The Impact of Labour Market Dynamics on the Return–Migration of Immigrants*

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Abstract

Using administrative panel data on the entire population of new labour immigrants to The Netherlands, we estimate the causal effects of individual labour market spells on immigration durations using the "timing-of-events" method. The model allows for correlated unobserved heterogeneity across migration, unemployment and employment processes. We find that unemployment spells increase return probabilities for all immigrant groups, while re-employment spells typically delay returns. The precise quantitative impacts on migration durations depend on both the timing and lengths of the employment and unemployment spells, and are evaluated in several factual and counterfactual examples.

Keywords: temporary migration, durations, timing of event method, labour market dynamics.

JEL Codes: J61, J64, C41

1 Introduction

The labour market performance of immigrants in the host country has received ample attention in the empirical literature. Neglected, however, is the question as to what extent this labour market performance affects the decisions of migrants to return to their source country. In particular, what is the effect of adverse or positive labour market events such as the occurrence of unemployment spells and re-employment spells ? How does the effect vary by the duration of the labour market spell ? The failure of the empirical literature to ask these questions let alone to furnish convincing answers arises from a combination of methodological challenges and severe limitations of the data usually encountered in migration analysis.

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. These data characteristics - large size, repeated and accurate measurement - are fairly unique in migration analysis (exceptions are Nekby (2006) for Sweden and Aydemir and Robinson (2008) for Canada) and enable us to examine durations reliably. The usual data situation is one of small samples, possibly subject to selectivity and attrition issues, extracted from surveys of respondent who provide recall data; these problems are particularly acute in studies of migration durations since survey attrition usually confounds outmigration. By contrast, our administrative population data has no attrition. We expand on three important features of our data.

First, this Dutch immigrant register is based on the legal requirement for immigrants to register with the authorities upon arrival.[1] 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). Sojourn times in labour market states are thus accurately recorded - they are day exact. Consequently, no data based on individual recall has to be used, nor do we employ less precise interval estimation techniques for durations. Moreover, the usual concerns about measurement error are less acute.

[1] They are also required to de-register upon leaving. Non-compliers are removed from the register by administrators. We know that these individuals have out-migrated for sure, only the exact date of their departure is unknown. We take this 'administrative removal' into account in our modelling, see Section 2.4.

Second, another important 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 94,270 labour immigrants. The immigration motive is usually latent in standard datasets, and different behavioural patterns of labour and non-labour migrants would confound the empirical analysis. Indeed, we show below that the other immigrant groups, such as family migrants (this category include both family unification as well as immigration of foreign born spouses, i.e. family formation), differ systematically from labour migrants in terms of labour market attachment, return behaviour, and demographic characteristics.

Third, size is the final attractive feature of our data to be highlighted here. The size of our data allows us to stratify our analysis, rather than be constrained to estimate one common model on pooled data. Such pooling is problematic since immigration laws stipulate visa requirements which differ by country of origin (Appendix A gives some details), and visa status in turn affects migration and labour market behaviours. In particular, we consider immigrants from sending countries in the EU15 ('old Europe'), the new EU (the majority of which arrived after the EU enlargement in 2004); the countries outside Europe are grouped into developed (DCs) and less developed (LDCs) sending countries.

While modern duration analysis (see e.g. van den Berg (2001) for a survey) is widely applied in labour economics, the discussed limitations of survey data have prevented its widescale adoption in migration studies. Moreover, the richness of our data enables us to go beyond standard modelling of migration durations, and to tackle the complex task of examining jointly the migration and labour market processes. Correlation between these two processes might stem from correlated unobserved heterogeneity, and our model accommodates this. Applying the "timing-of-events" method (Abbring and van den Berg (2003)) allows us to give the estimated effects of the labour market dynamics on the return decision of immigrants a *causal* interpretation. Controlling for unobserved correlated heterogeneity in the labour market and migration processes is thus crucial, since otherwise the resulting endogeneity would confound the causal impact (below we actually quantify the resulting bias and reveal it to be substantial). In particular, employment, unemployment and migration durations are modelled as mixed proportional hazards which incorporate correlated unobservables. The model for the migration duration permits the sojourn times in the various labour market states to have causal effects which are allowed to depend both on durations and also on the timing of the spells. These causal effects are then estimated non-parametrically using piecewise constant functions.

These concerns distinguish this paper from the recent empirical literature on return migration. For instance, outmigration propensities of both immigrants and natives have been considered in Nekby (2006) for the case of Sweden. Using administrative data she estimates linear probability models and focuses on the role of characteristics (finding evidence of positive selection in terms of education). Rather than using a static framework, Aydemir and Robinson (2008) estimate standard proportional hazard models on administrative data for Canada (reporting evidence of positive selection in terms of skill levels). Instead of focussing exclusively on characteristics, Kirdar (2009) considers also the effect of unemployment spells on the return decision using survey data for Germany. Estimating logistic hazard specifications, he finds that the effect of unemployment spells on outmigration hazards depends on unemployment durations. Both approaches to migration duration estimation differ from ours in that we consider a causal effects framework. Unlike these three studies, we also control, in addition, for unobserved heterogeneity (see e.g. van den Berg (2001) for a discussion of the importance of this). A complimentary, mainly theoretical literature focuses on the return migration motive. However, by not considering the effects of labour market shocks, the concerns of this literature are different from ours.[2]

By providing estimates of the causal effects of labour market dynamics on the return decision of immigrants, 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 and migration processes is fundamental to this end. In particular, quantifying

[2]The two principal opposing paradigms are theories of optimal migration durations based on preference for source country consumption (Galor and Stark (1991), Dustmann and Weiss (2007)) or target savings (Dustmann (2003)), and theories of mistaken expectations and immediate failure on the labour market (Borjas and Bratsberg (1996)). Empirical tests are conducted in Yang (2006) and Gibson and McKenzie (2011).

the (possibly non-linear) effects of unemployment durations on the return migration decision is relevant to current debates about the financial costs, in terms of the state's social welfare bill, of "failed" immigrants. Such debates also usually ignore that the labour market fortunes of these immigrants can be reversed; hence we also consider the effects of re-employment. A related policy debate concerns the contributions of immigrants to the host country in the presence of extensive return migration.

We find that, unconditionally, both unemployment and return migration are substantial: between 35% and 50% of labour immigrants experience unemployment spells, and 48% leave the host country during the observation window of 1999 to 2007.

Turning to the causal effects, overall, we find that unemployment spells increase return probabilities for all immigrant groups, while re-employment spells typically delay returns. All effects are substantial and significant. The precise quantitative impacts on migration durations are complex, because they depend on both the timing and lengths of the employment and unemployment spells. We therefore quantify the causal effects in several experiments, which isolate the impact of one dimension. As regards the duration effects, we find that relative to a three month unemployed immigrant from the EU15, an additional 9 months of unemployment increases the return probability by at most 6 percentage points, whilst a further 12 months of unemployment lead to an additional increase of return by 8 percentage points. For immigrants from LDC countries, the impacts are higher. Relative to the baseline of three months of unemployment, the next additional 9 months of unemployment increase the return probability by at most 9 percentage points, and a further 12 months of unemployment add a further 17 percentage points. Comparing thus immigrants from the EU15 and LDCs, return probabilities after 24 months of unemployment have increased by 14, respectively 26, percentage points. As regards the timing of unemployment spells, we find that starting a six month unemployment spell 12 months, instead of 3 months, after entry to the Netherlands increases the return probabilities for migrants from the EU by 6 percentage points. For immigrants from LDCs the respective increase is 5 percentage points. Finally, we investigate the effect of improved immigrant "quality" in a counterfactual analysis which attributes average DC characteristics to LDC immigrants holding the unemployment duration effect fixed.

This covariate effect increases return probabilities, but the effect does not exceed 13 percentage points. In summary, we conclude that the unemployment durations have a substantial effect, while the effect of differences in timing and immigrant "quality" are relatively smaller.

The outline of the paper is as follows. The econometric model is set out in detail in Section 2. In particular, we specify the labour market and the migration processes, and elucidate the role of unobservable heterogeneity in Section 2.2. The causal effect is identified by the argument of Section 2.3. Estimation proceeds by maximising the likelihood which is spelt out in Section 2.5. The data are described in Section 3, and the empirical results are presented in Section 4. Since the precise quantitative impacts on migration durations are complex, as they depend on both the timing and lengths of the employment and unemployment spells, Section 4.5 considers several quantification experiments. The last section concludes.

2 The econometric model

We seek to determine the *causal* effect of labour market dynamics on the return migration intensity of immigrants, so the random outcome variable of interest is the time spent in the Netherlands, denoted by T_m. The observational units are labour immigrants in the host country (the Netherlands). For expositional clarity, we present first a restricted model of the migration duration which ignores the labour market processes. These are introduced subsequently, and we address the empirical challenge that arises from the potential correlation between the labour market process and the migration process which confounds the causal effect.

We follow common practice in duration analysis and express the distribution of the migration duration variate T_m in terms of the associated hazard, say θ_m. The proportional hazard (PH) model expresses this return hazard as the product between a baseline hazard, $\lambda_m(t)$, which is a function of time alone and common to all individuals, and a covariate function, $\exp(x_m(t)\beta_x^m)$, which accelerates exits: $\theta_m(t|x_m(t)) = \lambda_m(t)\exp(x_m(t)\beta_x^m)$. The covariate vector $x_m(t)$ is allowed to change over time. To accommodate unobserved heterogeneity (see e.g. van den Berg (2001) for a discussion of the importance of this), the mixed proportional hazard model (MPH) extends the PH model by multiplying it by a time-invariant person-specific error term, say v_m with distribution G: $\theta_m(t|x_m(t), v_m) = v_m \lambda_m(t) \exp(x_m(t)\beta_x^m)$.

As we are interested in the causal impact of the labour market processes on migration durations, we need to extend this simple framework in two ways. First, we need to formulate the MPH models for the unemployment and re-employment processes, and describe the timing of event. Second, we then introduce the causal impact of the labour market processes on migration duration, and carefully distinguish this effect from the correlation that can arise from the correlation between the unobserved heterogeneity terms (stemming from e.g. dynamic sorting). Finally, we present the identification argument for the causal effect.

2.1 Labour market processes and the timing of events

Generically, let T denote the random time since first entry into the Netherlands that a particular event takes place. In particular, T_m is the time the immigrant leaves the host country in order to return to the sending country, T_e the time an employment spell ends in the host country, and T_u the time an unemployment spell ends. The durations or sojourn time in the employment and unemployment state are denoted by $\delta_e(t)$ and $\delta_u(t)$.

