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ABSTRACT

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We analyse postwar Dutch migration to New Zealand. We document that history, reflect on analytical and econometric modelling and then combine a sample of Dutch migrants in New Zealand with a representative sample of Dutch in The Netherlands to estimate wage equations simultaneously with the migration decision. We use the results for ex post evaluation of the migration decision.

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1. Motivation and general framework

Analyses of the economic situation of immigrants commonly focus on their situation in comparison to natives of the destination country. While this is a relevant perspective for research on the labour market in the receiving country, it is not the natural focus for the migrants themselves. One may assume that their decision to emigrate was not motivated by a comparison with natives in the destination country, but by comparing their perspectives at home with those for themselves in the destination country. The perceived welfare of natives in the destination country will no doubt affect the expectations of potential migrants. Still, their basic comparison will be between their own homeland position and the position in the destination country. In this paper, we propose to share that perspective. That will make the outlook quite similar to the standard approach in labour market (or geographical) mobility within a country: compare the alternatives of moving and non-moving and assess or explain the decision that has been made by the individual, i.e. to move or not to move.

In this paper we will attempt to assess the consequences of migration decisions by Dutch migrants to New Zealand. Did they take a good decision to emigrate, or had they better stayed at home? Obviously a question that is easier posed than answered, because many factors can be important in the individuals' own assessment, and we may lack the information to take all these factors into account. There are many dimensions to such a comparison. Adjustment costs are vital here. A migrant takes his or her decision with the information available at the time and that information may turn out to have generated erroneous predictions. With erroneous predictions, the migrant may regret the decision but may not be able or willing to reverse it (and return to the homeland), because of the adjustment cost. In fact, the cost barrier gives the question its relevance for the individual. If instantaneous and costless moves can be made, regrettable choices can be reversed immediately: the individual could always be in the preferred state. The relevance of the issues is in the possibility of being caught behind the barrier of adjustment cost.

We may formulate a very general basic model for migration decisions as in equation (1):

$$(1) \qquad M_A = \int_A^T \int_O^\infty v_{Zt} f_{Zt}(v_{Zt}) dv_{Zt} e^{-\rho(t-A)} dt - \int_A^T \int_0^\infty v_{Ht} f_{Ht}(v_{Ht}) dv_{Ht} e^{-\rho(t-A)} dt - C_A$$

where M_A gives the inclination to migrate at age A, with a positive value predicting actual migration. The terms under the integrals give the expected present value of maximum attainable, indirect, utility v in the homeland H and the new (destination) country Z. In both countries, there is a probability distribution f of maximum attainable utility that may vary over time. C_A is the cost of moving, in utility metric. ρ is the individual's discount rate.

The framework is completely general. It allows for uncertainty in outcomes, and differences in risk attitudes among individuals: v is the indirect utility, and different degrees of concavity of the utility function can accommodate differences among individuals. Risk and its appreciation is a vital consideration in the migration decision. The core of the decision is on the maximum attainable utility, reflecting individuals' optimising behaviour. The optimisation should cover the full scope of individual choices: labour force participation, self-employment versus employment, type of job, labour effort, contribution to and benefits from the public sector (taxes, subsidies, social insurances, etc). The framework in principle covers return migration as well as multiple migration and re-migration. It brings out that the migration decision will relate to the individual's endowments and the opportunity to derive welfare from them in both

countries: the social, economic and institutional framework, the uncertainty of realising potential, and tastes, including risk attitudes. The probability distribution may also reflect the individual's information, i.e. it would be the individual's perceived probability distribution. Anything that increases homeland present value decreases the inclination to move, anything that increases the destination country present value increases the inclination to move.

While equation (1) serves to depict the conceptual framework, it is clearly too broad and wide-ranging to apply directly. The data requirements are too extensive for structural estimates of individual decisions. Obviously, strong simplifications are inevitable. But we will use the model as a general conceptual framework. We will describe the history of Dutch migration to New Zealand in the next section, and then in section 3, we offer some more formal modelling, in 4 we describe the data, in 5 we present an econometric model and in 6 we discuss the results. In 7 we draw the conclusion to our lead question. We will stress that, although correcting for selectivity bias in estimated earnings seems an obvious necessity, it is actually a futile exercise in the present context.

2. Postwar history of Dutch migration to New Zealand[1]

Table 1 and Figure 1 show the inflow of Dutch migrants into New Zealand in the postwar period. In the late 'forties', there was a somewhat complicated start, with a few immigrants from Holland, and a few from Indonesia. In October 1950, a Migration Treaty was signed between the governments of New Zealand and the Netherlands. The governments would share in moving cost for selected migrants aged between 18 and 35, who in return would have to perform a job assigned to them by the New Zealand government for 2 years. New Zealand would set a quota, 1200 men and 800 women for the first year. Immigration rapidly increased, even surpassing the quota, and New Zealand tightened selection in response. Participation in the Assisted Migration Program, as it was called, diminished, from 55% of immigrants in 1953 to 11% in 1958, because immigrants disliked the two year job assignment and because the Dutch government implemented a general subsidy for emigration in 1955, and the New Zealand government participated in this program. In 1956, 90% of the immigrants were subsidised; the percentage would remain that high for a long period.

Between 1955 and 1957, the Nomination System was introduced. Churches, business firms and the Dutch Emigration Service were allowed to have families immigrate, provided they guaranteed work and housing. The New Zealand government set an annual quota of 1000 immigrants without any further restrictions. The quota usually was not exhausted, except in the early 1980's when the recession hit particularly hard in the Netherlands and the unemployment rate soared up.

In 1993, the Dutch government denounced the Migration Treaty, as emigration policy was abolished as a government activity. As a consequence, Dutch applicants for immigration were subject to the general system that selects on the basis of points awarded for age, education and experience. By that time, Dutch immigration had already steadily diminished. After 1993, the inflow was less than 300 individuals per year.

[1] This section is based on Priemus, 1997. The general history of New Zealand immigration is reviewed and analysed in Winkelmann (1999).

Priemus (1997) notes that entrants were carefully selected, initially by the New Zealand authorities under the Assisted Migration Program and later by the Dutch under the Nomination System (under this system, an unsuccessful immigrant returned to Holland at Dutch expense). It was certainly not only farmers who emigrated to predominantly agricultural New Zealand.[2] While the percentage was indeed 43 in 1950, it was down to 16 in 1951 and to only 7 in 1962. The share of farmers among the Dutch is now comparable to that among the New Zealanders (some 12%). Dutch immigrants are and have been overrepresented in manufacturing and construction and underrepresented in commerce. The share of self-employed is quite high, at 24% of those fully active in 1981, with a comparable 13% for the entire New Zealand active population. Unemployment among the Dutch was generally low, and there was some consensus notion that the Dutch work hard and do well. Supported both by New Zealand and by Dutch policies, the Dutch were keen on integration in the New Zealand society; geographically, they were spread all over New Zealand, and they made little attempt to cluster together. Dutch immigrant associations in 1997 only numbered some 1700 members at a total Dutch born population of 25 000. Only a small minority of the second generation speaks Dutch.

As the data show, in all some 41 000 Dutch immigrated to New Zealand between 1947 and 1997. The Dutch immigrant population numbers about 25 000 in 1997. Over the postwar period 3 000 Dutch have died in New Zealand. Hence, out of the 41 000 some 13 000 have left the country, many going back to Holland, but others moving on to other immigration countries like Australia or Canada.

Elich and Blauw (1981) is the only study that looks specifically at Dutch return migration from New Zealand. From the Register of Outmigration in 1970 and 1975 they took 100 "units" (families, singles) in each year migrating to Canada, Australia and New Zealand and then checked the Register of Immigration in later years to see who got back to Holland. They traced the return migrants through the Register of Population and approached them for an interview. In 1980, about a third of the emigrants to New Zealand had returned to Holland (36% for the 1970 cohort and 33% for the 1975 cohort). The estimate of a third squares nicely with the aggregate estimate cited above and also suggests that most return migration takes place in the first 5 years. This is indeed the case in the combined Canada/Australia/New Zealand sample, as shown in Figure 2.

