutually interdependent.

In the literature, we find evidence for the influence of individual labour market changes on the return decision. Kırdar (2009) shows that the effect of unemployment spells on return depends on unemployment durations. Bijwaard et al. (2014) find, using a model that accounts for the endogeneity of labour market changes, that for labour migrants unemployment induces return and re-employment makes the migrants more prone to stay.

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, such as labour market dynamics and family formation, is missing. The main reason is probably the lack of sufficient data. The contribution of this paper is to provide a thorough analysis of the impact of these lifecourse experiences using a unique large longitudinal administrative data set.

3 Institutional setting

The Netherlands provides international students with the opportunity to study at an institution of higher education. The student needs to comply with the admission requirements as set out in the Dutch Higher Education and Research Act (Wet op het hoger onderwijs en wetenschappelijk onderzoek, WHW). Furthermore to be granted entry into the Netherlands, the student must subsequently comply with the conditions as specified in the Aliens Act. Note that, in the Dutch education system, doctoral candidates are not

considered students but researchers, i.e. employees.

When an international student wishes to enrol at a Dutch educational institution, admission will be assessed on the basis of the students previous qualifications, the content of the programme completed, the (recognised) diplomas obtained and the language skills geared to the study programme for which admission is requested. Proficiency in English is a compulsory requirement which is tested by means of a language test. International students who have obtained their qualifications in a country where English is the language of tuition and the official working language are exempted from this test.

Third-country¹ nationals who wish to enter the Netherlands for a longer period of time must apply for a Regular Provisional Residence Permit (MVV) before travelling to the Netherlands. An MVV is a visa for a stay longer than 90 days. The MVV grants entry into the Netherlands and enables her/him to apply for a residence permit for an intended stay for more than three months. The MVV requirement does not apply to nationals of the EU/EEA, Australia, Canada, Japan, New Zealand, USA, South-Korea and Switzerland. The visa for a longer stay may be applied for at a Dutch diplomatic or consular representation abroad. After entry, the MVV is valid for a maximum of three months.

The third-country national must first satisfy a number of general conditions. These conditions include that the third-country national does not pose a threat to public order or national security and that he has sufficient means of existence. With regard to international students, sufficient means of existence means that they can pay for their studies and living expenses in the Netherlands independently. For the academic year of 2011/2012, the standard for a student attending higher education is € 795 a month. This amount is exclusive of tuition fee.

International students are furthermore required to sign a written declaration of temporary stay. By signing this declaration, the student confirms that he is aware of the fact that residence in the Netherlands is granted solely for the purpose of study. Should the

¹Any person who is not a citizen of the European Union, Norway, Iceland, Liechtenstein or Switzerland

student drop out or not complete the programme in time, the student must leave the Netherlands.

International students who are not subject to the MVV requirement and who wish to study in the Netherlands must submit an application for a regular residence permit for the purpose of study just like students who are subject to the MVV requirement. The student must matriculate in an educational institution as a full-time student, with sufficient means of existence, as described above.

Each international student must register in the Municipal Register of Population (GBA) with the municipality where he has taken up residence. The GBA is a database that keeps the personal data of all inhabitants in the Netherlands. Government services who need personal data for their duties receive this information from the GBA.

International students holding a regular residence permit for the purpose of study are permitted to work to a maximum of 10 hours a week, or in the months of June, July and August not more than 40 hours a week, in addition to attending the study programme. The student who wishes to work must, however, first ensure that the employer has applied for a work permit.

In December 2007 (unfortunately beyond our observation window) a job-seeking year was introduced which implies that after graduation, the international student in higher education in the Netherlands has the right to apply for a temporary residence permit valid for a maximum period of one year. Within this year, the former student graduate has the opportunity to find a job as a high educated migrant.

4 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 students who entered the Netherlands between early 1999 and the end of 2007.

Statistics Netherlands has linked the immigration register to the Municipal Register of Population (GBA) and the Social Statistical Database (SSD). The GBA contains basic demographic information of every immigrant, like birthdate, 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 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. This is strongly related to the visa restrictions students face when trying to study in the Netherlands, see Section 3. We distinguish five country of origin groups (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 (Dutch) Antilles and Surinam separately. These countries still have strong ties with the Netherlands and have only limited local study possibilities. Students from LDC's are the largest group with 39% of the students. See Appendix A for the distribution over the countries of birth within each group.

4.1 Descriptive Results

Table 1 provides some descriptive statistics of the foreign students 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 Antilles/Surinam on average younger. For most groups we see an increasing inflow of students over the years. Note that the students from the Antilles and Surinam differ substantially from the other students, with two-thirds of the students younger than twenty and a decreasing inflow over the years.

PLACE TABLE 1 ABOUT HERE

Of all immigration spells, 37% end in out-migration. 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: 22% is ever employed and 40% is ever unemployed. To get a rough idea of the relevant 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 the Antilles and Surinam stay more often in the Netherlands, with slightly more than half

of those students still in the country nine years after arrival. About 70% of the students from the other groups have left the country within nine years.

PLACE FIGURE 1 2 and 3 ABOUT HERE

The probability of getting married (in the Netherlands) is much lower for students from the EU or born in Antilles/Surinam, see Figure 2. About 15% of those students get married within nine years of arrival. Students from other countries 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 who remain in the country enter the labour market. Students from Antilles/Surinam start working earlier and the students from developed countries the latest.

5 Methodology

We seek to identify the effect of labour market and family formation dynamics on foreign students' decision to leave. So the random outcome variable of interest is the time spent in the Netherlands. 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 (all students are single at entry). A study spell can end in either employment or unemployment (or departure). This is a typical competing risks situation, as we only observe the event (employment/unemployment) that occurs first, censoring the competing one.