The timing of events and our definitions are illustrated in Figure 1. We depict the labour market and migration durations of two migrants. In accordance with our data definitions of Section 3, the migrants are employed at the moment they enter the country. Migrant 1 arrives after Migrant 2. The length of Migrant 1's (first) employment spell is $\delta\big(t_{e11}\big) = t_{e11}$. He remains in the country unemployed until time t_{m1}. His unemployment spell is thus of duration $\delta\big(t_{u11}\big)= t_{u11} - t_{e11}$. The unemployment spell is terminated at the moment he leaves the host country at time t_{m1}. Migrant 2 stays for a longer period in the country, $t_{m2} > t_{m1}$, and undergoes a different labour market experience. His first employment spell has duration $\delta\big(t_{e21}\big) = t_{e21}$. After an unemployment spell of length $\delta\big(t_{u21}\big) = t_{u21} - t_{e21}$ he becomes employed again. This second employment spell is terminated when he leaves the host country at time t_{m2}, and has duration $\delta\big(t_{e22}\big)= t_{e22} - t_{u21}$. The last labour market spell for each

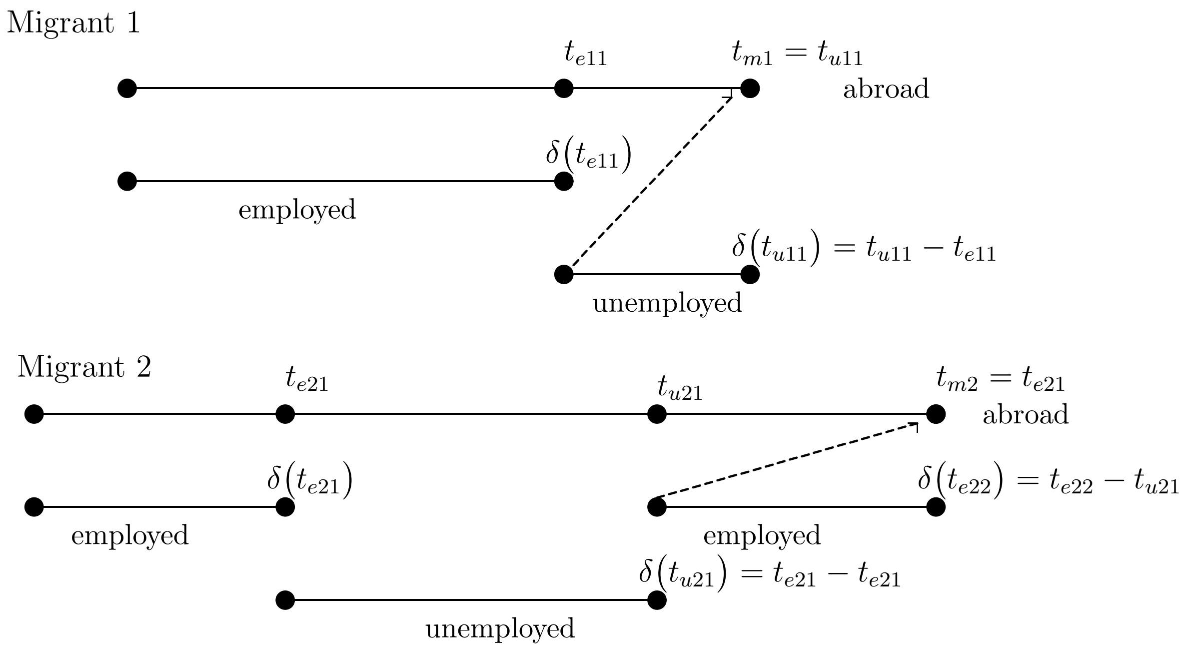


Figure 1: Migration and labour market dynamics

migrant is always censored. While Migrant 1 experiences an adverse labour market shock (unemployment), Migrant 2 experiences a positive shock (re-employment). We seek to determine the effect of such shocks, both in terms of their incidences and their durations, on the duration of the migration spell.

As the migrant is either employed or unemployed, the labour market process is alternating, and has three possible transitions, viz. unemployment to employment, employment to unemployment, or return migration (leaving the Netherlands). The conditional hazards for the unemployment and re-employment spells follow mixed proportional hazard models:

$$\theta_u\big(\delta_u(t)\big|x_u(t), v_u\big) = v_u\lambda_u\big(\delta_u(t)\big)\exp\Big(x_u(t)\beta_x^u\Big) \tag{1}$$

$$\theta_e\big(\delta_e(t)\big|x_e(t), v_e\big) = v_e\lambda_e\big(\delta_e(t)\big)\exp\Big(x_e(t)\beta_x^e\Big), \tag{2}$$

with baseline hazards λ_k, unobserved time-invariant characteristics v_k, and observed time-varying characteristics x_k where $k \in \{u, e\}$ denotes the labour market state. In order to keep track of labour market 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, and $I_r(t)$ indicates that the immigrant is employed again after a period of unemployment. This setting is further generalised by distinguishing between the number of the labour market spell.

The return migration hazard is also of the MPH form. We allow T_m, $\delta_e(t)$ and $\delta_u(t)$ to be correlated through unobservable heterogeneity terms and through a possible direct effect of labour market dynamics on the migration hazard. The latter is the causal effect to which we now turn. We consider both the incidence of the unemployment and re-employment event as well as its duration, and allow the impact to vary systematically with observed characteristics. In our empirical implementation these three aspects of the causal impacts (incidence, duration, heterogeneity) are considered progressively. Thus the extended MPH model for the return hazard is

$$\theta_m(t|t_u, t_e, x_m(t), z(t), v_m) = v_m \lambda_m(t) \exp\Big(x_m(t)\beta_x^m + I_u(t)\Big\{\gamma_u + \alpha_u\big(\delta_u(t)\big) + z_u(t)\phi_u\Big\} + I_r(t)\Big\{\gamma_e + \alpha_e\big(\delta_e(t)\big) + z_e(t)\phi_e\Big\}\Big). \quad (3)$$

The covariates z in the (return) migration hazard are a subset of the time-varying characteristics of the migrants x. The duration impacts, α_k, are modelled by piecewise constant functions, so these effects are allowed to exhibit duration dependence.

The causal effects need to be distinguished from the correlated effects that arise from the correlation between the unobserved error terms $(v_e, v_u, v_m) \equiv v$ where v is distributed according to some distribution function G. We turn to this important endogeneity issue.

2.2 Endogeneity: Confounding unobservable heterogeneity

It is well known that, due to dynamic sorting effects, the distribution of v_e among those who become unemployed at t_e will differ from its population distribution. In particular, individuals with high v_e will tend to enter unemployment earlier than individuals with low v_e. If v_e and v_m are dependent, then the distribution v_m for unemployed migrants at a given time in the country will differ from the distribution of v_m for migrants still employed. Similarly, if v_m and v_u are not independent, then the distribution of v_m among re-employed migrants will differ from its population distribution. Therefore, one cannot infer the causal effect of unemployment on the return-migration from a comparison of the realised durations of those who became unemployed at t_e with the rest of the population, because one would then mix the causal effect of unemployment on the duration with the difference in the distribution of v_m between these migrants. In this case $I_u(t)$ and $I_r(t)$ will be endogenous, and T_u, T_e and T_m should be modelled jointly to account for dependence of the unobserved heterogeneity terms. Therefore, we allow v_u, v_e and v_m to be correlated.

For the sake of parsimoniousness,[3] we assume that each of the unobserved heterogeneity terms remains the same for recurrent durations of the same type, and we adopt a two-factor loading model with two independent fundamental factors W_1 and W_2, both having a discrete distribution on $(-1, 1)$ with $p_j = Pr(W_j = 1)$. This implies that

$$v_k = \exp(\alpha_{k1}W_1 + \alpha_{k2}W_2) \tag{4}$$

with $k = \{u, e, m\}$. Let $W = (W_1, W_2)'$, $v = (v_e, v_u, v_m)'$ and A be the matrix of factor loadings with rows $A_k = (\alpha_{k1}, \alpha_{k2})$. Note that this two-factor model is very general as it allows for positive and negative correlations among the unobserved heterogeneity terms. The variance-covariance matrix of the unobserved heterogeneity terms is given by $\text{Var}\big(\ln(v)\big) = A\text{Var}(W)A'$.[4] Using a two-point mass specification to model unobserved heterogeneity is common in duration analysis (see e.g. van den Berg and Ridder (1998)), and extending this to correlated processes by considering a factor-loading specification has also been pursued recently in Crépon et al. (forthcoming) and Osikominu (forthcoming).

2.3 Identification of causal effects: The timing-of-events method

The full effect of employment dynamics on re-migration hazards is given in our framework by the functions $\gamma_u + \alpha_u\big(\delta_u(t)\big) + z_u(t)\phi_u$ and $\gamma_e + \alpha_e\big(\delta_e(t)\big) + z_e(t)\phi_e$. An application of the "timing-of-events" method of Abbring and Van den Berg (2003)

[3] After 5 year of continuous full-time employment, an immigrant in the Netherlands can apply for permanent residenceship, which then would also make him eligible for welfare and employment rights similar to those enjoyed by natives (by contrast, EU15 immigrants gain these almost immediately; see Appendix A for details). Such a status change could imply that the unobserved heterogeneity vector v changes at this date. However, our Kaplan Meier estimates, depicted below in Figure 2, reveal that most immigrants return before month 60, and that at this date the return probability does not exhibit a jump.

[4] One additional restriction is needed for identification. We let $\alpha_{m2} = 0$.

implies that these effects have a causal interpretation. This method requires that employment, unemployment and migration durations are modelled parametrically as mixed proportional hazards, as we have. Correlated unobservables, by contrast, are estimable non-parametrically, as are the duration effect functions α_u and α_e. Identification of the causal effect requires that the so-called "no-anticipation"-assumption holds, to which we now turn. Note that this identification strategy differs from more familiar instrumental variable strategies.

Denote by t_e the time an unemployment event would start, and consider first the migration hazard at a time t *before* the unemployment event. The no-anticipation assumption requires that migrants do not anticipate the unemployment event by migrating before the anticipated event would occur. Note that leaving on the date the event occurs does not violate the identification assumption. Hence the migration intensity $\theta_m\big(t|t_e, t_u, x_m(t), v_m\big)$ is assumed to be affected only for $t > t_e$.

This assumption seems plausible for recent immigrants to the Netherlands given the loss of earnings a pre-mature job resignation would entail. We consider some potential threats to the validity of the no-anticipation assumption specific to the Dutch case (see Appendix A for a more detailed discussion of Dutch labour and residentship law), and distinguish between permanent and temporary contracts.[5] To assess the empirical relevance of these threats, a simple plausibility check is to inspect the (non-parametric) Kaplan Meier estimates of the return probabilities. An active systematic threat should manifest itself in terms of jumps. To pre-empt the subsequent theoretical discussion, none of our group-specific estimates, depicted below in Figure 2, suggests the presence of jumps.

The loss of a permanent job is usually unanticipated, as the statutory notice period of one month is relatively short (also compared to average migration durations) and unions have little power. An exception might be month 36 of continuous full-time employment after which any full-time work contract essentially becomes permanent (so some employers might have an incentive to terminate a contract). A forward looking immigrant, however, would incorporate this in his expectations and interpret

[5] Unfortunately, we do not have data about the status of an individual's work contract; however, external estimates (Sà (2008)) suggest that the share of temporary contracts among recent male immigrants is about 32%.

a permanent contract accordingly as essentially temporary with a high continuation probability. Termination dates of fixed term contracts, by contrast, are known. However, the immigrant has little incentive to leave the country before the end of such a temporary contract as he would forego positive earnings. Moreover, he has a positive probability of finding another job in the same or in another firm, and forward looking individuals are likely to incorporate these positive re-employment probabilities in their return decision. In particular, even recent immigrants from non-EU countries have three months to find another job before they lose their right to stay, and our estimates suggest that the incidence of re-employment is non-trivial (see Table 1 below).

Should any anticipation occur, however, it is likely that the time span between the anticipating (migration) event and the anticipated unemployment event, $t - t_u$, is small relative to the migration duration t, since the migrant would then forego positive earnings. Hence we conclude that, should any bias be present, the effect would be small, and that the no-anticipation assumption is likely to hold for the vast majority of migrants; the smooth shapes of the Kaplan Meier estimates of the return probabilities seem to confirm this.

2.4 Administrative removal

Some migrants do not officially inform the authorities that they are about to leave the host country. However, all citizens (immigrants and natives) are required to register with their municipalities (this is a pre-requisite for many social services, and for tax-benefit matters). It is thus clear that any migrant who has no entries in the tax-benefit register and does not appear in the register of another municipality must have left the country. Only the exact date of the departure is unknown. Such non-compliers are periodically identified and removed from the registers by the authorities in a step labelled "administrative removal".

We address this as follows. We assume that the two observable events "administrative removal" and "zero income at last observed time" imply that the migrant has left *before* the date the administrative removal is recorded, and *after* the last date of any observed change in the observed characteristics (e.g. labour market status, housing and marital status). Such limited information is equivalent to *interval-censored* data. For interval-censored data the exact end of a duration is unknown, but it is known that the duration ended in some period of time. If a migrant is administratively removed at duration t_a and the last observed change for this migrant occurred at duration $t_1 < t_a$, the contribution to the likelihood (of the out-migration) of this migrant is the probability of survival till t_1 times the probability that the migrant left the country between t_1 and t_a. The latter is equal to the survival from t_1 until t_a given survival. Consequently, administrative removal has no effect on the employed part of the likelihood function, nor on the likelihood of migrants who are administratively removed with non-zero income till their administrative removal date.