Elich and Blauw asked the returned migrants for their motives to return. Only 20% (in the combined sample) mentioned lack of a job or having unsatisfactory work. "Personal problems" (problems with relatives back home, with the partner, children, or language) are altogether mentioned by 51% of the returned migrants. The key motives are dissatisfaction with the host country lifestyle (24%), no or no satisfactory job (20%), family problems in Holland (19%), homesickness of the wife (18%), termination of intended length of stay (16%). Among stated motives, lack of economic success is not dominant. 64% evaluate their migration positively and their return not negatively. Only 8% ex post regret their migration, 18% regret having returned. If one were to take these answers at face value, perhaps there is no need for great concern for

[2] In the 1950's, the big difference in industrial employment composition was for men in agriculture and manufacturing; the share of services was equal in both counties. For males, agriculture counted for 20% of employment in New Zealand in 1956, and for 13% in The Netherlands in 1960. Manufacturing counted for 24% in New Zealand and 33% in The Netherlands. Other shares in one-digit composition were virtually identical in both countries. For women, the compositions barely differed between the two countries. Sources: New Zealand Census 1956; Netherlands Census 1960.

selective return migration if one studies economic success. But that clearly is a premature assessment. The return migrants do differ a little from the immigrants by level of education. Among New Zealand return migrants, lower secondary education is overrepresented and upper secondary is underrepresented.[3] There is no bias in gender composition of the returned migrants. In the pooled sample (separate figures for New Zealand not available) service workers are strongly overrepresented. Clerical workers and high job level management and professional workers are underrepresented[4].

A crude overall indication of the benefits of migration can be gotten if we simply compare an average Dutch individual who emigrated at some point in time and from then on got the average New Zealand income. We only have to compare real incomes per capita, at a proper exchange rate. If an average emigrant can just jump from one mean income series to the other, these two series give an indication of the income gain or loss from the move at any point in time. If income distributions would be stable in both countries, the ratio of the time series would be an index of the change in the income gap since migrating.

As Figure 3 shows, real per capita growth in The Netherlands was much stronger than in New Zealand, in particular up to the late 1970's. This has continuously undermined the position of New Zealand as an attractive destination for Dutch emigrants motivated by material welfare. Figure 4 tells a similar story in nominal terms. Note that nominal income comparison at the current exchange rate is a relevant variable for migration decisions. The developments in the two countries differ dramatically. While New Zealand income initially was more than double the Dutch level, it had fallen to about three quarters of the Dutch level in the seventies, and then fluctuated a bit about that level. Hence, just by considering average income levels, the Dutch who moved to New Zealand in the early fifties moved to a high income country; if they stayed, this advantage was more than wiped out over the next decades. Those who came later, moved from a high income to a low income country.

As suggested by our formula (1), income dispersion is also a relevant variable to understand mobility patterns. As Edward Leamer [5]once exclaimed at a conference: "A low Gini is a lack of opportunity!". Economic opportunity, the possibility to realise the market value of endowments and acquired skills, may differ substantially between countries, and a crude indication of such opportunities is given by measures of income dispersion. It has been predicted that migration from high dispersion to low dispersion countries will primarily consist of low skilled workers, since they in particular stand to gain from the move, while migration from low dispersion to high dispersion economies should be dominated by high skilled workers. Income inequality in the Netherlands is well documented, over a long period (even back to the early twentieth century, see Hartog and Veenbergen, 1981), but unfortunately, data on New Zealand only start in 1984. The evidence suggests that New Zealand has a more unequal distribution than the Netherlands. Atkinson et al (1995) give data on disposable income per equivalent adult. P_{10}, the

[3] The percentages are, for the original migrants and for the return migrants, basic 18, 19; lower secondary 23, 30; upper secondary 35, 23; tertiary 22, 26.

[4] The percentages for original migrants, return migrants when they emigrated and return migrants when they returned are, for professionals and high level management 25,16,18; clerical 16,7,12; commercial 9,6,10; service 7,24,21, agricultural 3,3,4; labourers 39,45,34.

[5] At the Kiel Conference in June 1998.

income at the lowest decile relative to the median, is 61.5 in the Netherlands and 53.6 in New Zealand (in 1987), and P_{90} is 175.0 for the Netherlands and 186.6 for New Zealand, giving P_{90}/P_{10} ratio's of 2.85 and 3.48.

Sylvia Dixon (1998) documents earnings inequality in New Zealand for the period 1984-1997. Inequality in hourly earnings clearly is trended upward during that period, both for men and for women. We made calculations for The Netherlands similar to the results she reports, for years as close as possible: hourly pre-tax earnings, separately for men and women (see Table 2)[6].

Clearly, in the late 1980's and mid 1990's, inequality is higher in New Zealand than in The Netherlands. For emigration after the late 1980's one would thus predict it to be predominantly from the top end of the earnings distribution, as they would have better opportunities in New Zealand than in The Netherlands. Expenditures on social programs among the non-aged amounted to 3% percent of GDP in New Zealand (in 1979), and over 12% in the Netherlands (Gottschalk and Smeeding, 1997, Chart 2). This suggests better social protection at the low end in The Netherlands, and also would favour emigration from the top end rather than from the bottom end. It is hard to assess the situation in earlier decades, for simple lack of data for New Zealand. For The Netherlands, we know that inequality between the 1950's and the late 1980's has declined substantially. If the trends in New Zealand and The Netherlands have been similar, we would expect Dutch migrants to be mostly from the top end of the skill distribution.

As Figure 5 shows, the development in aggregate unemployment rates only started to deviate after the mid-eighties. Until that time, unemployment was consistently higher in the Netherlands, after that New Zealand unemployment skyrocketed while Dutch unemployment took a sharp decline. We would expect the relative unemployment rates also to be an important determinant of the emigration flows.

Of course, we want to do better than just compare two average income series. We want to get a hand on the differences between individuals, compare an individual's position in one country with the alternative given up in the other country, and analyse what these differences mean for individual decisions. Such analyses are most confidently done in terms of earnings and wealth and could conceivably cover the entire lifecycle. In principle, the comparison can have a broader base then just earnings or wealth, as a structural migration equation might include non-pecuniary effects and measure the trade-off with monetary gains (Björklund and Moffitt, 1987). While the non-migrant sample in the home country will barely be affected by non-random migration, the sample of migrants in the destination country may be expected to be subject to non-random selection both through the initial migration decision and through later decisions on return migration.[7] Essentially, this brings in unobserved heterogeneity from all the migration decisions taken in the past, and this will potentially bias the estimates of actual earnings functions. A sample of immigrants presently in the country has been conditioned by all decisions and a full structural modelling would require to specify the entire chain of past migration decisions and past opportunities. It would require a much more extensive dataset than we have available, and the present paper can only be exploratory in nature. The data we have available combine two labour market surveys. The basic dataset is a population survey in New Zealand. It allows to identify immigrants (and the year of their immigration) and we selected the

[6] We are grateful to Jeroen Smits, now at NIVROM, for his calculations.
[7] For analysis of selfselection among migrants, see e.g. Bauer et al (1998). The theory is explored in Chiswick (2000).

Dutch immigrants from this sample. We then added a Dutch labour force survey for the same year as the New Zealand data. From these two datasets we will make a comparison between the Dutch in New Zealand and the Dutch in Holland.

3. Analysing the migration decision

We will now reflect further on the theoretical basis for migration decisions. We will do so in three settings, to illuminate several elements in the decision making process.

3.1 An optimal lifecycle plan under perfect foresight

We can analyse the migration decision in the simplified standard human capital lifetime planning framework, where an individual maximises net present value of residence, taking into account the monetary equivalent of the utility cost of moving. The individual may then foresee an optimal age of emigration, under perfect foresight on future wages. With A for age at migration, W_{Ht} for wage in homeland Holland at age t, W_{ZAt} for wage in destination New Zealand at age t when migrating at age A, and redefining C as the monetary equivalent of the once-over utility effect of moving to the destination country, the present value for working in the homeland until A and then emigrating reads

$$(2) \qquad PV_A = \int_O^A W_{Ht} e^{-\rho t} dt + \int_A^T W_{ZAt} e^{-\rho t} dt - C_A e^{-\rho A}$$

To find the optimum migration age, differentiate to A:

$$(3) \qquad \frac{\partial PV_A}{\partial A} = \left[\left(W_{HA} - W_{ZAA} \right) - \left(\frac{C_A'}{C_A} - \rho \right) C_A \right] e^{-\rho A} + \int_A^T \frac{\partial W_{ZAt}}{\partial A} e^{-\rho t} dt$$

The optimum age at migration is found where the derivative in (3) is equal to zero. We can rewrite (3) as reaching zero at the age A where

$$(4) \qquad \{ W_{HA} + \left(\rho - \frac{C_A'}{C_A} \right) C_A \} e^{-\rho A} = W_{ZAA} e^{-\rho A} - \int_A^T \frac{\partial W_{ZAt}}{\partial A} e^{-\rho t} dt$$

Then, the left-hand side gives the marginal benefit of increasing A: staying longer in Holland gains the extra wage (discounted) and postpones the incurrence of migration cost C_A. The marginal cost of later migration, at the right-hand side, entails not receiving the New Zealand starting wage W_{ZAA} reduced by the effect of later migration on later wages (which is usually negative, hence the marginal cost is increased by additional reduction of all future wages in the destination country).