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 unemployment is denoted by $\delta_{eu}(t)$ and from unemployment to employment by $\delta_{ue}(t)$. 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.

PLACE FIGURE 4 ABOUT HERE

In Figure 4 we depict the labour market, marriage and migration dynamics of an arbitrary foreign student. The student is (by definition) studying and single at entry. After a study period of t_s the student finds a job in the Netherlands. This implies that the time till employment is $\delta_{se}(t) = t_s$, which is equal to the (censored) time till unemployment, $\delta_{su}(t) = t_s$. The student is fired at t_e . Thus the (first) job lasts for $\delta_{eu}(t) = t_e - t_s$. After a period of unemployment $\delta_{ue}(t) = t_u - t_e$, the student finds a new job at time t_u . In the meantime the student got married at time t_{mar} , which implies that (s)he has been single for t_{mar} . At the moment the student leaves the country, at t_m , the employment spell (and the marriage spell) in the Netherlands ends. This implies that the second employment spell was censored and of length $\delta_{eu}(t) = t_m - t_u$. We assume that all these events also change the incidence of the other events and that the incidence depends on (un)observed individual factors that influence all the events simultaneously.

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 four possible transitions: study to employment (se), study to unemployment (su), employment to unemployment (eu), 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 Mixed Proportional Hazard (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 $k = \{se, su, eu, ue\}$. $I_{mar}(t)$ 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 transition hazards;

a constant effect $\gamma_{mar,k}$ and $z_{mar}(t)\phi_{mar,k}$ that captures 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. The hazard of marrying is also of the MPH form and we allow for a direct effect of (un)employment on this transition:²

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

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.

Finally, the return migration hazard also has an MPH form. The return hazard is a function of control variables x , labour market changes, $I_u(t)$ and $I_e(t)$, and getting married $I_{mar}(t)$

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

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

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

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 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 effect of (un)employment/marriage on the duration with the difference in the distribution of v_m between these migrants. In this case $I_e(t)$, $I_u(t)$ 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 all the unobserved heterogeneity terms $v = (v_{se}, v_{su}, v_{eu}, v_{ue}, v_{mar}, v_m)$ 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

6 Estimation Results

We reckon that the demographic factors gender, age at entry, inter-ethnicity and having a Dutch parent influence the decision to return. Macro- and business cycle factors are captured by the national unemployment rate (changing on a quarterly basis) and the national unemployment rate at the moment of entry. We control for cohort effect by including both the year of entry and the unemployment rate at entry. We also observe whether the student has children and the monthly income of the student. However, we

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

do not include this information in the controls but in the effect of marriage formation (children) and labour market changes (income), because their value depends on these (possible) endogenous processes. As most children are born inside a union the indicator that 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 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 $\alpha_m < 0$. 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.

6.1 Impact of Control Variables on Return

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, see Table 2.⁴ We observed large differences among the country groups. Gender hardly seems to influence return, except that female students from the new EU countries are more prone to stay and females from Antilles/Surinam are more prone to leave. For labour migrants it is commonly found that both the younger and the older leave faster than those in their prime of their working age, see a.o. Bijwaard (2010). Students are almost all below 30 and we find, consistent with Bijwaard (2010), that the return hazard increases with age. Students from Antilles/Surinam and developed

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 upon request.

countries do not exhibit an age effect on return. Not surprisingly, students with a Dutch parent stay more often (only significant for Antilles/Surinam and EU 15 students). We find rather large cohort effects, especially for students from new EU countries, indicating that the most recent cohorts leave (much) faster. In an economic crisis, captured by a high (national) unemployment rate, it is harder for the students to find a job and this induces them to leave. But the students that arrive when unemployment is high are more prone to stay. The estimated baseline hazard implies 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 return hazard for students from the Antilles/Surinam only increases three years after arrival.

PLACE TABLE 2 ABOUT HERE

6.2 Effect of Labour Market Dynamics and Marriage Formation on Return

Our main effect of interest is the influence of labour market dynamics and marriage formation on the return hazard.⁵ First, we briefly illustrate the consequences of ignoring the endogeneity issue induced by the correlations between the unobservable heterogeneity terms. Our model nests the conventional (M)PH models for the return hazard. The PH model ignores unobservable heterogeneity altogether, $\theta_m^{PH}(t|t_d, t_r, x_m(t)) = \exp(x_m(t)\beta_x^m + I_u(t)\gamma_u + I_e(t)\gamma_e + I_{mar}(t)\gamma_{mar})$, whereas the MPH model, $\theta_m^{MPH}(t|t_d, t_r, x_m(t), v_m) = v_m\theta_m^{PH}(t|t_d, t_r, x_m(t))$ ignores the correlation between θ_m and the labour market and marriage hazards. First we consider a model with constant effect, i.e. the ϕ 's in equation (3) are all zero. The estimated effects γ_e, γ_u and γ_{mar} in equation (3) are reported in Table 3.

PLACE TABLE 3 ABOUT HERE

⁵The estimated effects of marriage formation on labour market dynamics hazards and of labour market changes on marriage formation hazards, which are part of our model but of secondary interest, are reported in Table A.2 in the appendix A.2 and Table A.4 in appendix A.3.

The simple PH model already demonstrates the importance of the labour market dynamics and marriage formation on the return of foreign students. In all cases (except one) does the incidence of an employment spell or a marriage significantly make them more prone to stay, and the event of unemployment makes students more prone to leave. Allowing for (uncorrelated) unobserved heterogeneity has only a small effect on the estimated effect of these life course events.