Let a_i indicate whether the emigration of migrant i was due to an administrative removal ($a_i = 1$). For an administratively removed migrant we introduce two different event dates: t_i^a is the administrative removal date and $t_i^1 < t_i^a$ is the date of the last recorded change in any of the characteristics of migrant i before t_i^a.

2.5 Likelihood function

We have data for $i = 1, \ldots, n$ immigrants entering the Netherlands in our observation window. Let K_{ie} and K_{iu} denote the number of the observed employment and unemployment spell of individual i. Note that for some migrants $K_{iu} = 0$ (e.g. a migrant who remains employed). We consider the first migration spell only. The three indicators $\Delta_{ik}^u, \Delta_{ik}^e$ and Δ_i^m signal that k^{th} employment/unemployment or the migration spell is uncensored. Thus the likelihood contribution of migrant i conditional on the unobserved heterogeneity $v = (v_e, v_u, v_m)$ is, in the light of the preceding discussions:

$$\begin{aligned} L_i(v) \;=\; & \prod_{k=1}^{K_{iu}} \Bigg\{ \bigg[\theta_u\big(\delta_u(t_{ik})\big|\cdot, v_u\big)^{\Delta_{ik}^u} \exp\Big(-\int_0^{\delta_u(t_{ik})} \theta_u(\tau|\cdot, v_u)\, d\tau\Big)\bigg]^{(1-a_{ik})} \\ & \quad \cdot \bigg[\exp\Big(-\int_0^{\delta_u(t_{ik}^1)} \theta_u(\tau|\cdot, v_u)\, d\tau\Big) - \exp\Big(-\int_0^{\delta_u(t_{ik}^a)} \theta_u(\tau|\cdot, v_u)\, d\tau\Big)\bigg]^{a_{ik}} \Bigg\}^{I_u(t_{ik}^-)} \\ & \times \prod_{j=1}^{K_{ie}} \bigg[\theta_e\big(\delta_e(t_{ij})\big|\cdot, v_e\big)^{\Delta_{ij}^e} \exp\Big(-\int_0^{\delta_e(t_{ij})} \theta_e(\tau|\cdot, v_e)\, d\tau\Big)\bigg]^{I_e(t_{ij}^-)} \\ & \times \bigg[\theta_m(t_i|\cdot, v_m)^{\Delta_i^m} \exp\Big(-\int_0^{t_i} \theta_m(\tau|\cdot, v_m)\, d\tau\Big)\bigg]^{(1-a_i)} \\ & \quad \cdot \bigg[\exp\Big(-\int_0^{t_i^1} \theta_m(\tau|\cdot, v_m)\, d\tau\Big) - \exp\Big(-\int_0^{t_i^a} \theta_m(\tau|\cdot, v_m)\, d\tau\Big)\bigg]^{a_i} \end{aligned} \qquad (5)$$

This likelihood naturally separates unemployment, employment, and migration spells, and for each spell allows for censoring and administrative removal. To simplify notation, we have suppressed the dependence on observed characteristics in the hazard rates. $I_u(t_{ik}^-)$ indicates that the migrant is unemployed just before t_{ik} and similarly for $I_e(t_{il}^-)$. When $K_{iu} = 0$ the relevant term becomes 1. Note that the last, and only the last, labour market spell is censored. This is either because the migrant is still in the country at the end of the observation period or because the migrant has left the country.

Integrating out the unobserved heterogeneity distribution we obtain the likelihood function

$$L = \prod_{i=1}^{n} \int\int\int L_i(v)\, dG(v_e, v_u, v_m) \qquad (6)$$

where $G(v_e, v_u, v_m)$ is the joint distribution of the unobserved heterogeneity terms implied by the discussion of v_k given by equation (4).

3 Administrative panel data on the population of recent immigrants to The Netherlands

All legal immigration by non-Dutch citizens to the Netherlands is registered in the Central Register Foreigners (Centraal Register Vreemdelingen, CRV), using information from the Immigration Police (Vreemdelingen Politie) and the Immigration and Naturalization Service (Immigratie en Naturalisatie Dienst, IND). It is mandatory for every immigrant to notify the local population register immediately after the arrival in the Netherlands if he intends to stay for at least two thirds of the forthcoming six months. Natives as well as immigrants are required to register with their municipality. Our data comprise the entire *population* of immigrants who entered during our observation window of 1999-2007, and after merging in other administrative registers we obtain a panel.

In addition to the date of entry and exit, the administration also records the migration motive of the individual. The motive is usually coded according to the visa status of the immigrant (see Appendix A for some details); if not, the immigrant reports the motive upon registration in the population register. Statistics Netherlands distinguishes between the several motives: labour migrants, family migrants, student immigrants, asylum seekers (and refugees), and immigrants for other reasons. Given the focus of the current paper on labour market events, we consider exclusively these labour migrants, which represent 26% of all non-Dutch immigrants in the age group 18-64. This restriction is justified in some detail in Appendix B, where we show that the other migrant groups have a substantially larger propensity to remain in the Netherlands, have a significantly weaker attachment to the labour market, and are demographically different.[6]

It is possible that the labour migration motive is either miscoded or misreported. Since most non-EU labour migrants require an employment-dependent work visa to immigrate, they should be formally employed not too long after entry. Thus, in order to limit the possibilities of misclassification error of the labour migration motive, we require that immigrants be employed in the Netherlands within three months of their entry (we have verified that our results are not sensitive to this particular cut-off). Of the original 146,290 migrants with a labour motive 94,270 (64%) are employed within three months of their entry.

This immigration register is linked by Statistics Netherlands to the Municipal

[6]We do not seek to identify labour migrants in the other immigrant groups. Given our very large data set, the potential gain to estimation efficiency is negligible, while the chance of wrongly re-classifying an individual is not.

Register of Population (Gemeentelijke Basisadministratie, GBA) and to their Social Statistical Database (SSD). The GBA contains basic demographic characteristics of the migrants, such as age, gender, marital status and country of origin. From the SSD we have information (on a monthly basis) on the labour market position, income, industry sector, housing and household situation. Since we consider only new entrants to the Netherlands, most immigrants are not eligible for social benefits such as unemployment insurance payments, since these are conditional on sufficiently long employment or residence durations (for non-EU immigrants essentially 5 years). Statistics Netherlands classifies an individual as employed, if the principal source of income is employment, and as unemployed otherwise.

Although in principle the exact date of emigration is known, some migrants do not officially inform the authorities that they leave. The departure of these non-complying individuals is registered as an "administrative removal" after the authorities have assessed that the migrant has left the municipality without showing up in the files of another municipality in The Netherlands or as an emigrant. Given the municipality registration requirement for all citizens, we know that these migrants have left The Netherlands for sure, only the exact date of their departure is unknown. These administrative removals are included among emigration and they amount to around 38% of all emigrations. 73% of these administrative removed migrants have no observed income in the country. We conjecture that the majority of these migrants have left the country shortly after they stopped receiving income (either earnings or benefits). For those who still have income until they are administratively removed we assume that they left at that exact date. We have explicitly addressed the issue of administrative removals in the formulation of the likelihoods above.

To summarise the principal advantages of our data compared to conventional datasets used in the literature, we have a large panel of the entire population of labour immigrants; to be exact, we observe 94,270 individuals, 120,287 employment spells, and 56,783 unemployment spells. Other migration types, usually latent, are excluded and do not confound the empirical analysis which focuses on the effect of labour market dynamics. Income levels and labour market states are accurately recorded in the administrative data (as they are used by the authorities for tax and benefit

Table 1: Descriptive dynamics

	EU15	new EU	non-EU DCs	non-EU LDCs
Stayer[a]	48.2%	70.9%	40.9%	58.6%
	Length of stay at return migration			
< 6 month	3.9%	12.9%	2.4%	6.0%
6 − 12 months	11.3%	20.0%	10.3%	13.6%
12 − 18 months	13.3%	17.1%	12.4%	13.2%
18 − 24 months	13.1%	14.0%	15.2%	13.4%
24 − 60 months	46.4%	29.7%	49.1%	43.6%
> 5 year	11.6%	6.4%	10.8%	10.2%
Average [months]	32.5	23.9	32.8	30.6
	Labour market dynamics			
Mean # of spells per migrant				
Employment	1.349	1.233	1.093	1.221
Unemployment	0.714	0.475	0.405	0.509
Always employed[b]	49.9%	63.8%	64.5%	62.6%
Once unemployed	36.9%	28.5%	32.0%	29.1%
> 1 unemployed	13.2%	7.8%	3.5%	8.3%
Never re-employed[c]	77.9%	83.4%	92.9%	86.2%
Once re-employed	14.5%	12.2%	5.8%	9.1%
> 1 re-employed	7.5%	4.4%	1.3%	4.8%

[a] Stayers are migrants who remain in the country till the end of the observation period.
[b] Percentage of migrants that is employed through the whole stay in the country.
[c] Percentage of migrants that is never re-employed, unemployed and then re-employed, during their stay in the country

purposes), and the start of the migration spell is recorded exactly. Moreover, the size of this labour immigrant population allows us to estimate our model separately for distinct migrant groups, rather than conducting a restrictive pooled analysis. In particular, we distinguish between migrants according to their initial labour mobility, and thus estimate separate models for migrants from sending countries in the EU15 ('old Europe'), the new EU (the majority of who are Poles and arrived after 2004), and the countries outside Europe are grouped into developed (DCs) and less developed (LDCs) sending countries. In the Data Appendix, we define these groupings precisely, and disaggregate them by country of birth.

3.1 Summary Statistics: Labour Immigrants

We proceed to discuss the summary statistics for our data relating to the dynamics of migration and of labour market events. The Data Appendix considers other aspects of the data.

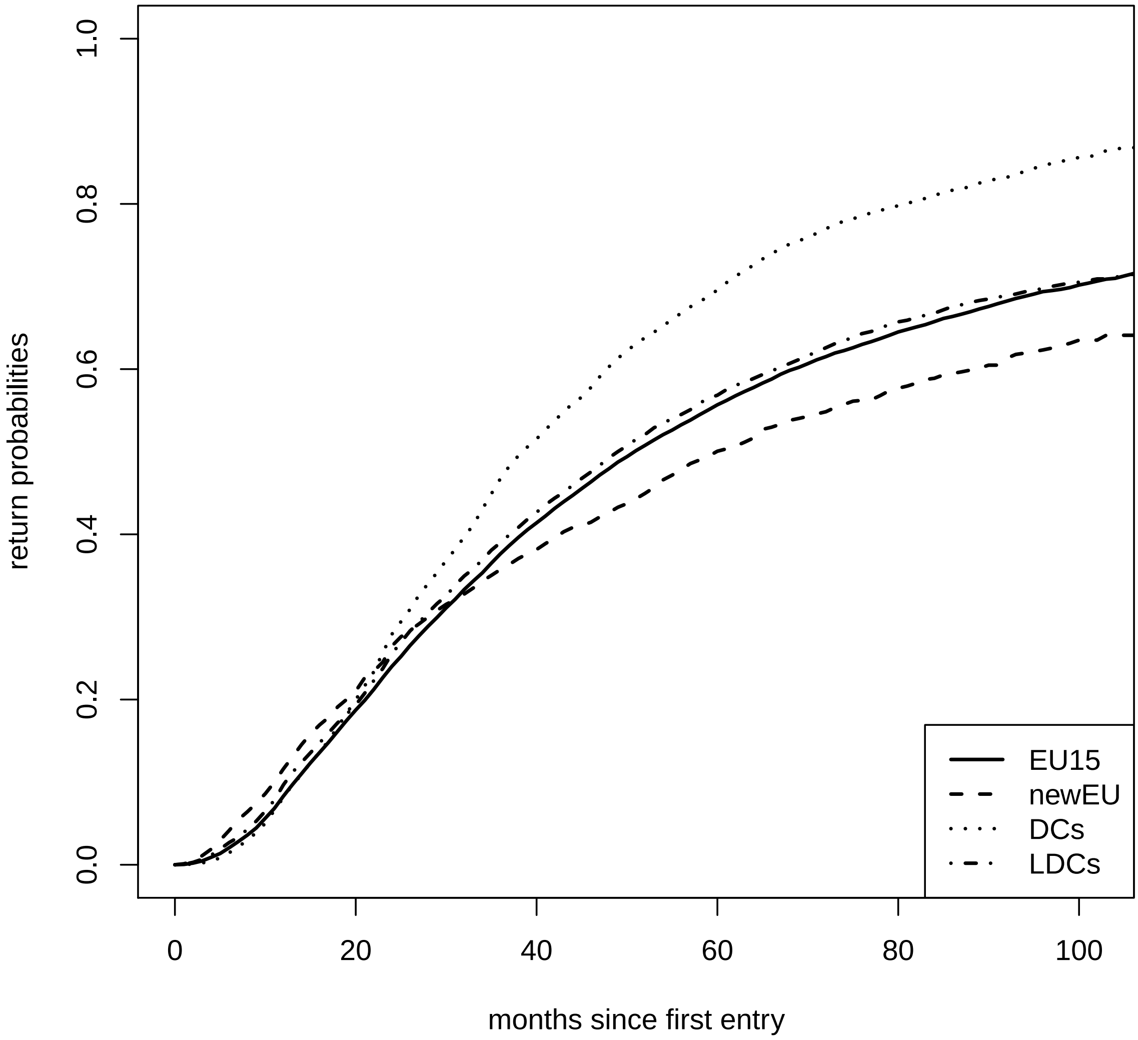
In Table 1 we consider the incidence of return migration, and conditional on returning the duration of the stay in the Netherlands. Note that the group of 'stayers' includes permanent immigrants, and temporary migrants who have not yet returned. Hence immigrants from the new EU, having arrived predominantly in the second half of our observation window, are expected to exhibit a high proportion of censored migration spells. This is borne out in the data, since the share of stayers from the new EU is 71% whereas for other immigrants the range is between 41% and 59%. Relatedly, the durations of their completed spells are shorter. However, a large share of new EU movers (13%) leave the Netherlands after less than 6 months, which is considerably larger than for other immigrant groups. These differences highlight already the importance of a analysis disaggregating by sending countries.