Such a possibility is illustrated in Figure 6. Setting C_A'=0 for simplicity (it's probably positive), discounted marginal benefits may first increase because the wage W_{HA} increases, and may later decrease because the discounting effect comes to dominate. Marginal cost, starting below marginal benefits, may be low initially if the starting wage in the destination country is not too high, then increase rapidly because of the discounted total wage loss from later migration and then decrease because discounting dominates. The two curves would cross twice, the planned optimal age at migration would be A^*.

The problem is not necessarily "well-behaved", and there may be corner solutions. Marginal benefit may always be higher than marginal cost, and hence, there will be no migration: postponing migration always adds more in the homeland than in the destination country. Or the other way round: later migration always gives higher marginal cost than marginal benefit, and migration takes place at age zero.

A "well-behaved" interior optimum, with declining marginal benefit and increasing marginal cost is a conceivable outcome. Marginal benefits starting out above marginal cost, may decline if a high discount rate outstrips wage growth in the homeland. Marginal cost may increase if post-migration wages fall steeply with later migration. Note that (4) has a very elegant implication. Suppose, for simplicity, that destination country wages are not sensitive to age at migration (i.e. the term under the integral is zero). Then, the optimal age at migration is located where the wage gap W_{ZAA}-W_{HA} equals the return on the migration cost C_A : ρ reduced by relative change in migration cost:

$$W_{ZAA} - W_{HA} = \left(\rho - \frac{C_A^{'}}{C_A} \right) C_A$$

If the wage profile is not insensitive to the age at migration, we should augment the instantaneous wage gap by the discounted future wage effects.

Casual observation suggests that an interior optimum, i.e. planning an optimal migration age A > 0 is not very common. Corner solutions A = 0 or A > T (i.e. no migration) are more plausible. The case of first benefiting from homeland earnings and then switching to the migration country, with initially marginal benefits from postponing migration greater than marginal cost and a foreseeable reversal at higher ages, does not seem very common. Homeland investments apparently are not expected to pay off in the destination country. Let's consider the case in greater detail by adding more specific assumptions on wage profiles.

There is international evidence that immigrant wages typically show a dip upon entry that may be made up in subsequent years. The situation is graphed in Figure 7. If the migration dip would not exist, the migrant would face the potential wage profile W_{Zt}. It might be equal to the wage profile of similarly qualified native New Zealanders, but that is immaterial for the present purpose. If the migrant arrives at age A, there will be a dip in the wage rate, that is only eliminated after F periods. The total wage loss in this interval is the shaded area, the "Entrant Loss". The existence of the Entrant Loss by itself lowers the probability of migration, as it reduces the gains from migration (if any). Let's decompose the immigrant's wage profile in a wage that would be realised at age t if migrating at A = 0, the youngest possible age, (W_{Zt}) and a loss that is a fraction of this wage: $\delta_{A,f}$, the fraction of this wage lost at age f when arriving at age A. $\delta_{A,A}$ is the initial dip, $\delta_{A,f}$ decreases for increasing f and reaches zero at A+F, where A + F may be greater than T: the loss is never made up. Equation (2) can now be rewritten as

$$(5) \qquad PV_A = \int_0^A W_{Ht} e^{-\rho t} dt + \int_A^T W_{Zt} e^{-\rho t} dt - \int_A^{A+F} \delta_{Af} W_{Zf} e^{-\rho f} df - C_A e^{-\rho A}$$

Differentiating the Entrant Loss (the third integral, without the minus sign) to A yields

(6) $$\frac{\partial E_A}{\partial A} = \delta_{A,A+F} W_{Z,A+F} e^{-\rho(A+F)} - \delta_{AA} W_{ZA} e^{-\rho A} + \int_A^{A+F} W_{Zt} \frac{\partial \delta_{At}}{\partial A} e^{-\rho t} dt$$

Now assume, as in Figure 6, that $\delta_{A,A+F}$ equals zero (A + F < T). Then, if the proportional wage loss would be independent of migration age (and the third term also drops out), the derivative would be negative: due to discounting, the entrant loss will be lower if you plan to migrate later. The discounted effect from the other losses, if the wage loss does depend on the age of arrival, will no doubt be non-negative. Even with A + F < T, i.e. full catching up before retirement, and the first term dropping out, the third term will still be positive. Hence, it is hard to sign the effect in general.

We will now put the two pieces together and take the derivative of (5) by combining (3) and (6):

(7) $$\frac{\partial PV_A}{\partial A} = \left[W_{HA} - (1 - \delta_{AA}) W_{ZA} - \left(\frac{C'_A}{C_A} - \rho \right) C_A \right] e^{-\rho A} - \int_A^{A+F} W_{Zt} \frac{\partial \delta_{At}}{\partial A} e^{-\rho t} dt$$

As before we can write the condition for the optimal anticipated age at migration as equality of marginal cost and marginal benefit of migration at that age:

(8) $$\left\{ W_{HA} + \left(\rho - \frac{C'_A}{C_A} \right) C_A \right\} e^{-\rho A} = (1 - \delta_{AA}) W_{ZA} e^{-\rho A} + \int_A^{A+F} W_{Zt} \frac{\partial \delta_{At}}{\partial A} e^{\rho t} dt$$

Similarly, the outcome is not obvious, and corner solutions are very well possible. The unspecified age sensitivity of wages combined with discounting makes for unpredictable outcomes[8]. The impact of the Entrant loss on the optimal migration age depends on the relative magnitude of initial loss and cumulated later loss. Without Entrant loss (δ_{st} = 0, all s, t) and without migration cost (C_A = 0), in a well-behaved interior solution, the planned migration age would be at $W_{HA} = W_{ZA}$, assuming W_{ZA} (marginal cost) increases faster than W_{HA} (marginal benefit): move as soon as the destination wage surpasses the homeland wage. The initial earnings dip δ_{AA} reduces marginal cost, and hence increases planned age of migration. But later losses (δ_{At}) increase the marginal cost, and hence, decrease planned migration age. Hence, the unpredictable balance of the two determines the outcome.

Comparative static predictions are fairly straightforward. Consider first a regular interior optimum, with positive planned age of migration. Then, the intended migration age decreases with anything that increases marginal cost (lower δ's, higher W_{ZA}) or that decreases marginal benefits (lower W_{HA}, higher C'_A). For a corner solution with migration at age zero, there is no effect if marginal cost increases or marginal benefit decreases. But the optimal migration age might rise above zero if marginal cost falls or marginal benefit increases. For a corner solution with no migration at all, increases in marginal benefit or decreases in marginal cost are inconsequential, but reverse changes may lower the optimal migration age below T.

[8] Interestingly, the model is formally exactly equal to a model for the optimal planned age of maternity, with the same problem of an initial dip δ_{AA} and possible later catching up. For example, Wetzels (1999) predicts maximum postponement of the birth of the first child from a model that has the first and the third term in (6) both equal to zero.

We can generalise without complications the concept of wages W to reflect expected income: wage times probability of having a job plus probability of unemployment times alternative income (benefit, welfare, family support, etc).