However, allowing for correlated unobserved heterogeneity substantially affects the estimates. The estimated effects are typically smaller in magnitude than for both PH and MPH models. Contrary to intuition, the negative impact of employment on return disappears (or even changes sign) when selection is taken into account. The (M)PH model ignores this negative selection and therefore leads to a substantial bias. It seems that most students only use employment to save money before returning. The large positive effect of employment on the return of students from Antilles/Surinam is in line with the constrained domestic schooling model of Rosenzweig (2006), as students from these countries have few study possibilities in their home country. For students from the European Union, the other group for which employment leads to faster return, it is unlikely that they are school constraint. A possible explanation for their behaviour is target saving, that assumes that migrants leave when their accumulated saving exceeds some threshold. Thus, these students work temporarily to save some money and return home. A (short) employment spell in the Netherlands also increases their chances on the home labour market.

For all five student groups we confirm that unemployment leads to faster return. Unemployed students usually are not eligible for social benefits such as unemployment insurance payments, since these are conditional on sufficiently long employment. Entering unemployment therefore leaves the student with little income which make them more prone to find a job elsewhere. This unemployment effect is particularly strong for students from Antilles/Surinam, which is also in line with the constrained domestic schooling model.

Across all groups it is evident that a marriage extends the duration of stay. This

marriage effect is particularly strong for students from (new) EU countries. It is obvious, that students become more attached to the Netherlands after marriage. However, we do not know whether these students marry a native or another foreigner. In the latter case they may leave together to a third country.

6.3 Heterogeneous effects

Next we permit the impact of the life-course processes on the return to vary across individual characteristics. We allow the effect to vary by gender, age, income of the student, whether the student has children and the business cycle of the Dutch economy, see Table 4.⁶ The income of a student only (substantially) differs when they are employed and, therefore we limit the income to affect only the impact of employment on return. Both the impact of employment and unemployment might change when the business cycle in the Netherlands changes. As most children are born within a marriage we limit the influence of having children on the return hazard only to go through a marriage.

PLACE TABLE 4 ABOUT HERE

The effect of employment on return is depicted in the first panel of the table. The gender of the student does not significantly change the effect of becoming employed, except for students from the former Dutch colonies. Income while employed plays an important role. Students who find a high paid job are more likely to stay than students in low paid jobs. Students from DCs are less affected by employment and the income they earn in their jobs. In general older students (students who arrive at a higher age) are more focussed on a stable job and stable residence and are therefore more prone to stay when they find a job (only significant for LDC and Antilles/Surinam-students). The business cycle does not significantly change the impact of becoming employed on return.

⁶The tables with the heterogeneity in the impact of marriage on labour market dynamics, Table A.3, and in the impact of labour market dynamics on marriage formations, Table A.5, can be found in Appendix A.2 and A.3.

The effect of unemployment on return is depicted in the second panel of Table 4. Gender only influences the impact of unemployment for students from the new EU countries. Female students from these have a larger impact of unemployment on return. For most groups a higher age at arrival reduces the impact of unemployment. However, given the large increase of return due to unemployment, these older students are still very likely to leave when they become unemployed. The reduction of job opportunities during an economic crisis leads to an accelerating effect of the impact of unemployment on return, with higher (national) unemployment inducing faster return. This is particularly strong for students from the new EU countries.

We find less heterogeneity in the impact of marriage on return, the third panel of Table 4. This is probably because we observe too few students marrying in the Netherlands. The only significant heterogeneity in the impact of marriage on return we find is that female students from Antilles/Surinam are more affected by marriage than male students from these former Dutch colonies.

7 Conclusions and Discussion

Despite that international student mobility has increased substantially, little research has focussed on migration behaviour of students. An important issue in researching student migration is that the majority of foreign students only stay temporarily. The process of their return migration is intrinsically related to their life course behaviour in the host, both on the labour market and on the marriage market. These processes are likely to be interdependent, both directly, as (un)employment and marriage affects the decision to stay, and indirectly, as many observed and unobserved (e.g. risk attitude) student characteristics influence their labour market dynamics, their marriage formation decision and their return migration decision. 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 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 correlated hazards method enabled us to estimate the effects of (un)employment and marriage histories on migration durations, while we controlled for (correlated) unobserved heterogeneity.

Overall, the estimation results indicate that when students find a spouse they are more prone to stay and when they become unemployed they leave faster. When students find a job this hardly affects their return. However, students from the EU 15 and Antilles/Surinam are more prone to leave when they find a job. This seems contrary to intuition, but can be explained by realising that many students use the labour market experience in the Netherlands to obtain a job elsewhere, either in their home country or in a third country. Another explanation for this counterintuitive result is that the students may act according to target saving behaviour, assuming that they leave when their accumulated savings exceeds some threshold. The constrained domestic schooling model of Rosenzweig (2006), which assumes that students only study in the Netherlands because they have little study possibilities in their home country, is a plausible explanation for the positive employment effect on return for students from LDCs and Antilles/Surinam. The employment effect on return is smaller for students in high paid jobs. When students become unemployed they leave faster, but older students are less affected by unemployment. Confirming intuition, students who find a partner in the Netherlands are much less inclined to leave.

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. 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 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, (Mahroum, 2000; Tremblay, 2005; Vertovec, 2002). From our analysis we derive that it is not only the question of how to get the students but also how to retain them.

Understanding the link between the labour market behaviour, family formation and return migration decisions therefore also assists policy makers. 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.

References

- Y. Baruch, P. S. Budhwar, and N. Khatri. Brain drain: Inclination to stay abroad after studies. *Journal of World Business*, 42:99–112, 2007.
- G. S. Becker. *A treatise on the Family. Enlarged edition.* Harvard University Press, Cambridge MA, 1991.
- M. Beine, R. Noël, and L. Ragot. The determinants of international mobility of students. Working Paper: Economics of Education 3848, CESifo, Munich, 2012.
- G. E. Bijwaard. Immigrant migration dynamics model for The Netherlands. *Journal of Population Economics*, 23:1213–1247, 2010.