Immigrants from the EU15 are more (less) likely to stay than migrants from (less) developed countries outside the EU. Conditional on returning, the distribution of completed durations look fairly similar for these three groups, as do the average duration. Turning to the unconditional distribution of the immigration duration, Figure 2 depicts the Kaplan Meier estimates of the return probabilities (= 1− survival probabilities) by immigrant group. All groups look very similar for durations up to 24 months.[7] One explanation for the differences at longer durations are the lower (higher) staying incidences for non-EU DCs (new EU). Relative to immigrants from the EU15, fewer immigrants from the latter group stay for longer durations. Overall, both Table 1 and Figure 2 highlight the importance of the temporary nature of labour migration. Across all immigrant groups, a substantial proportion leave the Netherlands eventually, and many do so within 24 months.

Turning to the labour market dynamics, Table 1 reveals that migrants from the EU15, relative to the other groups, experience greater labour market volatility: during

[7] For example, Aydemir and Robinson (2008) find that out-migration rate in Canada 20 years after arrival is around 35% among young, working-age, male immigrants and around 6 out of 10 of those who leave do so within the first year of arrival.

Figure 2: Kaplan Meier estimates of return probabilities



the observation window they experience a higher incidence of unemployment spells (the mean spell number of is 0.7), more employment spells (1.3) and a slightly bigger proportion have more than one unemployment spell (13%), and the share of the 'always employed' is smaller (50%).[8]

Since we seek to estimate the effects of negative and positive individual labour market shocks on the migration durations below, we now consider the immigrants by their labour market status prior to their departure from the host country. Hence Tables 2 and 3 condition on leaving the host country, whereas Table 1 considered the unconditional labour market dynamics.

[8]Note that migrants who are always employed, of course, enter the likelihood as censored observations, and are included in the estimation.

Table 2: Descriptive statistics: Unemployed immigrants who leave.

	EU15	new EU	non-EU DCs	non-EU LDCs
Unemployed at emigration[a]	54.3%	44.4%	40.8%	48.7%
Repeated unemployment[b]	20.4%	14.1%	7.9%	15.1%
Mean # unemployment spells[b]	1.30	1.20	1.10	1.22
	Current unemployment duration[b]			
< 3 month	18.5%	26.4%	23.3%	20.1%
3 – 6 months	15.8%	22.5%	17.1%	17.1%
6 – 12 months	22.7%	22.6%	19.5%	22.4%
> 1 year	43.0%	28.5%	40.1%	40.4%
Average (months)	15.1	10.8	14.6	13.8
	Preceding employment duration[b]			
< 3 month	16.4%	17.7%	6.2%	11.8%
3 – 6 months	15.1%	17.7%	10.8%	11.9%
6 – 12 months	45.7%	39.0%	60.4%	54.0%
> 1 year	22.8%	25.6%	22.6%	22.3%
Average (months)	15.5	13.2	20.0	17.8

[a] As percentage of all migrants who leave.
[b] At the departure moment for the migrants who are unemployed when they leave.

In Table 2 we condition on being unemployed at the time of the return migration. In line with the results of Table 1, immigrants from the EU15 have a higher incidence of unemployment at the time of their departure (54%), a higher incidence of repeated unemployment (20%), and are more likely on average to experience longer unemployment durations (15 months). By contrast immigrants from DCs outside Europe have, compared to Europeans, lower incidences of unemployment (41%) and of repeated unemployment (8%), while their preceding employment spells were longer on average (20 months).

In Table 3 we consider immigrants who, after a period of unemployment, have found a job and subsequently leave. Hence this group has a volatile labour market experience (employment, followed by unemployment, followed by re-employment), but the last labour market spell is a 'positive' one. Unsurprisingly, the incidence of such labour market histories is low, ranging between 3 and 10%. Although non-European immigrants from DCs exhibit the lowest incidence (3%), the durations of the last two labour market spells look fairly similar across all groups, except for the new EU immigrants who experience typically shorter durations.

Table 3: Descriptive statistics: Re-employed immigrants who leave.

	EU15	new EU	non-EU DCs	non-EU LDCs
Re-employed at emigration[a]	7.4%	9.9%	2.7%	4.8%
Repeated re-employment[b]	29.9%	29.3%	10.2%	33.8%
Mean # re-employment spells[b]	1.45	1.42	1.13	1.52
	Current (re-)employment duration[b]			
< 3 month	18.2%	26.9%	17.1%	17.0%
$3-6$ months	16.7%	21.6%	15.1%	17.4%
$6-12$ months	23.4%	22.5%	26.9%	23.7%
> 1 year	41.7%	29.0%	40.9%	41.9%
Average (months)	15.0	10.7	13.9	14.4
	Preceding unemployment duration[b]			
< 1 month	18.3%	22.2%	11.3%	20.7%
$1-2$ months	18.1%	18.1%	18.3%	13.2%
$2-3$ months	17.2%	20.0%	16.7%	20.4%
$3-6$ months	20.5%	19.7%	17.4%	22.0%
$6-12$ months	17.4%	13.2%	26.3%	15.9%
> 1 year	8.5%	6.8%	8.6%	7.8%
Average (months)	5.1	4.3	6.3	4.9

[a] As percentage of all migrants who leave.
[b] At the departure moment for the migrants who are re-employed when they leave.

4 Results

The full model, given by the MPH hazards (1) to (3) and the heterogeneity model (4), permits the causal effects of the labour market processes to exhibit duration dependence and to vary systematically with observed characteristics, whilst controlling for correlated effects that arise from correlated unobserved heterogeneity. In view of this complexity, and given the nested structure of the model, we consider first simpler variants before turning to the full model.

Our first interpretations of the results focus on the estimated coefficients of the models. However, the precise quantitative impacts on migration durations depend on both the timing and lengths of the employment and unemployment spells. To facilitate the interpretation of the coefficients, we thus consider in Section 4.5 several illustrative examples which focus directly on the survival probabilities.

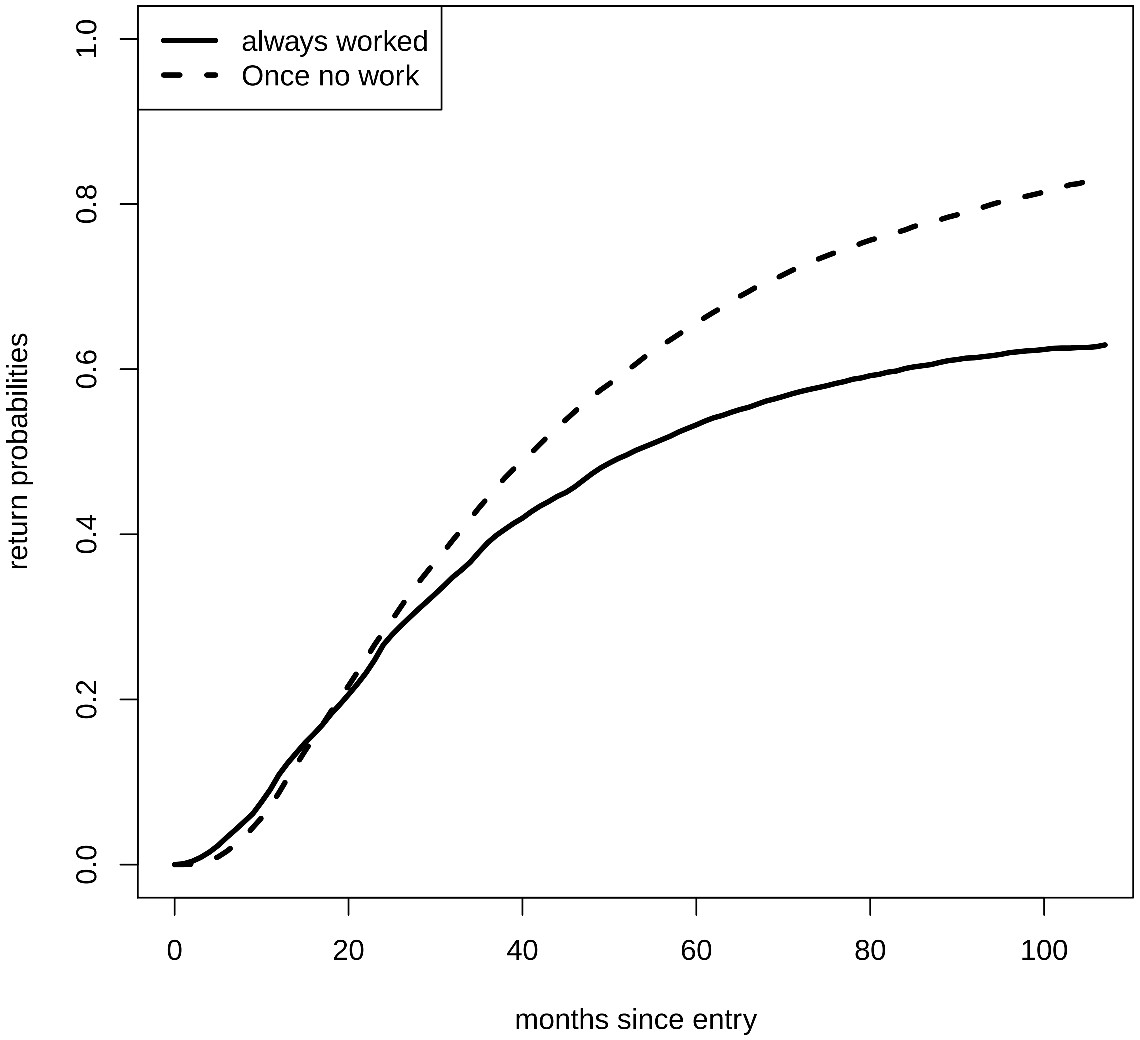
4.1 The restricted model

In order to gain a first descriptive impression of the effect of the incidence of unemployment on migrants' return, we compare the Kaplan Meier estimates for the group of immigrants who always work and those who have experienced unemployment once (at the date of their return, the latter might be either still unemployed or are re-employed). For short durations, this comparison is of course distorted, as immigrants who experience changes in their labour market status must have stayed for a sufficiently long period to allow such events to take place.