3.2 A simple instantaneous decision model

Rather than portraying an individual as executing a predetermined lifetime plan, we may assume the individual at any time to ponder on the possibility of migration and to do so on the basis of predicted discounted lifetime welfare. Let the decision variable again be M_A, and the individual will only emigrate for $M_A > 0$. Rather than predicting the individual's planned age of migration, we predict whether an individual of age A , at that age, will migrate or not. The present value at age A of moving at age A equals

$$(9) \qquad M_A = \int_A^T W_{ZAt} e^{-\rho(t-A)} dt - \int_A^T W_{Ht} e^{-\rho(t-A)} dt - C_A$$

We then predict instantaneous migration at age A from the wage streams and the factors determining them, the discount rate and the factors determining the full moving cost C. Anything that decreases the present value in Holland and that increases the present values in New Zealand increases the inclination to migrate. If we decompose wages in a base wage and a growth rate (or an income relative to the base rate at any age t), we predict the inclination to emigrate to increase in destination country base wage and growth rate and to decrease in home country base wage and growth rate. The effect of the discount rate follows from differentiation of (9) according to Leibniz's rule. It is straightforward to derive

$$(10) \qquad \frac{\partial M_A}{\partial \rho} = \int_A^T (W_{Ht} - W_{ZAt})(t - A) e^{-\rho(t-A)} dt$$

Thus, when ρ increases the inclination to migrate gets a positive boost from future ages at which the home wage would be larger than the destination wage and a negative push from ages where the home wage would be lower. The former reflects a decline in discounted wage loss from migration, the latter a reduced discounted wage gain from moving. It's the balance that determines the total effect. Thus, the relative age-wage profiles are important in determining the effect of the discount rate on the inclination to migrate. General statements cannot be made without restricting the shape of the age-wage profiles. With the destination wage always higher than the home wage, the inclination to migrate will indeed fall with increasing discount rate, but that's a trivial case.

To find the effect of advancing age on the inclination to migrate, we differentiate (9) to age. This yields

$$(11) \qquad \frac{\partial M_A}{\partial A} = -W_{ZAA} + W_{HA} + \int_A^T \left\{ \rho (W_{ZAt} - W_{Ht}) + \frac{\partial W_{ZAt}}{\partial A} \right\} e^{-\rho(t-A)} dt - \frac{\partial C_A}{\partial A}$$

With advancing age, the inclination to migrate goes up with the reduced instantaneous homeland wage loss W_{HA} and goes down with the eliminated direct destination country wage gain W_{ZAA}. On balance, increasing age reduces the inclination to migrate if the destination wage is greater than the homeland wage: at the higher age, the gain from moving has fallen. There is a

similar discounted future effect from the fact that all future wages have shifted up by one year (the first term in braces) and there is a discounted effect from the fact that later migration (unavoidable with increasing A) may change the wage profile in the destination country (the Entrant Loss). And of course there is an effect from possible age-sensitivity of the cost of moving. The total effect is again not easy to sign and various patterns are possible.

There is a general, intuitive notion that migration if considered at all, is best undertaken at the youngest possible age (e.g. straight after completing education, although education of course may also be completed abroad). But as the above analysis indicates this holds only under restrictive conditions. For example, Schwartz (1976) indeed concludes that the rate of migration declines with age. But he imposes that the benefit from migration at a given age (the difference between the wage rate in both countries) declines, at every age, for any postponement of migration. This condition appears not to be met in our data (see later).[9] The support that Schwartz finds for his prediction is based on aggregated interdivisional migration flows in the US, cross-classified by age, education and some other traits. We will return to the age-effect in our empirical section.

3.3 Imperfect information: the search approach

Rather than assuming perfect foresight, we may analyse migration decisions in the more realistic settting of imperfect information on the situation in the destination country. By exploiting the analogy to the job search model for the unemployed, we can portray the potential migrant as waiting for a suitable job offer to arrive.

The simplest model is one with stationarity. Taking inspiration from the standard job search model, we assume homeland income W_H, a job offer arrival rate for positions in a preselected emigration destination λ (from a Poisson process), a discount rate ρ and an offer distribution in the destination country $F(W_Z)$. Then, the optimal strategy is the reservation strategy, comparing offer W_Z to reservation wage Φ, with Φ determined as

$$(12) \qquad \Phi = W_H + \frac{\lambda}{\rho}\int_{\varphi}^{\infty}(1-F(W_Z))dW_Z$$

and hazard rate

$$(13) \qquad H = \lambda\{1-F(\Phi)\}$$

Under stationarity, reservation wage and hazard rate would be independent of time (age), but in a model of unanticipated non-stationarity (Van den Berg, 1999), we can simply index the variables on age t. Van den Berg (1990) estimates a structural model along these lines. Interestingly, utility in both states is modelled as utility (income = Y, employment) = u(x), utility (income = Y, unemployment)= αu(x), where α is estimated. Narendranathan (1993) extends this specification, due to Nickell, to a parameterization of α on individual

[9] There is another complication, not considered in our paper at all. Return migrants may get a premium upon a return to their homecountry, in the sense of higher wages than if they had not migrated. See Røed (2000). This further complicates comparisons.

characteristics. The utility function is taken to be logarithmic[10], the job offer arrival rate is parameterized as $\lambda = \exp(x'\beta)$.

With an assumption on $F(W_Z)$ the model can in principle be estimated. $F(W_Z)$ should be deduced from observations on wages for immigrants in the destination country. Van den Berg uses panel data, allowing for censoring at the end of the sampling period. In our case, we would have to construct the data by moving backwards from 1986 on, to adjust home wages W_H and destination wages W_Z for general economic developments. In the absence of further information, we could simply apply overall indexes in both countries, essentially assuming that an individual's position in any distribution is stable over time. As an extension, wages can be taken as discounted future wages until retirement, after estimating the sensitivity of wages to age and to experience in the destination country.

A model like this can be estimated from a combined sample of nationals still living in their country of birth ("uncompleted spells") and nationals in a destination country, for whom the time of migration is known. If incomes at the time of migration are not known, they might be constructed from predictions transformed to the time of the decision. Attractive examples are Van den Berg (1990) and Narendranathan (1993), who estimate structural search models in specifications that might be applied to migration as well. Parameters of the job offer distribution are to be inferred from the observed wage distribution of the employed (i.e. those who have migrated) and the models allow structural estimation of the parameters of the job arrival rate. This route seems an attractive option for migration models, although, as noted, incomes at the time of migration are usually not observed but have to be predicted. We have not (yet) attempted this approach.

Note that the model has some straightforward implications on predicted behaviour. The reservation wage will go up, and the emigration rate down with increases in the homeland wage W_H and decreases in the discount rate ρ. Changes in the offer arrival rate λ and the offer distribution have no unambigious effect however.

4. Data and descriptive analysis

The Dutch dataset is the OSA sample, a national representative household panel survey. Within each household all members aged between 16 and 64 were interviewed. The panel started in 1985. Attrition has been countered by selective addition of households to maintain a representative sample of the Dutch labour force. The 1986 sample contains 2452 households. We will use the 1986 sample, to match the New Zealand dataset for that year.

The New Zealand dataset is derived from the 1986 Population Census. It includes the whole population of working age migrants (i.e., those aged 15-64), and a 5 percent random sample of the New-Zealand born population. Immigrants are identified by their country of birth rather than by their residence status (i.e. they could have adopted New Zealand citizenship, be permanent residents or on temporary permits). Visitors are excluded from the sample, provided they answer in the questionnaire that their usual place of residence is outside of New Zealand. The analysis in this paper is based on the 1986 census, although there is a similar 1996 census. The

[10] Hence, the reservation wage is writen as a reservation utility.

simple reason for this is that most Dutch immigration took place in the 1950s, and a large fraction of this immigration wave was still of working age in 1986, whereas many immigrants had passed this threshold by 1996 (The overall number of Dutch working age immigrants fell from 20196 in 1986 to 15153 in 1996).

Of course, the Dutch immigrant sample is special in its age distribution because it reflects the history of migration as set forth in section 2, in combination with the truncation ages for the sample (15-64). Figure 8 graphs the distribution of the Dutch immigrants by year of arrival. The pattern in the graphs is similar to that in Figure 1, giving the number of immigrants arriving in New Zealand for every year.