- G. E. Bijwaard, C. Schluter, and J. Wahba. The impact of labour market dynamics on the return–migration of immigrants. *Review of Economics and Statistics (forthcoming)*, 2014.
- B. L. Boulier and M. R. Rosenzweig. Schooling, search and spouse selection: Testing economic theories of marriage and household behaviour. *Journal of Political Economy*, 97:712–732, 1984.
- B. Bratsberg. The incidence of non-return among foreign students in the United States. *Economics of Education Review*, 14:373–384, 1995.
- C. Y. Co, I. N. Gang, and M. S. Yun. Returns to returning. *Journal of Population Economics*, 13:57–79, 2000.
- L. Coppola. Education and union formation as simultaneous processes in Italy and Spain. *European Journal of Population*, 20:219–250, 2004.
- F. Docquier and H. Rapoport. Globalization, brain drain and development. *Journal of Economic Literature*, 50:681–730, 2012.
- A. Dreher and P. Poutvaara. Foreign students and migration to the United States. *World Development*, 39:1294–1307, 2011.
- J. Gibson and D. McKenzie. The microeconomic determinants of emigration and return migration of the best and brightest: Evidence from the Pacific. *Journal of Development Economics*, 95:18–29, 2011.
- M.J. Greenwood. Human migration: Theory, models, and empirical studies. *Journal of Regional Science*, 25:521–544, 1985.
- N. Imran, Z. Azeem, I. I. Haider, N. Amjad, and M. R. Bhatti. Brain drain: Post graduation migration intentions and the influencing factors among medical graduates from Lahore, Pakistan. *BMC Research Notes*, 4:417, 2011.
- M. G. Kirdar. Labor market outcomes, savings accumulation, and return migration. *Labour Economics*, 16:418–428, 2009.
- A. C. Liefbroer and M. Corijn. Who, what, where, and when? specifying the impact of educational attainment and labour force participation on family formation. *European Journal of Population*, 15:45–75, 1999.
- B. L. Lowell, A. Findlay, and E. Stewart. Brain strain: Optimising highly skilled migration from developing countries. Working paper 3, Institute for Public Policy Research, London, 2004.
- S. Mahroum. Highly skilled globetrotters: Mapping the international migration of human capital. *Research & Development Management*, 30:23–32, 2000.

- D. S. Massey and R. M. Zenteno. The dynamics of mass migration. *Proceedings of the National Academy of Sciences*, 96:5328, 1999.
- D. S. Massey, J. Arango, G. Hugo, A. Kouaouci, A. Pellegrino, and J. E. Taylor. Theories of international migration: A review and appraisal. *Population and Development Review*, 19:431–466, 1993.
- J. B. Meyer. Network approach versus brain drain: Lessons from the Diaspora. *International Migration*, 39:91–110, 2001.
- F. G. Mixon Jr. and Y. Hsing. College student migration and human capital theory: A research note. *Education Economics*, 2:65–73, 1994.
- OECD. *Education at a Glance 2013*. OECD, 2013.
- V. K. Oppenheimer. A theory of marriage timing. *American Journal of Sociology*, 94: 563–591, 1988.
- M. R. Rosenzweig. Global wage differences and international student flows. In S. M. Collins and C. Graham, editors, *Brookings Trade Forum 2006: Global Labor Markets*, pages 57–96. Washington D.C.: Brookings International Press, 2006.
- M. R. Rosenzweig. Higher education and international migration in Asia: Brain circulation. In F. Bourguignon, editor, *Annual World Bank Conference on Development Economics*, pages 59–100. Washington D.C.: Oxford University Press, 2008.
- K. Tremblay. Academic mobility and immigration. *Journal of Studies in International Education*, 9:196–228, 2005.
- S. Vertovec. Transnational networks and skilled labour migration. WPTC 02-02, Transnational Communities Programme, London, 2002.

Table 1: Data description

	EU 15	New EU	DC	LDC	Antilles & Surinam
Female	57.6%	59.4%	53.0%	49.2%	54.4%
Interethnic	2.2%	0.2%	4.6%	1.3%	7.4%
Dutch Parent	2.4%	0.1%	2.7%	0.7%	2.4%
	<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
	<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