Figure 3 depicts the Kaplan Meier estimates for all immigrants (the plots for each immigrant group look similar). It is evident that for durations above 20 months unemployment seems to have a significant effect on return probabilities. The size of the effect seems to increase in the duration of stay. We proceed from this descriptive analysis to the analysis of the causal effect based on our empirical model.

We focus first on the incidence of labour market events by setting the varying duration and heterogeneity impacts to zero, $\alpha_k = \phi_k = 0$, and refer to this as the "Timing-of-Events Model 1". It nests the PH model for return migration that ignores unobservable heterogeneity altogether, $\theta_m^{PH}(t|t_u, t_e, x_m(t)) = \exp(x_m(t)\beta_x^m + I_u(t)\gamma_u +$

Figure 3: Kaplan Meier estimates of return probabilities by labour market experience



$I_r(t)\gamma_e)$, whereas the MPH model, $\theta_m^{MPH}(t|t_u, t_e, x_m(t), v_m) = v_m\theta_m^{PH}(t|t_u, t_e, x_m(t))$ ignores the correlation between λ_m and (λ_u, λ_e). The coefficients of interest are the causal effects given by γ_u and γ_e.

To help interpret these coefficients, consider the PH model for two reference immigrants (with $\beta_x^m = 0$), and assume that immigrant a suffers an unemployment spell at time t_1 that is ongoing at time t, whereas immigrant b is employed throughout. Since the survival probability is $\Pr\{T_m > t\} = \exp\left(-\int_0^t \theta_m^{PH}(s)\, ds\right)$, the ratio of the survival probabilities is

$$\frac{\Pr\{T_m^a > t\}}{\Pr\{T_m^b > t\}} = \exp\left(-[\exp(\gamma_u) - 1] \int_{t_1}^{t} \lambda_m(s) ds\right).$$

Thus we observe an unemployment duration effect, but its coefficient $-[\exp(\gamma_u)-1]$ is constant. If, say, $\gamma_u = 1.045$, this coefficient is 1.84 and exits from the Netherlands are relatively much faster. Note that for the other two models, the conditional survival probabilities need to be integrated with respect to the distribution of v.

Table 4: The impact of the incidence of labour market events on return-migration hazards

	EU 15	new EU	non-EU DCs	non-EU LDCs	EU 15	new EU	non-EU DCs	non-EU LDCs
	Unemployment				*Re-employment*			
PH-model	1.045^{**}	0.938^{**}	0.103	1.400^{**}	-0.179^{**}	0.203^{**}	-0.370^{**}	-0.383^{**}
	(0.095)	(0.192)	(0.219)	(0.300)	(0.027)	(0.062)	(0.078)	(0.061)
MPH-model	1.144^{**}	0.967^{**}	0.267	1.501^{**}	-0.163^{**}	0.217^{**}	-0.332^{**}	-0.367^{**}
	(0.099)	(0.193)	(0.239)	(0.307)	(0.029)	(0.063)	(0.088)	(0.064)
Timing of Events model 1	0.778^{**}	0.684^{**}	0.223	1.207^{**}	-0.091^{+}	0.277^{**}	-0.356^{**}	-0.093
	(0.105)	(0.197)	(0.237)	(0.314)	(0.038)	(0.069)	(0.125)	(0.083)

$^{+}p < 0.05$ and $^{**}p < 0.01$

Table 4 reports the estimates of the causal effects given by γ_u and γ_e. The simple PH model already demonstrates the importance of labour market events on return migration. In all cases (except one) does the incidence of an unemployment spell significantly increase return probabilities, and the event of finding employment increases migration durations. Extending this model to incorporate (uncorrelated) unobserved heterogeneity has only a small effect on the estimated causal effect.

However, taking into account the correlated unobserved heterogeneity in the timing-of-events model has a substantial effect on the estimates. The estimated effect is typically smaller in magnitude than for both PH and MPH models. For instance, as regards the incidence of unemployment for EU15 immigrants, the MPH estimate is 1.144 whereas our model estimate is .778, the two differing by a factor of 1.47. We conclude that ignoring the endogeneity issue would result in substantial selectivity biases.

4.2 The full model

Building on the insights of the timing-of-events model 1, we first allow the durations of the labour market events to impact on immigration durations more flexibly. This is implemented non-parametrically by modelling the sequence $\{\alpha_k\}$ as piece-wise constant functions. Thus, in model 2 we have $\gamma_u = \gamma_e = 0$ and $\phi_u = \phi_e = 0$. Finally, in model 3 we further allow the effect to be heterogeneous across migrants in terms of z_u and z_e which measure demographics and previous labour market history. For the sake of expositional clarity, we present the effect of the unemployment and the re-employment spells in Tables 5 and 6 separately, although it is clear from equation (6) that these are estimated simultaneously. For ease of reference, the panels labelled 'model 1' report again the results of the last row of Table 4. For the sake of brevity, we do not discuss the coefficients of the covariates x_k which are only of secondary importance.[9]

[9]The estimates are, of course, available from the authors. The covariates include extensive measures of demographics, a non-parametric function of income, housing descriptors, sector dummies, cohort effects measured by the year of entry, and controls for macro effects.

Table 5: The estimated causal effect of becoming unemployed on return migration hazards

	Model 1				Model 2				Model 3			
	EU 15	new EU	non-EU		EU 15	new EU	non-EU		EU 15	new EU	non-EU	
			DCs	LDCs			DCs	LDCs			DCs	LDCs
Constant effect $[\gamma_u]$	0.778**	0.684**	0.223	1.207**								
	(0.105)	(0.197)	(0.237)	(0.314)								
Duration dependence $[\alpha_u]$:												
(0-3 months)					0.643**	0.585**	0.379	1.261**	0.865**	1.814**	0.108	1.058**
					(0.106)	(0.202)	(0.222)	(0.308)	(0.117)	(0.272)	(0.241)	(0.326)
(3-6 months)					0.658**	0.910**	0.282	1.406**	0.983**	2.054**	0.047	1.183**
					(0.107)	(0.206)	(0.224)	(0.311)	(0.119)	(0.275)	(0.243)	(0.328)
(6-12 months)					0.517**	0.698**	−0.214	1.358**	0.939**	1.752**	−0.423	1.116**
					(0.107)	(0.211)	(0.226)	(0.314)	(0.119)	(0.277)	(0.244)	(0.328)
(> 1 year)					0.312**	0.748**	−0.509+	1.575**	1.009**	1.562**	−0.671**	1.315**
					(0.117)	(0.226)	(0.224)	(0.328)	(0.123)	(0.278)	(0.243)	(0.336)
Labour market history $[\phi_u]$:												
Repeated unemployment									−0.198**	−0.523+	0.067	−0.459**
									(0.057)	(0.205)	(0.232)	(0.145)
Order of unemployment spell									−0.186**	−0.046	−0.216	−0.156
									(0.032)	(0.126)	(0.182)	(0.083)
Duration of previous employment spell:												
< 3 m.									−0.302**	−0.235+	0.065	−0.016
									(0.043)	(0.117)	(0.122)	(0.103)
$3-6$ m.									−0.338**	−0.081	0.116	−0.119
									(0.043)	(0.103)	(0.087)	(0.096)
> 1 yr									−0.318**	−0.189+	0.032	−0.153+
									(0.036)	(0.092)	(0.064)	(0.072)

Notes: The model equations are given by (1) to (3), the likelihood is given by (6). SE in parentheses. $^+$: $p < 0.05$ and ** : $p < 0.01$. Model 3 covariates (z) also include demographics (sex, married, number of children, age group dummies, and cohort effects measured by the year of entry). Reference category for employment durations: $6-12$ months. ‘order of unemployment spell’ refers to the second, third etc. unemployment spell.

4.3 The Causal Effects of Becoming Unemployed on Return Migration Hazards

The estimated causal effects of unemployment spells on return migration hazards are reported in Table 5. Across all three specifications and all immigrant groups it is evident that unemployment dynamics shorten migration durations.

We recall that the average effect γ_u for the all groups of immigrants estimated in Model 1 is substantial except for immigrants from non-EU DCs, the significant point estimates ranging from 0.68 to 1.2. Models 2 and 3 reveal that the causal effect exhibits duration dependence. For EU migrants, the impact peaks for durations of 3-6 months. For non-EU migrants, the picture is more heterogeneous, as duration dependence increases for immigrants from LDCs, whereas the coefficients remain insignificant for the others. Further permitting the causal effect to vary across characteristics (demographics and labour market history) increases the magnitude of the duration effects for EU immigrants. This follows, in particular, since the duration of the preceding employment spell lengthens the migration spell. By contrast, the effect of the previous labour market history is found to be insignificant for non-EU DC immigrants.

4.4 The Causal Effects of Becoming Re-employed on Return Migration Hazards

Finding employment after a period of unemployment is a positive labour market event which is likely to impact also on migration durations. Table 6 reports the results. For all except non-EU LDC immigrants, the effect of having found employment after an unemployment spell delays the migrant's return. The effect is particularly strong for immigrants from developed countries outside the EU. Previous unemployment durations only exhibit an effect if these were no longer than 3 months, indicating that such unemployment spells were anomalies which were quickly overcome by the individual. The one immigrant group which deviates from this pattern of extended migration durations are immigrants from the new EU, i.e. predominantly Polish immigrants. The estimated causal impact of re-employment for this group, however, is consistent with target savings: having re-gained employment, it is plausible that such immigrants are back on track to reach their savings target and return once this has been attained.

Table 6: Estimated causal effect of re-employment on return migration hazards.

	Model 1				Model 2				Model 3			
	EU 15	new EU	non-EU		EU 15	new EU	non-EU		EU 15	new EU	non-EU	
			DCs	LDCs			DCs	LDCs			DCs	LDCs
Constant effect $[\gamma_e]$	-0.091^{+}	0.277^{**}	-0.356^{**}	-0.093								
	(0.038)	(0.069)	(0.125)	(0.083)								
Duration dependence $[\alpha_e]$:												
(0-3 months)					-0.222^{+}	0.298^{**}	-0.233	-0.327^{+}	-0.096	0.339	-0.164	-0.302
					(0.089)	(0.113)	(0.182)	(0.147)	(0.082)	(0.205)	(0.253)	(0.186)
(3-6 months)					0.017	0.454^{**}	-0.190	0.000	0.127	0.532^{+}	0.132	0.085
					(0.088)	(0.122)	(0.192)	(0.142)	(0.083)	(0.209)	(0.260)	(0.185)
(6-12 months)					-0.042	0.203	-0.097	-0.102	0.083	-0.319	0.054	0.038
					(0.080)	(0.119)	(0.145)	(0.123)	(0.077)	(0.211)	(0.229)	(0.172)
(> 1 year)					-0.315^{**}	0.194	-0.641^{**}	-0.390^{**}	-0.242^{**}	0.357	-0.626^{**}	0.140
					(0.058)	(0.108)	(0.119)	(0.095)	(0.072)	(0.210)	(0.214)	(0.158)
Labour market history $[\phi_e]$:												
Repeated re-employment									0.068	0.327	-0.073	0.261
									(0.091)	(0.214)	(0.586)	(0.202)
Order of re-employment spell (> 1)									-0.194^{**}	-0.055	-0.318	-0.097
									(0.051)	(0.125)	(0.423)	(0.107)
On benefit									-0.431^{**}	-0.825^{**}	0.048	-0.570^{**}
									(0.085)	(0.314)	(0.284)	(0.210)
Duration of previous unemployment spell:												
< 1 m.									-0.406^{**}	-0.332^{+}	-0.128	-0.281
									(0.080)	(0.165)	(0.285)	(0.174)
$1-2$ m.									-0.284^{**}	-0.138	0.298	-0.580^{**}
									(0.079)	(0.173)	(0.248)	(0.195)
$2-3$ m.									-0.185^{+}	0.100	-0.037	-0.164
									(0.080)	(0.168)	(0.252)	(0.172)
$6-12$ m.									0.030	-0.179	0.294	-0.279
									(0.080)	(0.188)	(0.226)	(0.184)
> 1 yr									0.079	-0.162	-0.444	-0.218
									(0.101)	(0.238)	(0.305)	(0.240)

Notes: As for Table 5. Reference category for re-employment durations: $3-6$ months. 'order of re-employment spell' refers to the second, third etc. re-employment spell.