The age distribution by arrival year as we observe it in our sample is transformed asymmetrically by mortality and is truncated because of the age restriction in the sample. This is shown clearly in Figure 9. For arrival cohorts between the mid-forties and the mid-sixties, the average age at arrival is quite stable at about 20 to 22. For older and younger arrival cohorts the sample truncation ages affect the average age. For older cohorts still to be in the sample, they must have come at younger and younger ages (if you go backwards), for more recent cohorts you cannot be included if you are too young. For older cohorts, average age moves up from the upper boundary constraint, for younger cohorts average age moves up from the lower boundary. Conditioning on arrival cohort we observe that most immigrants have come at young ages. But there is still a fair amount of dispersion and the arrival age is not uniquely low as for example schooling ages are. In the latest cohort (arrival between 1977 and 1986), almost 30% of the immigrants arrived at ages above 34. The "moving boundary" does not create an additional problem of endogenous sample selection. The only endogenous sample selection rule is the immigration decision. A person born before 1922 cannot be in the immigrant sample in 1986, because he is then over 64. Anyone born after 1972 cannot be in the sample, because in 1986 he is under 15. But those born before 1922 or after 1972 cannot be in the non-migrant sample either, for the same reason. There is no additional endogenous selection problem.

The samples are characterised in the Appendix. The Dutch in New Zealand are old both relative to Dutch in The Netherlands and to the native New Zealanders, reflecting the presence of a large stock of older immigrants, i.e. the reduction of immigration flows in later years. On average the immigrants have been in New Zealand for some 22 to 23 years. The Dutch in New Zealand work substantially more hours than the Dutch in the Netherlands, reflecting their adjustment to the New Zealand standard. The immigrants are disproportionately selfemployed, calling for separate analyses of employees and selfemployed. They also have lower unemployment rates than native New Zealanders. Similarly, male migrants have on average a substantial income advantage of 16 log-points over native men. For women, the opposite is observed as the average income of a migrant woman is 7 log–points below the income of a native woman. These comparisons are problematic, of course, as they are not adjusted for differences in age, education, and other factors. Also, a direct comparison between Dutch and New Zealand income is not meaningful, first, because incomes are measured in local currency, and second, because Dutch numbers give gross monthly income whereas the New Zealand numbers give the gross annual income.

The share of Dutch male immigrants in agriculture is much higher than in The Netherlands, but it is quite close to the New Zealander's share. Female immigrants are more active in agriculture than native New Zealand women. The Dutch in New Zealand have substantially less education than the Dutch in the Netherlands. This is at variance with the hypothesis on the relation

between the skill level of migrants in relation to income dispersion. Since schooling levels have risen considerably over time, we considered education levels by age interval, and then the relation still holds: in all intervals, migrants have less education than non-migrants. Perhaps, in earlier decades the relation between income dispersion in the two countries was the opposite from the situation in the 1980's, but we have no way of knowing.

5. Empirical Modelling

In this section we model the wages of non-migrants (the Dutch in the Netherlands) and migrants (Dutch-born residents of New Zealand), respectively. Apart from gaining general insights into the nature of earnings determination in the two countries, we will address a couple of specific questions: What is the role of selectivity, i.e., how does the wage determination of an actual migrant differ from the wage determination of an hypothetical, randomly selected migrant? And what would migrants earn had they not migrated? Similar questions can be asked with respect to non-migrants.

In the prototypical switching regression model, the selection equation is given by $M_i = z_i'\gamma + u_i$. Further, define a dummy variable M^* that is 1 if a person is a migrant and 0 else, such that

(14) $$M_i^* = 1 \text{ if } M_i \geq 0 \Leftrightarrow u_i \geq -z_i'\gamma$$

and

(15) $$M_i^* = 0 \text{ if } M_i < 0 \Leftrightarrow u_i < -z_i'\gamma$$

The wage equations in the two regimes can be written as

(16) $$W_{Hi} = x_i'\beta_H + u_{Hi} \text{ (observed if) } M_i = 0$$

(17) $$W_{Zi} = x_i'\beta_Z + u_{Zi} \text{ (observed if) } M_i = 1$$

where the subscript "H" stands as before for homeland (Holland) and "Z" for destination (New Zealand). W_{Hi} and W_{Zi} are measured on a logarithmic scale. The economic content of the vectors z and x have been left unspecified. If one follows the Roy model (Roy, 1950), people move if $W_{Zi} > W_{Hi}$, i.e., $u_i = u_{Zi} - u_{Hi}$, $z_i = x_i$, and $\gamma = \beta_Z - \beta_H$. This approach is unnecessarily restrictive, however, as it does not allow for a ready integration of factors such as expected future wages or non-constant moving cost. Still, the idea behind the Roy model at a minimum suggest that all variables in x should also be part of z, i.e., factors that affect current wages also have an effect on the migration decision.

In this set-up, the conditional expectation functions for the observed wages conditional on selection are given by

(18) $$E(W_{Zi}|M = 1) = x_i'\beta_Z + E(u_{Zi}|u_i \geq -z_i'\gamma) \neq x_i'\beta_Z$$

and

(19) $E(W_{Hi}|M = 0) = x_i'\beta_H + E(u_{Hi}|u_i < -z_i'\gamma) \neq x_i'\beta_H$

Other expectations we are interested in are the expectation functions unconditional on selection

(20) $E(W_{Hi}) = x_i'\beta_H$

(21) $E(W_{Zi}) = x_i'\beta_Z$

that give the expected wages in the Netherlands and in New Zealand for a randomly selected person, and the counter-factual expectations

(22) $E(W_{Hi}|M = 1) = x_i'\beta_H + E(u_{Hi}|u_i \geq -z_i'\gamma)$

(23) $E(W_{Zi}|M = 0) = x_i'\beta_Z + E(u_{Zi}|u_i < -z_i'\gamma)$

that give the earnings of migrants had they not migrated and of non-migrants had they migrated. Conditional, unconditional and counter-factual expectations differ unless u_{Hu} and u_i as well as u_{Zu} and u_i are mutually independent. But independence is highly unlikely, not only in the Roy model (where both wage errors are by construction part of the selection error) but also in the more general setting. If those who have above average wages at home and below average wages abroad are less likely to migrate, conditional on their observed characteristics, then $E(u_{Hi}|u_i < -z_i'\gamma)$ and $E(u_{Zi}|u_i \geq -z_i'\gamma)$ will both be positive.

How much can we possibly learn from the data about the parameters of the model? One particular feature of the sample is that the population of non-movers is very large relatively to the population of movers. The Dutch population is about 15 million, about 10.5 million of which are of working age. In 1986 there were 20,196 Dutch working-age migrants in New Zealand, or one in 520 non-migrants. In other words, the unconditional probability of being a migrant is less than 0.2 percent. Take as an example the case, where u_i, u_{Hi} and u_{Zi} have a trivariate normal distribution with mean vector zero and non-zero covariances σ_{Hu}, σ_{Zu} and σ_{HZ}. Under the normalization $\sigma_u = 1$, we obtain

(24) $$E(u_{Hi}|u_i < -z_i'\gamma) = -\sigma_{Hu}\frac{\phi(-z_i'\gamma)}{\Phi(-z_i'\gamma)}$$

where ϕ and Φ are the density and cumulative density functions of the standard normal distribution, respectively. The denominator of the right side gives the probability of not migrating. Using a probability of non-migration that reflects the population proportion of 0.998, the corresponding hazard function takes a value of about 0.006. Usual values of σ_{Hu} are between 0 and 1 in absolute value. Hence, conditional and unconditional expectations are approximately the same. While this result does not matter much for the interpretation of the results of non-migrants (indeed - who ever reported a national earnings function with a correction for selective outmigration?), it is a serious obstacle in determining the counter-factual wage function of migrants (22). In particular, it holds that

$$(25) \qquad E(u_{Hi} | u_i \geq -z_i'\gamma) = \sigma_{Hu} \frac{\phi(-z_i'\gamma)}{1-\Phi(-z_i'\gamma)}$$

Using similar arguments as above, the hazard that correspond to the proportion of migrants in the Dutch population can be calculated as approximately 3.15. Thus, the selection effect is likely to be quite substantial, as the hazard amplifies even modest correlations between the home-wage equation and the selection equation to *a-priori* implausible magnitudes. On top, it is difficult to estimate the counter-factual. The standard method requires estimation of σ_{Hu} first from (19). Estimation is bound to be exceedingly fragile and may not make any empirical sense. With a near-zero hazard, conditional and unconditional distributions are almost the same.[11] For instance, our attempts to estimate σ_{Hu} produced switches in sign, and statistical significance in either case, depending on whether or not marital status was included in the selection equation. Hence, we do not use these estimates to compute counter-factual wages of migrants in the Netherlands, but rather rely on the unconditional expectation (21) as an approximation. Similar arguments can be made with respect to the highly selective wage equation of Dutch migrants.