Table 2: Estimated impact of control variables on the return migration hazard

	EU 15	new EU	DC	LDC	Surinam/Antilles
Female	-0.041 (0.039)	-0.278** (0.072)	-0.010 (0.090)	-0.021 (0.029)	0.110 ⁺ (0.046)
age 21-24	0.154** (0.047)	0.545** (0.095)	0.031 (0.134)	0.161** (0.037)	0.086 (0.051)
age 25-29	0.154 ⁺ (0.060)	0.145 (0.119)	0.013 (0.144)	0.132** (0.043)	-0.000 (0.102)
age 30-34	-0.023 (0.145)	-0.169 (0.298)	0.058 (0.196)	0.261** (0.062)	-0.163 (0.275)
age >35	0.152 (0.253)		-0.028 (0.277)	0.296** (0.086)	-0.714 (0.370)
interethnic	0.107 (0.141)		0.212 (0.268)	-0.358 ⁺ (0.172)	0.072 (0.113)
NLparent	-0.350 ⁺ (0.152)		-0.013 (0.356)	-0.149 (0.207)	-0.498 ⁺ (0.211)
Unemployment (nat)	0.275** (0.026)	0.604** (0.063)	0.367** (0.069)	0.342** (0.022)	0.165** (0.026)
U at entry	-0.307** (0.092)	-1.053** (0.198)	-0.444 (0.230)	-0.530** (0.077)	-0.117 (0.168)
year2000	0.082 (0.124)	-0.347 (0.356)	-0.191 (0.349)	-0.050 (0.110)	0.095 (0.125)
year2001	0.060 (0.149)	-0.825 ⁺ (0.385)	-0.493 (0.371)	-0.139 (0.127)	0.207 (0.201)
year2002	0.266 ⁺ (0.124)	0.220 (0.326)	0.098 (0.335)	0.099 (0.108)	0.484** (0.146)
year2003	0.869** (0.106)	1.627** (0.339)	0.828 ⁺ (0.324)	1.095** (0.102)	0.620** (0.116)
year2004	1.441** (0.151)	2.480** (0.410)	1.552** (0.439)	2.062** (0.141)	0.825** (0.240)
year2005	1.808** (0.149)	3.265** (0.397)	2.028** (0.435)	2.398** (0.139)	1.017** (0.226)
year2006	1.803** (0.124)	3.103** (0.345)	2.165** (0.379)	2.547** (0.121)	0.843** (0.164)
year2007	1.321** (0.187)	2.362** (0.461)	1.049 (0.597)	1.701** (0.236)	1.275** (0.262)
<i>duration dependence</i>					
α_2 (6-12 mos)	0.993** (0.073)	1.943** (0.164)	1.157** (0.187)	1.909** (0.102)	0.073 (0.115)
α_3 (1-2 yrs)	1.321** (0.074)	2.577** (0.172)	1.511** (0.203)	2.197** (0.102)	0.171 (0.102)
α_4 (2-3 yrs)	1.657** (0.087)	2.666** (0.202)	1.758** (0.244)	2.268** (0.108)	0.194 (0.105)
α_5 (> 3 yrs)	2.046** (0.099)	3.008** (0.239)	2.224** (0.278)	2.923** (0.114)	0.447** (0.099)

⁺ $p < 0.05$ and ** $p < 0.01$

Table 3: The impact of the labour market and marriage dynamics on return-migration hazards

	EU 15	new EU	DC	LDC	Surinam/Antilles
	<i>Employment effect, γ_e</i>				
PH-model	-0.362** (0.073)	-0.472** (0.152)	-0.222 (0.225)	-0.215** (0.070)	0.509** (0.067)
MPH-model	-0.368** (0.074)	-0.513** (0.165)	-0.246 (0.225)	-0.215** (0.071)	0.524** (0.065)
Correlated model	0.274 ⁺ (0.130)	-0.100 (0.187)	0.552 (0.312)	-0.059 (0.094)	0.857** (0.077)
	<i>Unemployment effect, γ_u</i>				
PH-model	0.954** (0.041)	1.152** (0.073)	1.264** (0.090)	1.436** (0.033)	2.224** (0.055)
MPH-model	0.964** (0.046)	1.423** (0.085)	1.346** (0.099)	1.448** (0.036)	2.349** (0.058)
Correlated model	2.047** (0.161)	1.163** (0.114)	2.108** (0.260)	1.464** (0.039)	2.466** (0.077)
	<i>Marriage effect, γ_{mar}</i>				
PH-model	-0.798** (0.189)	-1.022** (0.282)	-0.368 (0.276)	-0.947** (0.106)	-0.299 ⁺ (0.196)
MPH-model	-0.812** (0.191)	-1.206** (0.316)	-0.405 (0.287)	-0.953** (0.111)	-0.321 ⁺ (0.142)
Correlated model	-1.222** (0.221)	-1.320** (0.332)	-0.639 ⁺ (0.279)	-0.906** (0.108)	-0.332 ⁺ (0.145)

⁺ $p < 0.05$ and ** $p < 0.01$

Table 4: 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	-0.033 (0.155)	0.112 (0.306)	0.173 (0.443)	-0.012 (0.135)	-0.264 ⁺ (0.124)
Income > 1000	-0.736** (0.147)	-1.023** (0.307)	-0.136 (0.450)	-1.425** (0.127)	-1.218** (0.115)
Age at entry > 25	-0.328 (0.171)	-0.209 (0.401)	-0.651 (0.456)	-0.835** (0.156)	-0.476 ⁺ (0.215)
Unemployment (nat)	0.066 (0.083)	-0.070 (0.170)	0.092 (0.244)	-0.092 (0.077)	0.012 (0.068)
Constant	0.887** (0.206)	0.549 (0.342)	0.821 (0.566)	1.110** (0.140)	1.930** (0.126)
	<i>Effect of Unemployment</i>				
Female	-0.019 (0.079)	0.292 ⁺ (0.141)	0.076 (0.196)	-0.029 (0.058)	-0.149 (0.105)
Age at entry > 25	-0.276** (0.098)	-0.081 (0.187)	0.191 (0.198)	-0.641** (0.063)	-0.805** (0.219)
Unemployment (nat)	0.129** (0.045)	0.239** (0.075)	0.124 (0.109)	0.047 (0.034)	-0.087 (0.058)
Constant	2.120** (0.173)	0.786** (0.221)	1.951** (0.308)	1.647** (0.056)	2.678** (0.103)
	<i>Effect of Marriage</i>				
Female	-0.280 (0.428)		-0.889 (0.547)	-0.267 (0.211)	-0.546 ⁺ (0.275)
Children	-0.245 (0.480)			-0.489 (0.282)	-0.377 (0.285)
Constant	-1.004** (0.362)	-1.223** (0.322)	-0.038 (0.427)	-0.619** (0.169)	0.157 (0.220)