4.5 Quantifications: Impacts on Immigration Durations

We proceed to illustrate the impact of labour market histories on migrants' return probabilities. Specifically, we take the coefficient estimates of the return migration hazard models λ_m and consider, for each immigrant group, several labour market profiles. For simplicity, we abstract first from observable individual heterogeneity and focus on the 'reference' immigrant by setting the covariate coefficients β_x^m, ϕ_u, and ϕ_e in equation (3) to zero. The object of interest is the return probability $1 - Pr\{T_m > t\}$ where $Pr\{T_m > t\} = E_{v_m}\{\exp\left(-\int_0^t \theta_m(s)\, ds\right)\}$ is the the survival probability. The expectation is taken over unobserved heterogeneity v_m, recalling that T_m is the sojourn time in the host country. We consider variations in unemployment durations, in the timing of unemployment spells, and conclude with an analysis of counterfactuals.

4.5.1 The impact of Unemployment Durations

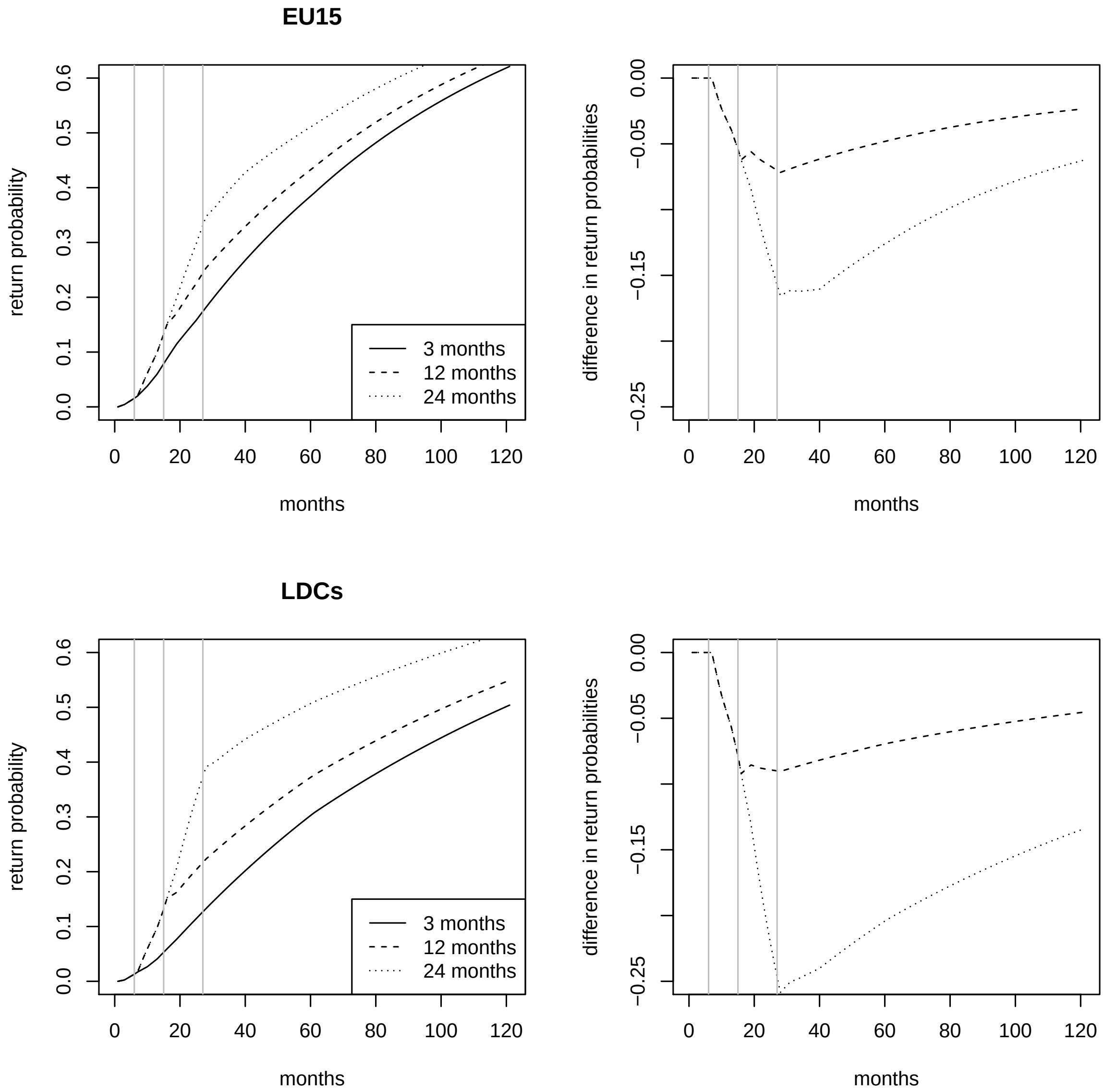
We compare the impact of unemployment durations of 3, 12, and 24 months, whereupon immigrants, who are still in the host country, experience a reversal of fortunes and find employment again. As migration durations also depend on the timing of the unemployment spells, we consider a common starting point, namely all unemployment spells start three months after entry into the Netherlands in 2003.

Figure 4 depicts the results for immigrants from the EU15 and from the non-European LDCs. The three vertical lines indicate the end of the respective unemployment spell (3 months plus the duration of the completed unemployment spell). As unemployment spells coincide over the considered three profiles, it is clear that the associated return probabilities must also coincide. To facilitate the comparison between the return probabilities, we also plot in the right panel the difference between the return probabilities associated with the longer unemployment durations and with the reference unemployment duration of 3 months.

The figure illustrates again, first that unemployment spells increase return probabilities, and second that the magnitude of the impact increases in the unemployment duration. Relative to the reference return probabilities associated with the 3 month unemployment spell, the largest difference occurs at the time the respective unemployment spell comes to an end (at times 3+12 and 3+24 months), whence return

Figure 4: The effect of unemployment spells on return probabilities

(i) Time units are months after entry into the Netherlands; (ii) all unemployment spells start in month 4, and vertical lines refer to the end of the respective unemployment spell; (iii) we consider unemployment spells of length 3 months (solid lines), 12 months (dashed lines), and 24 months (dotted lines); (iv) for the right panel, the reference category is the return probability function associated with 3 months of unemployment.

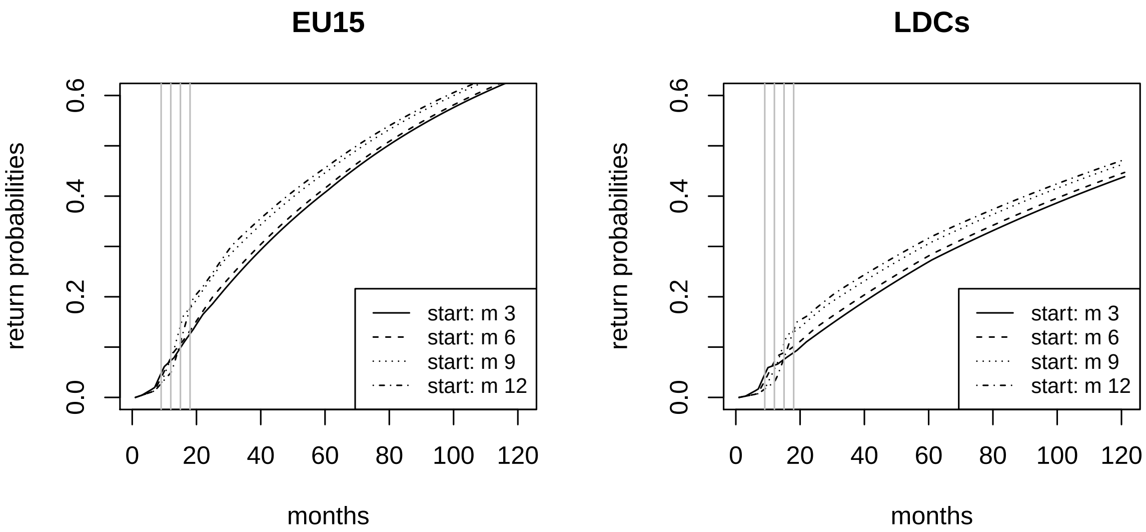


probabilities start to converge again.

Finally, the figure also illustrates the difference between the different immigrant groups, both in terms of the absolute values of the return probabilities (left panels), as well as the relative differences (right panels). In particular, the maximal difference in return probabilities for immigrants from the EU15 (LDCs) for unemployment durations 3 and 12 is 0.06 (0.09), and for the unemployment durations of 3 and 24 months is 0.14 (0.26). Hence the impact of longer unemployment durations from immigrants from LDCs is substantially larger.

4.5.2 The Effect of the Timing of the Unemployment Spell

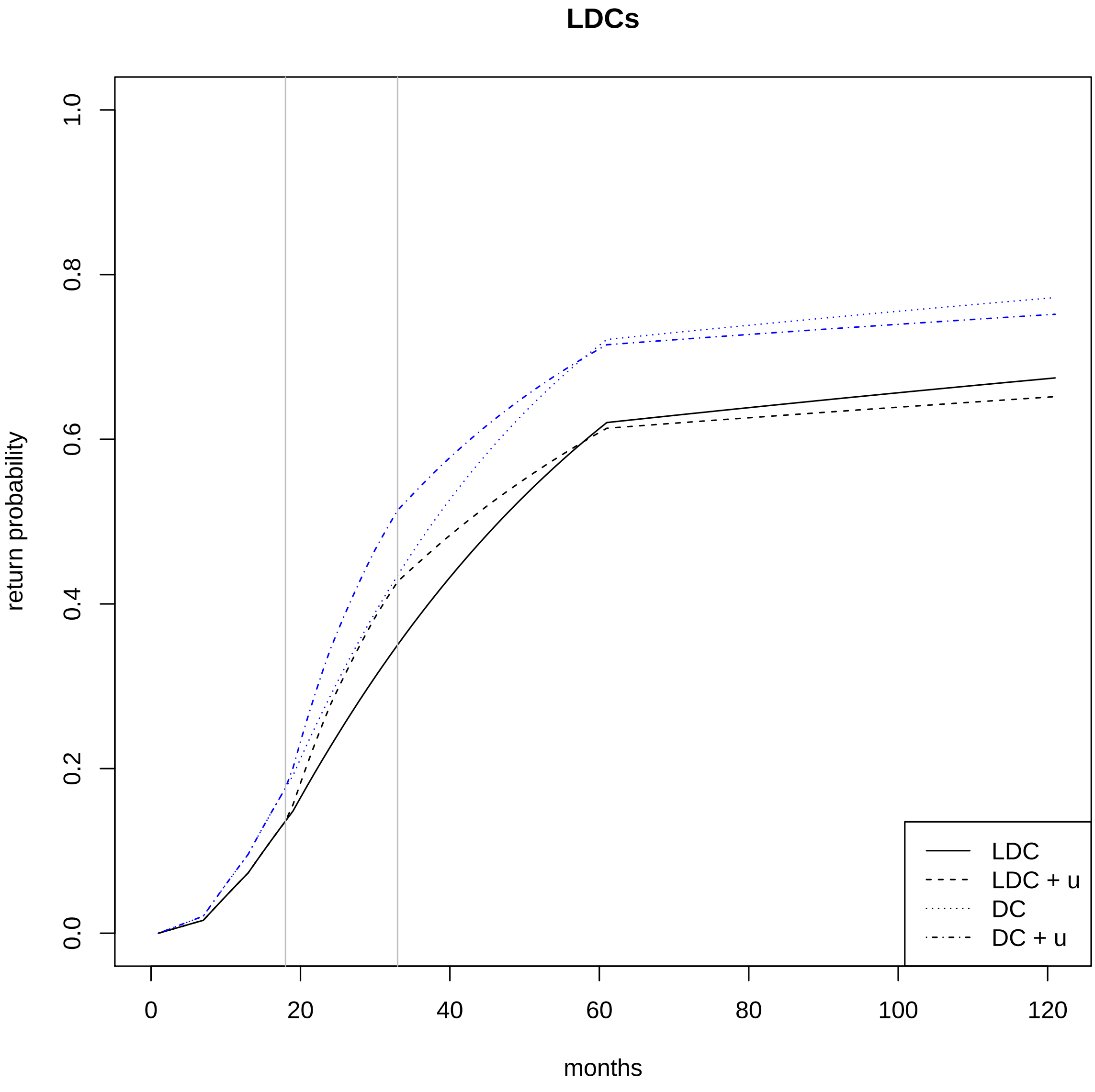
Figure 5: The effect of the timing of unemployment spells on return probabilities
(*i*) Time units are months after entry into the Netherlands; (*ii*) all unemployment spells are of length 6 months, and vertical lines refer to the end of the respective unemployment spell; (*iii*) we consider unemployment that start in month 3 (solid lines), in month 6 (dashed lines), in month 9 (dotted lines) and in month 12 (dashed–dotted lines).