For migrants, we modify the standard earnings function,

$$(26) \qquad W_i = \beta_0 + \beta_1 ys_i + \beta_2 t_i + \beta_3 t_i^2 + u_i$$

where "ys" stands for years of schooling and "t" for age by using the identity t=A+(t-A), where (t-A) is years since migration, i.e., experience in the New Zealand labor market. It follows that

$$(27) \qquad W_{Zi} = \gamma_0 + \gamma_1 ys_i + \gamma_2 A + \gamma_3 (t_i - A_i) + \gamma_4 A_i^2 + \gamma_5 (t_i - A_i)^2 + \gamma_6 A_i (t_i - A_i) + u_{Zi}$$

This generalization makes it possible to distinguish between the returns to experience gained in the Netherlands before migration and the returns to experience in New Zealand. The test is based on the joint restriction $\gamma_2 = \gamma_3$ and $2\gamma_4 = 2\gamma_5 = \gamma_6$. In this more general model, age-earnings profiles depend on the age at arrival in New Zealand. For instance, one can test the hypothesis that the earnings dip is larger for older migrants who experience relatively faster subsequent earnings growth.

Although we don't use features of the migration equation for the modelling of self-selected wage equation, we still have intrinsic interest in the determinants of the migration decision. To explicitly account for age-dependence of the migration decision, as laid out in section 3 of our paper, we model the duration until migration using a discrete time hazard model with time-varying covariates (e.g., Allison, 1984). The risk set includes all people of a certain age who have not yet migrated by that age. In the terminology of duration model, non-migrants are "right-censored" observations.

The decision of moving to New Zealand at age A, given that a person lived in Holland up to age A-1, is assumed to be determined by the latent model

[11] A further problem is that the hazard function becomes near linear in the tails of the distribution (see Puhani, 2000).

(28) $M_t = 1 \text{ if } h(A_i) + \beta_1 x_{1i} + \beta_2 x_{2i}(A_i + c_i) + u_i > 0$

$h(A)$ measures the variation in the hazard over the life-cycle. Two parameterizations are considered. In a first, $h(A)$ is a fourth-order polynomial in A. In a second, an age specific intercept is estimated without further restriction. x_1 are age invariant variables such as gender and education (which is assumed to be completed before the decision to migrate is made). $x_2(A + c)$ includes indicators of the relative economic conditions in the two countries at the time of migration (c the cohort (birth year) such that $A + c$ is the year of migration).[12]

For estimation, we generate a combined sample of Dutch in the Netherlands and Dutch in New Zealand. Ignoring the issue of return migration, the first group constitutes the part of the risk group that never migrated. For each age (beyond 15) a separate record is created. For instance, for a Dutch resident aged 40 in 1986, it is known that she did not migrate at age 20, nor at age 21, or 22 and so forth. The decision-relevant variables at age 20 were her personal (invariant) characteristics and the macro-conditions in 1966. The comparison group is made up of people who did migrate at age A. These are only included once, at the age they came to New Zealand. Again, the decision-relevant variables are the personal (invariant) characteristics and the macro-conditions in that year. In principal, pre-migration observations of migrants (when they were aged A - 1, A - 2,...) could be included in the risk set. However, migrants are over-sampled, whereas the Dutch sample is representative for the population in the Netherlands, and therefore more appropriate. This approach yields a somewhat peculiar discrete time hazard rate model, as the survivor function is one for all practical purposes (i.e., the size of the risk set (of potential migrants) is practically unaffected by a person leaving). Thus, the hazard rate (conditional probability of leaving at age A) is approximately the same as the marginal probability of leaving at age A.

6. Results

We start out, in Table 3, with a standard "assimilation" earnings function for New Zealand, where we include natives and immigrants in one regression equation, with a dummy for migrants, in four subgroups. Returns to schooling are about 6 to 7 percent and only markedly lower for self-employed women. The effect of potential experience (age minus schooling minus 6) is virtually loglinear and markedly lower for women and for self-employed. Part-time workers earn substantially less than fulltime workers, even with hours worked included. Returns to hours worked are diminishing, and even negative for self-employed men: labour is not traded by the hour with a standard unit price. The position of women clearly deviates from that for men, with a larger elasticity of hours worked and a penalty for marriage rather than a bonus. The former is understandable from selective participation with a reservation wage steeper in hours worked than for men, the latter effect suggests that married women are restricted in their choices compared to single women. The explanatory power of the model is quite low for the self-employed; in our further analyses we will only consider employees.

[12] Our previous caveats on modelling selectivity in highly selected samples notwithstanding, we report in the Appendix (Table A2) results from a joint estimation of equations (27) and (28) with self-selection. As expected, the high values of the implicit hazard rates lead to estimated coefficients that are numerically small and statistically insignificant.

The migrant earnings dip is substantial[13], at 15 to 36%, and a catch-up rate on years since migration that is too slow for all groups to ever really make up for the loss[14]. Self-employed women have the best option, but even they need 30 years of experience to undo their initial gap. Note that even for the best migrants, the prospects are poor. If we take "best" to mean an initial earnings loss two standard deviations smaller than the average migrant and a catch-up rate two standard deviations higher, self-employed women would make up in 7 years, while the other three categories all need close to 30 years of New Zealand experience.

In Table 4 we compare earnings for the Dutch who choose to remain in Holland and for those who migrated to New Zealand. Rates of return to schooling and hours worked are higher in Holland than in New Zealand, so we expect migrants to be lower educated and to work fewer hours. The prediction of predominantly lower educated to migrate is borne out in the statistics we discussed earlier. Note that the lower returns to schooling only hold for migrants: New Zealanders in New Zealand have a higher return than Dutch in Holland. The lower return to schooling for migrants in New Zealand than in The Netherlands has an interesting implication: the penalty for dropping out from school is lower in New Zealand. Often, the argument is made that in countries like New Zealand, less regulated than The Netherlands, it is easier to make a career without a school diploma. While we have no results specifically for school drop-outs the results suggest that in relative terms there may be some validity in the argument. As we observed earlier, the Dutch in New Zealand work more hours than the Dutch in Holland. With average income (and average hourly wage) lower in New Zealand, this suggests the extra working hours in New Zealand to arise from the income effect. The marriage premium for men is lower in Holland, for women it is higher in Holland, generating the expectation that male migrants will be married, while female migrants will not. Part-time work is generally punished, except for men in Holland.

In terms of experience profiles, there are again essential differences between men and women. For men, experience has unequivocally better returns in New Zealand than in Holland. The interaction term indicates that the return to New Zealand experience is hurt substantially by Dutch experience: 10 years of Dutch experience reduce the returns to New Zealand experience from 5.3% to 3.3% per annum. As Dutch experience is rewarded equally in Holland and in New Zealand, the initial gap between Dutch and New Zealand earnings at the time of migration is an almost constant fraction of the Dutch wage, determined by the ratio of the base wage in both countries. (Figure 10 shows a very small effect of later migration on the location of the migrants' profile).

For women, returns to experience are substantially lower in New Zealand than in Holland: they are cut in half. The experience effect in New Zealand is not affected by age of migration, but the initial earnings dip is very sensitive. Dutch experience in Holland is rewarded at 4% per year, whereas in New Zealand it is only rewarded at 1.2%, while New Zealand experience yields 2.1%. The ratio of the New Zealand starting wage to the Dutch wage left behind at migration

[13] The standard practice of interpreting predicted mean log-differences as percentage differences in means between groups is incorrect if the groups have unequal distribution of the dependent variable, as the transformation from mean log x to mean x is affected by dispersion of x as well. See Winkelmann (2000b). There is some evidence that, for men, wages of Dutch migrants are less dispersed than wages of New Zealand-born workers. The standard estimate thus tends to underestimate the true percentage difference.

[14] This result is similar to Winkelmann (2000a), using the same dataset.

falls by 2.8% for every year of postponed migration. The ratio of the New Zealand starting wage at migration to the New Zealand wage obtained when migrating at experience zero falls by .9% for every year of postponed migration.

In Table 5 we present a probit analysis for the country of residence: the decision to have migrated and not returned to Holland. As anticipated, we find a clear negative effect of schooling, reinforced by the negative effect of having a professional (high-education) occupation. Also as anticipated, we find a strong positive effect of having an agricultural occupation. The effect of macroeconomic conditions in the two countries perfectly matches theoretical predictions: unemployment in Holland stimulates emigration, unemployment in New Zealand reduces it, and a high relative income in New Zealand also stimulates emigration.