⁺ $p < 0.05$ and ** $p < 0.01$

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

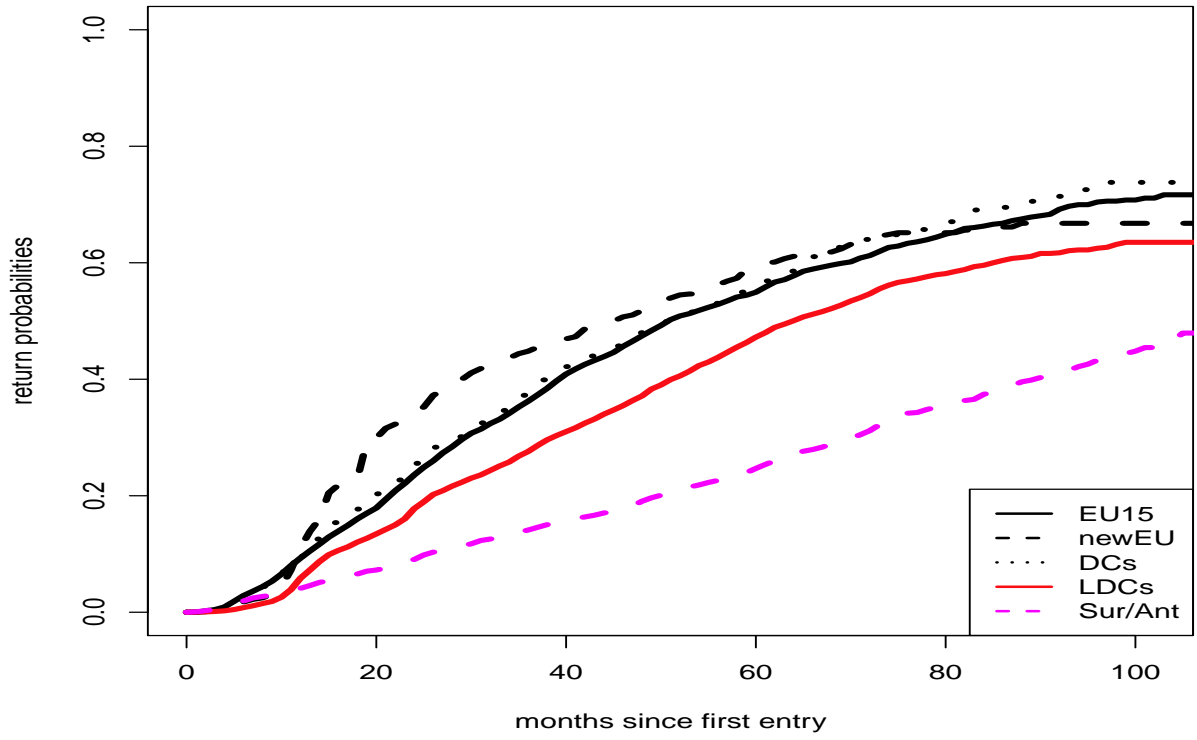


Figure 2: Kaplan-Meier estimates of getting married (in the Netherlands).