In order to assess the effect of the timing of an unemployment spell, we consider spells of a common length of 6 months, with start times at 3, 6, 9, and 12 months after entry into the Netherlands. Figure 5 displays the results. For survivals of at least 20 months, it is clear that while later starts of the unemployment spells have larger impacts on the return probabilities, the differences are fairly small. For instance, for immigrants from the EU15, the maximal difference between the return probabilities associated with the earliest and the latest start of the unemployment spell is .06, whereas this becomes .05 for immigrants from LDCs. Hence this difference between the immigrant groups is fairly small.

4.5.3 Counterfactual Analysis

Figure 6: Counterfactual analysis: LDC immigrants with average DC characteristics
Notes: as for Figure 5.



As policy makers in developed host countries often seek to attract higher 'quality' immigrants, it is of interest to consider the impact of imputed 'quality improvements' on return probabilities by essentially comparing outcomes for immigrants from non-European LDCs with average LDC characteristics and with average DC characteristics (holding thus constant the covariate coefficients of the return migration hazard model). Compared to the two previous exercises, the coefficient vector β_x^m is not zero and given by the estimates for the model for immigrants from LDCs. Average covariate values are reported in Table 9 in the Data Appendix. In particular, we consider single male wage earners in the service sector who do not own a house, who are averaged aged (31.6 vs. 35), and who earn average wages when employed (€2,751 vs. €5,476).

While covariates have a direct impact on return, they also, of course, affect unemployment propensities. To isolate the direct covariate effect, in Figure 6 the lines labelled 'LDC' and 'DC' depict the return probabilities for LDC immigrants with the respective covariate profile who are continuously employed. The additional unemployment effect is indicated by the line '+u' and computed as follows: Based on the results of Tables 1 and 2, we compute the expected return probability, weighted by the probability of being always employed (62.1% vs. 64%). For the survival probability conditional on having been unemployed, we assume that the unemployment spell starts at the average first employment length (17 months), and lasts the average length (13 months). As Table 2 revealed, there is little difference between immigrants from LDCs and DCs in terms of the last two outcomes.

Figure 6 reveals that the unemployment effect is very small, and the difference in profiles is driven by the direct covariate effect, which is dominated by the difference in average earnings. If the considered average immigrant from LDCs were to earn, on average, as immigrants from DCs when employed, then migration return probabilities would be higher, but the increase in the return probability would not exceed 13 percentage points. It is in this sense that improved immigrant 'quality' would increase migrants' return propensities.

4.6 Sensitivity checks

Our modelling approach assumes that unobserved heterogeneity v is time invariant. One concern is that this might not be valid for individuals who experience multiple labour market transitions.[10] However, we cannot condition on the experience of only one unemployment spell because of the ensuing selection bias. We address this concern by truncating the data at 36 months since entry, a period which is sufficiently long to allow labour market events to take place while at the same time being sufficiently short to make multiple transitions less likely.

The left panel of Figure 7 depicts the estimates of the Kaplan Meier estimates of unemployment probabilities and the imposed cut-off date. The plot illustrates, as did our earlier descriptive tables, (i) the substantial unemployment risk experienced by all immigrant groups, and (ii) the importance of stratification by immigrant group. Table 7 reports, for this restricted data, the estimates of Models 1-3, concentrating for reasons of space on the estimates of the causal impact coefficients γ_k and α_k.

The results for the restricted durations are similar to those for the unrestricted sample reported in Tables 5 and 6. The coefficients have undergone only small changes without affecting the qualitative conclusions. The right panel of Figure 7 illustrates the effect of the change in the coefficients brought about by the truncation at month 36. These are assessed, as in the duration experiment of Section 4.5.1, in terms of the effect on return probabilities for the representative immigrant, assuming an unemployment spell of 12 months that starts in month 3. For EU15 immigrants, there is a small effect on return probabilities for the higher durations, whereas for LDC immigrants there is no discernable difference.

[10] We our grateful to our editor for suggesting this robustness exercise.

Figure 7: Assessing the impact of truncating immigration durations at month 36.
Notes. Left panel: Kaplan Meier estimates of employment probabilities. Right panel: Impacts on return probabilities for unemployment spells of 12 months that start in month 3 (broken lines pertain to the estimates based on the truncated data at month 36, the solid lines are based on the unrestricted data).

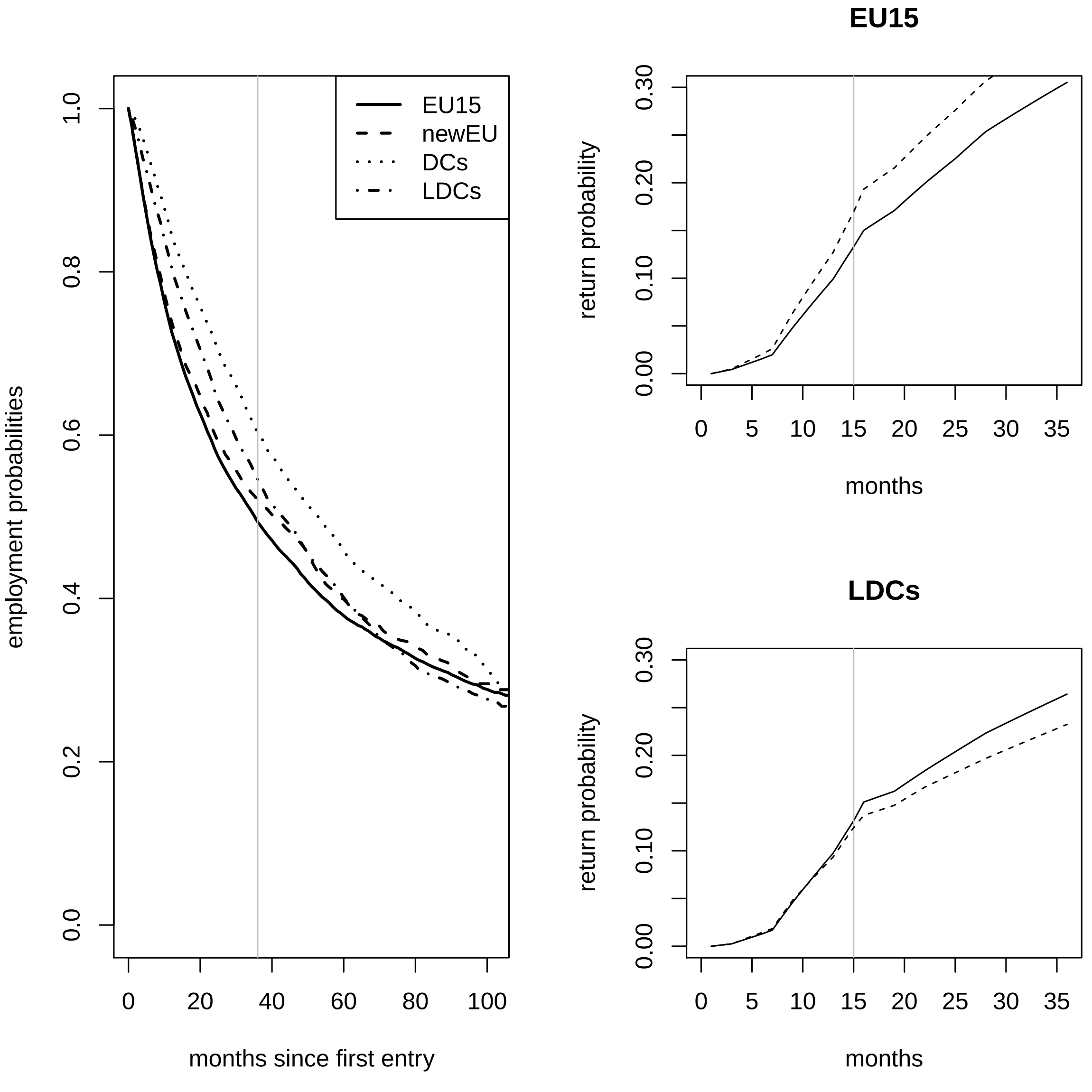


Table 7: Sensitivity analysis: migration durations less than 3 years.

	Model 1				Model 2				Model 3			
	EU 15	new EU	non-EU		EU 15	new EU	non-EU		EU 15	new EU	non-EU	
			DCs	LDCs			DCs	LDCs			DCs	LDCs
	Estimated causal effect of unemployment on return migration hazards											
Constant effect [γ_u]	0.574**	0.665**	0.324	1.234**								
	(0.129)	(0.213)	(0.280)	(0.378)								
Duration dependence [α_u]:												
(0-3 months)					0.700**	0.570**	0.078	1.180**	0.756**	1.837**	−0.160	1.015**
					(0.120)	(0.218)	(0.257)	(0.373)	(0.135)	(0.326)	(0.282)	(0.394)
(3-6 months)					0.818**	0.893**	0.007	1.223**	0.861**	2.101**	−0.215	1.014**
					(0.124)	(0.223)	(0.259)	(0.377)	(0.138)	(0.329)	(0.284)	(0.396)
(6-12 months)					0.721**	0.645**	−0.561*	1.049**	0.766**	1.805**	−0.758**	0.789+
					(0.127)	(0.227)	(0.264)	(0.381)	(0.140)	(0.335)	(0.290)	(0.398)
(> 1 year)					0.826**	0.666**	−0.781**	1.007**	0.946**	1.713**	−1.010**	0.632
					(0.139)	(0.246)	(0.268)	(0.395)	(0.149)	(0.354)	(0.300)	(0.406)
	Estimated causal effect of re-employment on return migration hazards											
Constant effect [γ_e]	−0.008	0.341**	0.310	−0.071								
	(0.051)	(0.080)	(0.176)	(0.100)								
Duration dependence [α_e]:												
(0-3 months)					−0.163+	0.329**	0.188	−0.101	−0.025	0.576**	−0.079	−0.027
					(0.076)	(0.122)	(0.227)	(0.166)	(0.103)	(0.223)	(0.321)	(0.239)
(3-6 months)					0.091	0.560**	0.309	0.116	0.244+	0.814**	−0.003	0.259
					(0.074)	(0.131)	(0.246)	(0.170)	(0.103)	(0.227)	(0.330)	(0.242)
(6-12 months)					0.039	0.219	0.460+	−0.149	0.209+	−0.474+	0.082	0.048
					(0.065)	(0.140)	(0.215)	(0.166)	(0.098)	(0.235)	(0.308)	(0.240)
(> 1 year)					−0.339**	0.211	0.288	−0.270	−0.151	0.488	−0.105**	0.019
					(0.072)	(0.182)	(0.268)	(0.173)	(0.106)	(0.262)	(0.330)	(0.252)

Notes: As for Table 5.

5 Conclusion

The majority of recent labour immigration to the Netherlands is temporary rather than permanent. Across all immigrant groups, a substantial proportion leave the host country eventually, and many do so within 24 months. We have considered in this paper the individual labour market drivers of immigration durations.