Initially, we thought to use these probit equations to correct for selectivity bias in the wage equations. However, as we discussed at some length, extensive reflection after finding rather implausible results convinced us that selection bias cannot really be tackled in this way. In none of the estimated equations is the selectivity correction term significant.[15]

In Figure 11, we have plotted the probability to migrate by age as implied by the estimated probit model. Without controls, the probability peaks just before age 25, when we standardize by taking the age effect net of controls we find a much flatter age pattern, and a peak shifted upwards by several years. Note that this is at variance with the notion of migrating as young as possible, and an inclination to migrate that falls continuously with age, as Schwartz (1976) claimed. The age effect on migration is certainly not unequivocal, just as we anticipated in section 3.

7. So, did they fare well?

With our estimation results available, we will now give a partial answer to the question that motivated our paper: how well off is a migrant due to migration? For the wage structures observed in 1986, we calculated net present values of lifetime wages, discounted at 10%. We use a standard immigrant: male, married, 10 years of schooling, working 40 hours a week, migrating at age 20 in 1950. All annual earnings (2000 working hours a year) are converted into Dutch guilders. The conversion factor we use is the ratio of average nominal per capita GDP in New Zealand evaluated at the exchange rate of the year in which earnings are assumed to have been generated, to average nominal per capital GDP in Holland, normalized so that the value is one in 1986 (when we observe the data). That is, we take the wage structures in each country as observed in our 1986 regression and adjust them for each country to particular years by applying the index of the country's average income, thus assuming that nominal wage growth does not disturb the 1986 wage structure. This gives us an indication of the present values of nominal incomes that actually accrued (or would have accrued in the other country). We don't correct for inflation: in the migration analysis, only relative inflation in both countries is relevant, and this

[15] We experimented a little with exclusion restrictions. In the first of each pair of equations, we excluded occupation from wage and selection equation, in the second we included them in both. In the latter case, the ML procedure stops at the starting values obtained from the two-step procedure. If occupation is only included in the selection equation, the selectivity correction term is highly significant, reflecting probably that occupations have a very significant effect on earnings, even when transformed.

is accounted for in our conversion. We also make a calculation where we freeze the conversion factor at the value for 1950, the presumed year of migration: this may serve as an indication of what migrants could have anticipated at unchanged 1986 wage structure and relative income levels constant for the rest of their working lives. Results are collected in Table 6.

Our typical migrant may have anticipated a substantial gain in lifetime earnings from his move to New Zealand. At the wage structures in 1986 (the only ones we observed) and the conversion factor for per capita incomes in 1950, he thought to more than double his present value. The actual aggregate development was quite a deception, as his lifetime earnings in New Zealand were 25% lower than he might have anticipated in 1950. Yet, over the course of his life, the 1950 migrant is still better off, with lifetime earnings 80% higher in New Zealand than in The Netherlands. The gains in the early years have been high enough to outweigh the strong deterioration that occurred during the postwar period.

We have further analysed the age effect on migration in Figure 12. In line with the analysis of the effect of age at migration in section 3, we calculated two present values for a standard migrant (as in Table 6). For any given age at migration A, we calculate the present value of earnings up to age A in homeland Holland, and the present value of earnings beyond age A in destination country New Zealand (all discounted back to 0, i.e. age 20). Both curves are calculated in their national currencies. As Figure 12a and b indicate, present value in Holland continuously increases with later migration, present value in New Zealand continuously declines with later migration. Total lifetime present value, for any age of switching from Holland to New Zealand, depends on the conversion rate of the two currencies. In panel b, we use the 1950 conversion rate: 1 New Zealand dollar is 5.3 Dutch guilders. At that conversion rate, lifetime earnings monotonically decrease with advancing age of migration: the best decision is to migrate when starting working life. In panel a, with the 1986 conversion rate (1:1), lifetime earnings increase monotonically when postponing migration: the best decision is never to migrate. Implicitly, somewhere between 1950 and 1986 the conversion rate development switched the optimum from 'go young' to 'go never'. Conceptually, as anticipated in Figure 6, the present value curves might have been non-linear, with an interior solution for the optimal migration age. The actual present value curves turn out to be virtually linear, excluding a parabolic shape for the aggregate.

The switch of the optimum decision for a typical individual, from migration to no migration reiterates the results we obtained earlier in this paper, and anticipated in our introduction.[16] The ex post rationality of a 1950 migrant, in spite of the clear deterioration of New Zealand's relative income level surprised us. Of course, the calculations are buried under a load of special assumptions, and there may be much more individual variety than we could uncover. In a survey we organized among the Dutch migrants in New Zealand 30% thought they were worse off financially in New Zealand than had they stayed in The Netherlands. In a later study, we will further confront results from that survey with the results we have reported so far from our econometric research.

[16] Anticipated lifetime present values by age (year) of migration might be included in the migration probit. However, with relative national income per capita we already have included a key determinant of this comparison.

Table 1: Dutch Immigrants Entering New Zealand

1947/48	103	1967	713	1986	408
1949	101	1968	405	1987	446
1950	503	1969	413	1988	600
1951	3.187	1970	436	1989	485
1952	4.575	1971	484	1990	599
1953	2.575	1972	636	1991	414
1954	768	1973	585	1992	437
1955	1.266	1974	677	1993	393
1956	1.335	1975	555	1994	295
1957	1.065	1976	453	1995	281
1958	1.733	1977	569	1996	229
1959	1.338	1978	607		
1960	1.158	1979	510	TOTAL	40.962
1961	1.375	1980	894		
1962	944	1981	1.060		
1963	594	1982	1.250		
1964	666	1983	860		
1965	655	1984	469		
1966	545	1985	313		

Source: Priemus 1997. The data for 1947 to 1990 are from the Dutch Emigration Service, the data for 1990 to 1997 from the New Zealand immigration service.

Table 2 Inequality in hourly earnings, New Zealand and The Netherlands

	The Netherlands			New Zealand		
Men	1979	1989	1996	1984	1990	1997
90-10 log difference	1.09	0.87	1.04	1.07	1.16	1.18
90-50	0.72	0.52	0.56	0.54	0.57	0.60
50-10	0.36	0.35	0.48	0.53	0.59	0.58
Standard deviation logs	0.43	0.37	0.46	0.46	0.50	0.52
Women						
90-10 log difference	0.82	0.78	0.98	0.96	0.99	1.02
90-50	0.53	0.40	0.46	0.51	0.50	0.54
50-10	0.29	0.38	0.52	0.45	0.49	0.48
Standard deviation logs	0.36	0.33	0.44	0.41	0.43	0.45

Source: New Zealand: Dixon (1998), Table 2. Netherlands: own calculations, Structure of Earnings Survey (LSO)

Table 3. New Zealand Earnings Functions: Immigrants and Natives.

	Male Employee	*Male Selfemployed*	*Female Employee*	*Female Selfemployed*
log(hours)	0.336	-0.063	0.504	0.199
	(0.003)	(0.007)	(0.003)	(0.010)
Years of Schooling	0.067	0.057	0.069	0.041
	(0.000)	(0.001)	(0.000)	(0.002)
Experience	0.060	0.029	0.040	0.023
	(0.000)	(0.001)	(0.000)	(0.002)
Experience squared	-0.001	0.000	-0.001	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Married	0.180	0.163	-0.106	-0.088
	(0.002)	(0.006)	(0.002)	(0.014)
Part-time work	-0.277	-0.385	-0.452	-0.194
	(0.005)	(0.013)	(0.004)	(0.016)
Migrant	-0.146	-0.358	-0.247	-0.241
	(0.014)	(0.034)	(0.025)	(0.074)
Years since Migration	0.002	0.008	0.005	0.008
	(0.001)	(0.001)	(0.001)	(0.003)
Constant	7.120	9.009	6.537	7.946
	(0.012)	(0.031)	(0.011)	(0.048)
R-squared	0.419	0.074	0.386	0.069
Observations	33102	10301	24640	3013

Source: OSA, 1986, New Zealand Census, 1986, own calculations.
Standard errors in parentheses.

Table 4. Earnings Functions for Dutch in Holland and Dutch in New Zealand (Employees only).