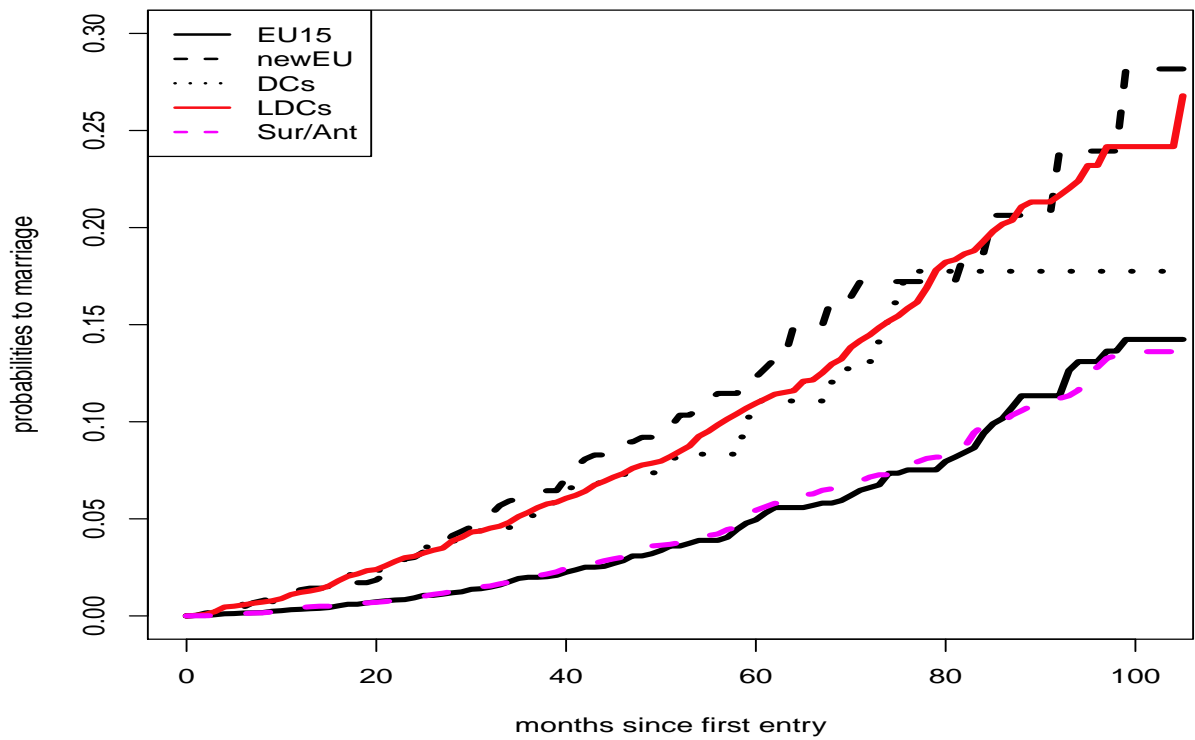
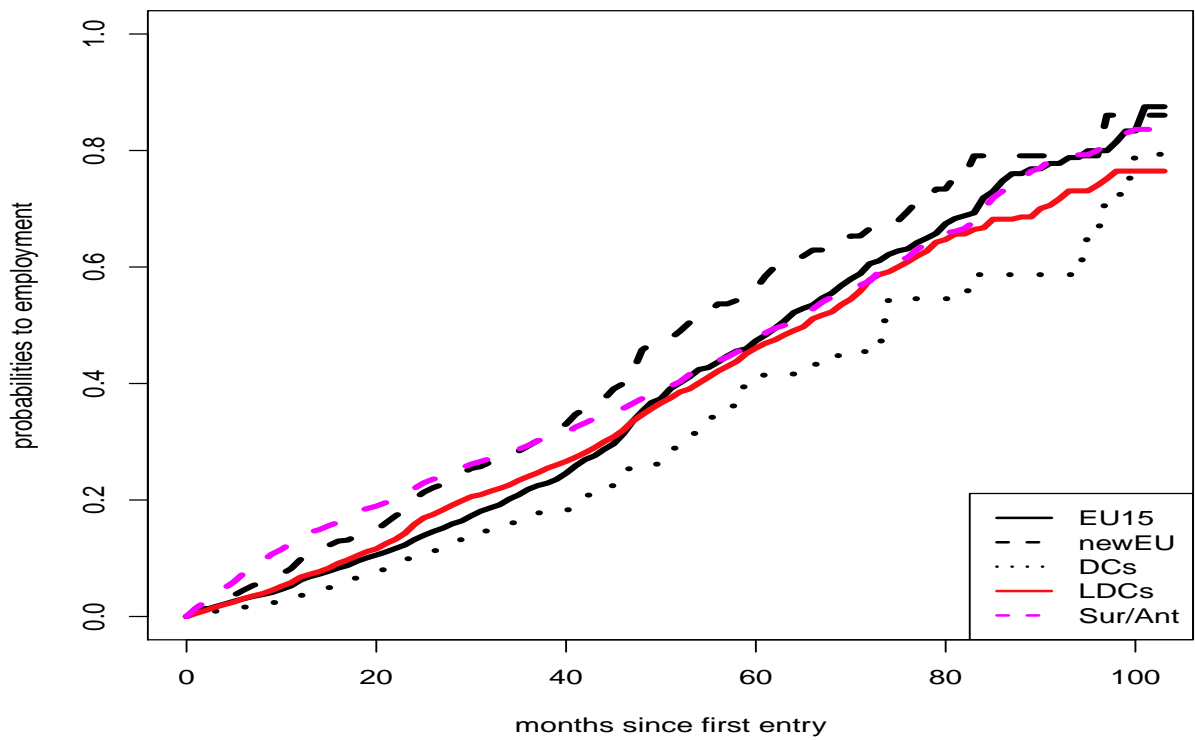


Figure 3: Kaplan-Meier estimates of entering the labour market.



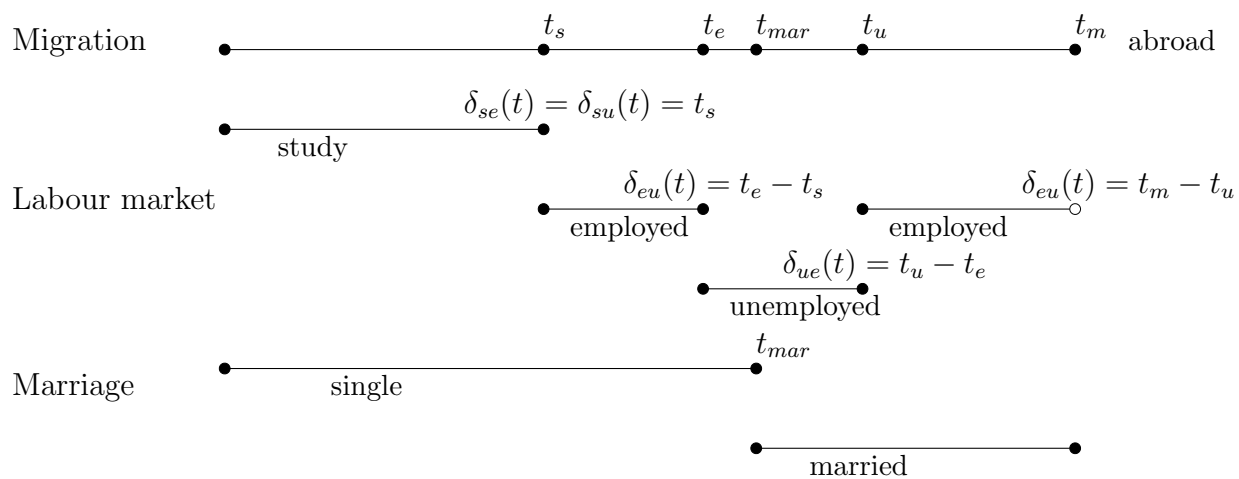


Figure 4: Migration, labour market and marriage dynamics

A Main countries of birth

Table A.1: Main countries 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

A.1 Likelihood construction

We have data for $i = 1, \dots, n$ students entering the Netherlands in our observation window. Let L_{ie} and L_{iu} denote the number of the observed (un)employment 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 or a student who leaves straight after graduation). We consider the first migration spell only. The six indicators Δ_{il}^k signal that the l^{th} transition has occurred, $k = \{se, su, eu, ue, mar, m\}$. Thus the likelihood contribution of migrant i conditional on the unobserved heterogeneity v is, in the light of the preceding discussions:

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

This likelihood naturally separates the labour market (student to either unemployment or employment, employment to unemployment and, unemployment to employment), 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 for $I_e(t_{ij}^-)$ and $I_s(t_{i,s}^-)$. 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 the student has left.