Despite this extent of temporary immigration, the interdependence of labour market events and immigration durations has received little attention in the empirical literature, mainly because of severe data limitations. We have addressed this gap using a unique Dutch administrative panel of the entire population of recent labour immigrants. Hence the usual concerns about immigrant data (small samples, missing covariates, latent migrant types, inaccurate measurement and recall) are absent, as we observe entry, exit, migration motive, and complete labour market histories. Moreover, the large size of the data enables us to estimate separate models for distinct immigrant groups, and we have shown the importance of controlling for observable migrant heterogeneity.

The principal methodological challenge arises, however, from unobservable heterogeneity that is correlated across the migration and the labour market processes. The timing of events method enables us to control for the selectivity of returnees, and thus to identify and estimate the causal effects of employment and unemployment histories on migration durations. Simpler models which ignore error correlations across labour market and migration processes are shown to exhibit substantial selection biases.

Overall, we have found that, across all immigrant groups, the unemployment duration raises the return probability, while employment spells following unemployment spell delay the return for all migrants except for those from the new EU countries. The causal impact of labour market dynamics is quantified in terms of migration durations in several experiments, focussing on the duration and timing of unemployment spells, and, in a counterfactual analysis, the effect of improved immigrant "quality". These experiments show that the unemployment durations have a substantial effect (as depicted by Figure 4), while the effect of differences in timing and "quality" are relatively smaller (as depicted by Figure 5). The unemployment dynamics modeled in these illustrations induce migrants' return probabilities to increase by between 6 and 26 percentage points.

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A Data Appendix

Table 8 explains the sub-populations of labour immigrants, and disaggregates these according to the country of birth. For countries outside the EU, we distinguish between developed (DCs) and less developed countries (LDCs). Among the EU15, immigrants from the UK and Germany predominate, for the new EU 69% are Polish immigrants. In the non-EU group, the three largest subgroups are from the USA, India and Japan. Overall immigrants from non-EU LDCs are the second largest group.

Table 8: Major country of birth

EU 15		new EU		non-EU			
				DCs		LDCs	
UK	27.4%	Poland	69.1%	USA	38.5%	India	19.2%
Germany	18.5%	Romania	10.1%	Japan	26.8%	China	10.2%
France	9.3%	Czechoslovakia	7.4%	Australia	10.1%	South Africa	7.8%
Portugal	8.4%	Hungary	6.0%	Canada	8.1%	Brasil	3.7%
Italy	8.2%	Bulgaria	5.4%	South Korea	4.9%	Taiwan	3.5%
Belgium	7.1%	Lithuania	0.8%	Norway	4.1%	Morocco	2.9%
Spain	5.7%			Switzerland	3.8%	rest Africa	17.6%
Greece	4.3%			New Zealand	3.1%	rest Asia	13.9%
Ireland	3.0%					Latin America	10.0%
Sweden	2.9%						
Denmark	1.8%						
Finland	1.8%						
Austria	1.3%						
$N =$	48,290	12,717		11,746		16,974	

This grouping also corresponds to the varying degrees of labour mobility among the four groups.[11] Immigrants from the EU15 can move freely in the Dutch labour market, as can, since 2004, immigrants from the new EU except for Bulgarians and Rumanians. All non-EU migrants need a work permit (the “Machtiging Voorlopig Verblijf (MVV)” or “Regular Provisional Residence Permit”). LDCs and DCs differ in that immigrants from these DCs are exempted from obtaining this MVV before entry. To obtain a work permit, three conditions must be met: (i) the presence of prioritised supply (i.e. a labour market check), and the recruitment efforts of the employer to fill the position with a native; (ii) renumeration in accordance with the market, and at least at the level of the statutory minimum wage; (iii) having secured adequate accommodation. Although self-employed migrants are exempted from the work permit requirement, residence permits are only granted if the authorities deem that the immigrant would serve ‘vital’ Dutch interest. The work permit is linked to

[11] The relevant Dutch laws are posted at `http://ec.europa.eu/justice/doc_centre/citizenship/movement/doc/netherlands_table_of_correspondence_en.pdf`

the specific job, and thus not portable by the migrant across jobs.

Immigrants from the EU15 gain rapidly the same employment and benefits rights as natives, essentially after 3 months of full-time employment. By contrast, all other immigrants have to gain permanent residentship before gaining these rights, the qualifying period for which is essentially 5 years of continuous full-time employment.

Work contracts can be either permanent or temporary. Temporary contracts are essentially contracts with a maximum duration of up to three years, after which point they would legally become permanent. Temporary contracts, because they are legally of a fixed term, do not require an advanced notice of termination (which is at least one month for permanent contracts) They are renewable, but the employer has to reapply for a work permit in case of non-EU immigrant employee (having obtained the original permit in the first place, this should not be too difficult to achieve in practice). Having lost a job, non-EU immigrants without permanent residence have about 3 months to find another job before they lose the right to stay in the Netherlands.

Our data does not include information about the type of work contract held by the immigrant. The incidence of temporary contract is, however, reported in Sà (2008, p.34) based on the EU LFS for 2005: among recent male immigrants with residentship below 5 years, the share of temporary contracts is about 32%, and converges to the share of around 9% for natives as migration durations increase beyond 10 years. It is likely that 32% is an overestimate for our data, since we only consider labour immigrants whereas Sà cannot separate out working family migrants who are more likely to be on fixed-term contracts (see also Appendix B).

In the light of this discussion of the legal context, month 36 and 60 since first entry to the Netherlands are potentially meaningful as they might be associated with potential status changes. However, the Kaplain Meier estimates of the return probabilities depicted in Figure 2 do not suggest jumps around these dates for any immigrant group. We interpret this as evidence that these issues do not threaten the validity of the no-anticipation assumption.

Table 9 reports some summary statistics for the sub-populations. The migrant groups look fairly similar in terms of the age distribution and occupational choices. Relative to EU15 and new EU migrants, non-EU DC migrants are more often male,

Table 9: Descriptive statistics at first entry

	EU15	new EU	non- EU DCs	non- EU LDCs
# of migrants	48,290	12,717	11,746	16,974
Female	33.1%	29.6%	22.2%	23.3%
Single	80.3%	72.7%	56.8%	71.3%
Married	17.1%	25.9%	42.2%	27.5%
Divorced	2.5%	1.3%	0.9%	1.2%
Other origin	16.2%	15.4%	19.6%	37.0%
Age				
18–25	20.5%	26.1%	9.5%	16.0%
25–30	29.7%	31.0%	22.7%	31.9%
30–35	21.1%	18.0%	22.4%	23.0%
35–40	12.4%	10.0%	17.3%	13.1%
40–45	7.6%	6.9%	12.0%	8.2%
45–50	4.5%	5.0%	7.8%	4.6%
50–55	2.7%	2.2%	5.3%	2.2%
55–60	1.2%	0.7%	2.5%	0.8%
60–65	0.2%	0.1%	0.5%	0.2%
Average	31.3	30.3	35.0	31.6
Housing				
house owned	34.1%	33.9%	27.4%	28.1%
value house < 100k	30.6%	19.5%	14.9%	26.7%
value house 100–200k	38.0%	36.3%	37.8%	37.5%
value house 200–300k	13.0%	16.1%	19.8%	15.6%
value house 300–400k	5.2%	6.0%	10.7%	5.4%
value house > 400k	5.3%	8.1%	10.6%	6.4%

married, less often own a house, and have a substantially larger share among the highest income group (recall that we require that the labour immigrant be employed within three months of their entry). Remarkable about migrants from the new EU states (69% of whom are Polish) is the fact that income is fairly homogeneous, with 36% in the first and 44% in the second income group.

Table 9: Descriptive statistics at first entry (continued)

	EU15	new EU	non-EU	
			DCs	LDCs
monthly income				
0 - 1000	32.5%	35.9%	21.5%	31.1%
1000 - 2000	26.2%	44.2%	12.0%	24.0%
2000 - 3000	18.2%	12.3%	12.7%	16.8%
3000 - 4000	7.6%	3.7%	8.9%	9.9%
4000 - 5000	3.9%	1.3%	6.8%	5.2%
5000 - 6000	2.9%	0.7%	6.0%	3.2%
> 6000	8.5%	1.4%	31.9%	9.7%
Average	€2517	€1484	€5476	€2751
Sector				
Agriculture	1.1%	5.7%	0.4%	1.2%
Industry	11.9%	9.6%	12.5%	8.9%
Construction	1.8%	1.9%	0.5%	0.6%
Catering	6.3%	2.1%	3.8%	4.2%
Trade	13.4%	9.9%	20.1%	10.8%
Transport	5.2%	3.5%	7.1%	3.8%
Finance	3.0%	1.8%	5.9%	3.7%
Services	42.5%	43.7%	33.9%	49.5%
Education	6.0%	5.5%	6.7%	10.1%
Care	2.8%	1.8%	2.0%	3.0%
Nonprofit	2.9%	1.7%	5.5%	2.6%

B Appendix: Labour Migrants versus other Migrant Types

This appendix compares labour migrants to migrants who reported different immigration motive at entry to the authorities (which must also be consistent with their visa status). Tables 10 and 11 report population shares, return and labour market behaviour, as well as demographic and socio-economic characteristics. The largest group is composed of family migrants (32 %), and the descriptive statistics make it evident that they are *systematically different* from labour migrants. In particular, they have a substantially larger propensity to remain in The Netherlands (75% compared to 51 %), and a significantly weaker attachment to the labour market (44% compared to 0% are never employed during the observation window). Figure 8 depicts the differences in return probabilities between the two groups. Finally, Table 11 reveals that family migrants are also demographically different, originating pre-dominantly from LDCs, being married and female, and having substantially lower household income. Similar comments apply to the other migrant groups. It is for these reasons that we have focused exclusively on labour migrants.

Table 10: Descriptive dynamics by migration motive

	Labour	Family	Study	Asylum	Other	Unknown
# migrants	94,270	186,811	73,596	62,006	35,689	68,335
Share	26%	32%	13%	11%	6%	12%
Stayer[a]	51%	75%	51%	60%	57%	62%
Never employed	0%	44%	70%	60%	58%	46%
Employed within 3 months	100%	20%	11%	7%	22%	28%

Non-Dutch immigrants aged 18-64 entering the Netherlands in 1999-2007.

[a] Stayers are migrants who remain in the country until the end of the observation period.

Table 11: Descriptive statistics: comparison of migrants by migration motive (at entry)

	Labour	Family	Study	Asylum	Other	Unknown
Female	29%	69%	49%	36%	65%	49%
Married	24%	51%	3%	32%	14%	18%
Single	74%	44%	97%	65%	81%	76%
Divorced	2%	4%	0%	1%	4%	5%
Age						
18–25	19%	31%	53%	29%	42%	41%
25–30	30%	26%	25%	23%	23%	17%
30–35	21%	18%	12%	18%	12%	12%
35–40	13%	11%	6%	12%	8%	9%
40–45	8%	7%	3%	8%	5%	7%
45–50	5%	4%	1%	4%	3%	5%
50–65	4%	3%	1%	5%	6%	9%
Average	32	30	26	31	29	30
monthly income						
no income	17%	91%	92%	96%	85%	68%
€0 - €1000	14%	4%	4%	3%	7%	21%
€1000 - €2000	26%	3%	2%	1%	4%	6%
€2000 - €3000	16%	1%	1%	0%	2%	3%
€3000 - €4000	8%	0%	0%	0%	1%	1%
€4000 - €5000	4%	0%	0%	0%	0%	1%
€5000 - €6000	3%	0%	0%	0%	0%	0%
> €6000	11%	0%	0%	0%	0%	1%
Average	€2802	€1714	€1707	€701	€1573	€1339
Country of birth						
EU 15	54%	13%	17%	0%	25%	23%
new EU	14%	10%	12%	1%	19%	2%
non-EU: DC's	13%	8%	10%	0%	14%	5%
non-EU: LDC's	19%	49%	54%	75%	35%	68%
# migrants	94,270	186,811	73,596	62,006	35,689	68,335

Non-Dutch immigrants aged 18-64 entering the Netherlands in 1999-2007.

Figure 8: Kaplan Meier estimates of return probabilities labour migrants versus family migrants