Integrating out the unobserved heterogeneity we obtain the likelihood function

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

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

A.2 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 by allowing for correlation among the processes through observed and unobserved factors. Table A.2 reports these effects. Across all groups marriage increases the probability that a student becomes employed (both from studying and from unemployment). The impact of marriage on becoming unemployed is less clear. Marriage reduces the chance to become unemployed while working, but increases the transition from studying to unemployment.

Table A.2: Marriage effects on labour market dynamics.

	EU 15	new EU	DC	LDC	Surinam/Antilles
<i>Student to employed</i>					
Marriage	0.479** (0.168)	0.289 (0.249)	0.759+ (0.347)	0.561** (0.108)	0.962** (0.109)
<i>Student to unemployed</i>					
Marriage	0.848** (0.234)	0.453+ (0.191)	0.540+ (0.249)	0.317** (0.071)	0.487** (0.189)
<i>Employed to Unemployed</i>					
Marriage	-0.617** (0.186)	0.650 (0.362)	-0.148 (0.306)	-0.222+ (0.111)	-0.069 (0.126)
<i>Unemployed to Employed</i>					
Marriage	-0.050 (0.171)	1.902** (0.325)	0.810** (0.286)	0.953** (0.116)	0.229+ (0.110)

+ $p < 0.05$ and ** $p < 0.01$

The impact of marriage on the labour market processes hardly differs (significantly) by gender or by the existence of children, see Table A.3.

Table A.3: Heterogeneity in marriage effects on labour market dynamics.

	EU 15	new EU	DC	LDC	Surinam/Antilles
<i>Student to employed</i>					
Female	0.407 (0.331)	-0.402 (0.473)	-1.509 ⁺ (0.766)	-0.043 (0.166)	0.018 (0.196)
Children	-0.968 ⁺ (0.422)			-0.294 (0.186)	-0.329 (0.223)
Constant	0.406 (0.288)	0.568 (0.439)	2.050** (0.678)	0.646** (0.144)	1.025** (0.154)
<i>Student to unemployed</i>					
Female	0.876 (0.473)	0.037 (0.620)	1.028 ⁺ (0.517)	0.250 (0.145)	-0.029 (0.380)
Children	-0.773 (0.535)			-0.333 (0.188)	0.158 (0.401)
Constant	0.387 (0.431)	0.408 (0.591)	-0.121 (0.434)	0.222 (0.122)	0.461 (0.317)
<i>Employed to Unemployed</i>					
Female	0.973 ⁺ (0.420)	0.356 (0.574)	-0.322 (0.739)	0.321 (0.186)	0.274 (0.226)
Children	-0.311 (0.381)			0.107 (0.178)	0.006 (0.210)
Constant	-1.198** (0.380)	0.314 (0.584)	0.098 (0.683)	-0.458** (0.169)	-0.215 (0.201)
<i>Unemployed to Employed</i>					
Female	-0.154 (0.379)	-0.839 (0.590)	-0.025 (0.750)	0.036 (0.172)	-0.283 (0.211)
Children	-0.296 (0.321)			-0.142 (0.160)	0.015 (0.202)
Constant	0.205 (0.336)	2.603** (0.604)	0.834 (0.699)	0.955** (0.165)	0.385 ⁺ (0.185)

⁺ $p < 0.05$ and ^{**} $p < 0.01$

A.3 Effect of labour market dynamics on marriage formation

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

Table A.4: Labour market effects on marriage

	EU 15	new EU	DC	LDC	Surinam/Antilles
Employment	0.395 (0.249)	0.609 (0.396)	1.383** (0.436)	0.294 (0.151)	0.867** (0.167)
Unemployment	-0.387 (0.326)	0.077 (0.303)	-1.242 ⁺ (0.547)	-0.245 ⁺ (0.108)	0.376 (0.220)

⁺ $p < 0.05$ and ^{**} $p < 0.01$

Table A.5: Heterogeneity in labour market effects on marriage

	EU 15	new EU	DC	LDC	Surinam/Antilles
	<i>Effect of Employment</i>				
Female	-0.434 (0.317)	-1.113 ⁺ (0.565)	1.162 (0.712)	-0.106 (0.163)	0.018 (0.213)
Income < 1000	-0.169 (0.390)	0.220 (0.635)	1.366 (0.740)	0.041 (0.239)	-0.107 (0.319)
Age at entry > 25	-0.927** (0.323)	-0.090 (0.452)	-0.072 (0.555)	-0.671** (0.166)	-1.281** (0.334)
Unemployment (nat)	-0.094 (0.177)	-0.001 (0.250)	0.412 (0.304)	0.081 (0.094)	0.118 (0.120)
Constant	1.194** (0.428)	1.377 (0.794)	-0.050 (0.930)	0.531 ⁺ (0.245)	1.019** (0.316)
	<i>Effect of Unemployment</i>				
Female	-0.145 (0.600)	0.237 (0.843)	0.532 (1.208)	0.278 (0.206)	1.143 ⁺ (0.448)
Age at entry > 25	-0.414 (0.583)	1.073 ⁺ (0.545)	0.659 (1.205)	-0.523** (0.196)	-0.032 (0.479)
Unemployment (nat)	-0.396 (0.329)	0.776 ⁺ (0.347)	0.270 (0.618)	0.288 ⁺ (0.112)	-0.304 (0.205)
Constant	0.001 (0.575)	-1.085 (0.904)	-2.265 (1.464)	-0.336 (0.212)	-0.327 (0.429)

⁺ $p < 0.05$ and ^{**} $p < 0.01$