	Men in NL	Men in NZ	Men in NZ	Women in NL	Women in NZ	Women in NZ
log(hours)	0.609	0.324	0.319	0.981	0.609	0.605
	(0.053)	(0.030)	(0.030)	(0.032)	(0.032)	(0.032)
Years of Schooling	0.060	0.046	0.045	0.062	0.050	0.048
	(0.003)	(0.002)	(0.002)	(0.005)	(0.005)	(0.005)
Experience	0.043	0.046		0.040	0.016	
	(0.002)	(0.002)		(0.004)	(0.004)	
Experience squared	-0.001	-0.001		-0.001	0.000	
	(0.000)	(0.000)		(0.000)	(0.000)	
NL Experience			0.044			0.012
			(0.002)			(0.004)
NL Experience squ.			0.000			0.000
			(0.000)			(0.000)
NZ Experience			0.053			0.021
			(0.003)			(0.006)
NZ Experience squ.			-0.001			0.000
			(0.000)			(0.000)
NL Exp. * NZ Exp.			-0.002			0.000
			(0.000)			(0.000)
Married	0.115	0.201	0.200	0.038	-0.151	-0.138
	(0.020)	(0.017)	(0.017)	(0.027)	(0.033)	(0.033)
Part-time work	0.013	-0.307	-0.312	-0.013	-0.320	-0.319
	(0.052)	(0.048)	(0.047)	(0.040)	(0.042)	(0.042)
Constant	4.158	7.446	7.355	2.740	6.475	6.411
	(0.195)	(0.118)	(0.118)	(0.138)	(0.132)	(0.137)
Observations	1485	6203	6203	803	3184	3184
R-squared	0.516	0.289	0.302	0.782	0.377	0.384
F-Test			38.45			12.06

Note: F-test is for null hypothesis of equal returns to experience for migrants in NL and NZ (3 d.f.)

Table 5. Decision to emigrate at Age A: Probit Results (Discrete Time Hazard Model; Employees Only

	Men		Women	
	(1)	(2)	(1)	(2)
Years of Schooling	-0.002	-0.002	-0.029	-0.029
	(0.002)	(0.002)	(0.003)	(0.003)
Unemployment in Holland	0.057	0.055	0.043	0.042
	(0.003)	(0.003)	(0.006)	(0.006)
Unemployment in New Zealand	-0.062	-0.060	-0.030	-0.029
	(0.006)	(0.006)	(0.011)	(0.011)
Relative Income	1.782	1.767	1.947	1.964
	(0.027)	(0.027)	(0.053)	(0.053)
Occupation: Professional	-0.056	-0.055	-0.171	-0.175
	(0.011)	(0.011)	(0.028)	(0.028)
Occupation: Service	-0.101	-0.101	-0.239	-0.240
	(0.010)	(0.010)	(0.022)	(0.022)
Occupation: Agricultur	0.420	0.418	0.306	0.302
	(0.019)	(0.019)	(0.042)	(0.042)
Age polynomial	yes	no	yes	no
Age dummies	no	yes	no	yes
Log-likelihood	-43692.2	-43595.6	-13401.9	-13338.9

Notes:
Sample: Male, age >15, the reference category is blue collar jobs.
All models are estimated using population weights

Table 6. Net present-values with and without migration for Dutch aged 20 in 1950 in Dutch Guilders

Net present value in The Netherlands	46822
Net present value in New Zealand, converted at 1950 exchange rate	112422
Net present value in New Zealand, converted at current (yearly) exchange rates	83902

Note: Computations are based on columns 1 and 3 of Table 4 (men). The discount rate is 10 percent. The hypothetical worker works full-time with 40 hours per week, is married and has 10 years of schooling.

Figure 1.

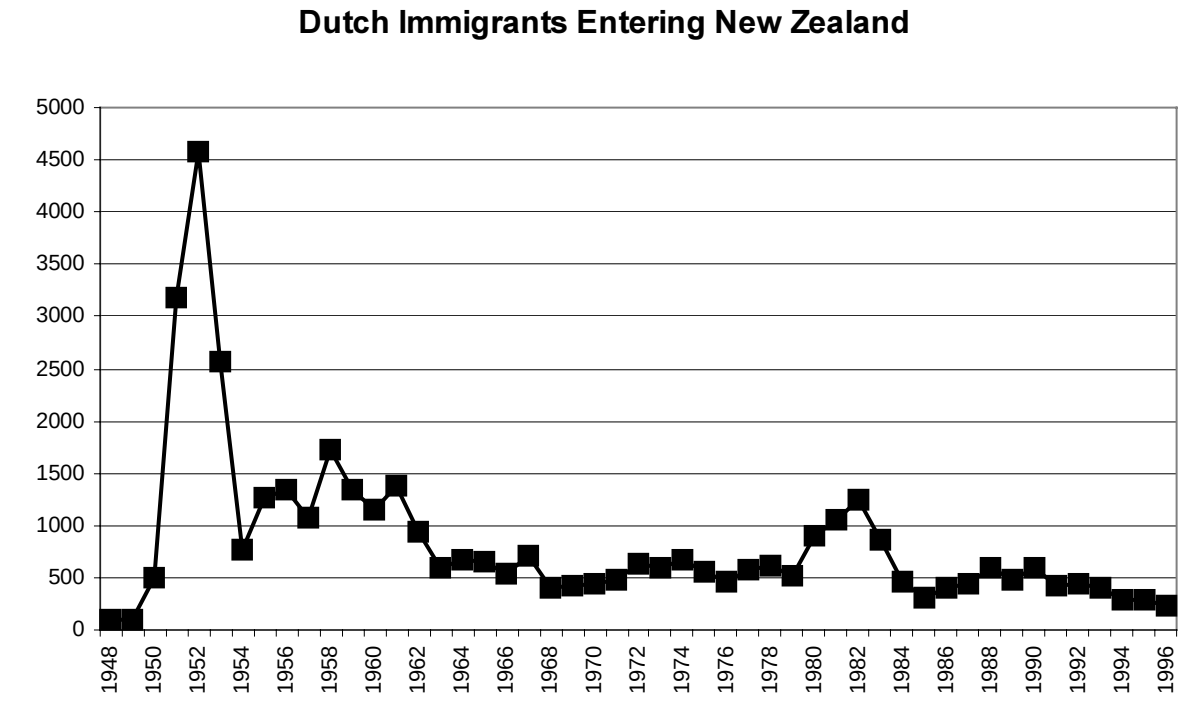
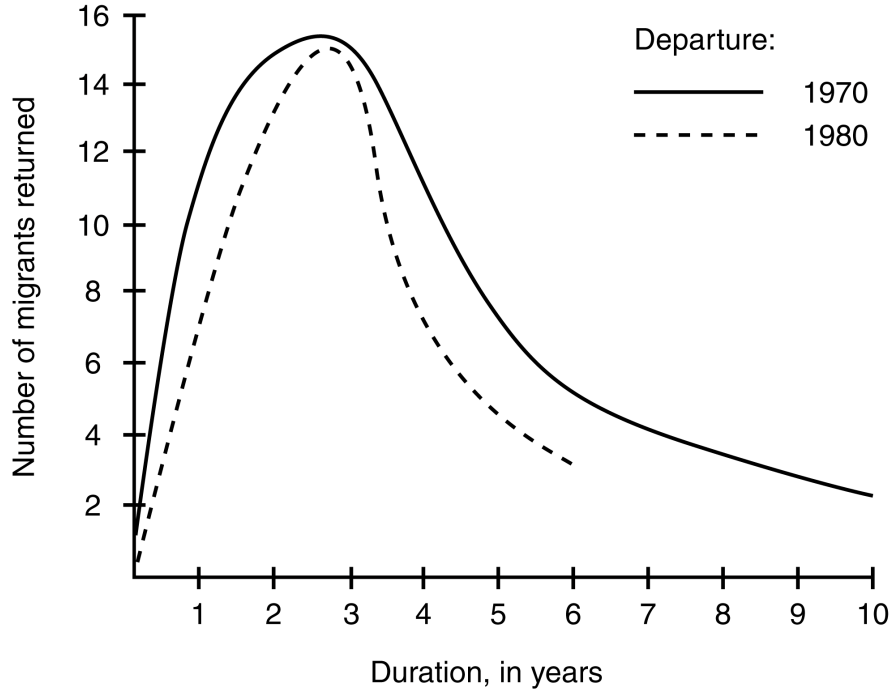


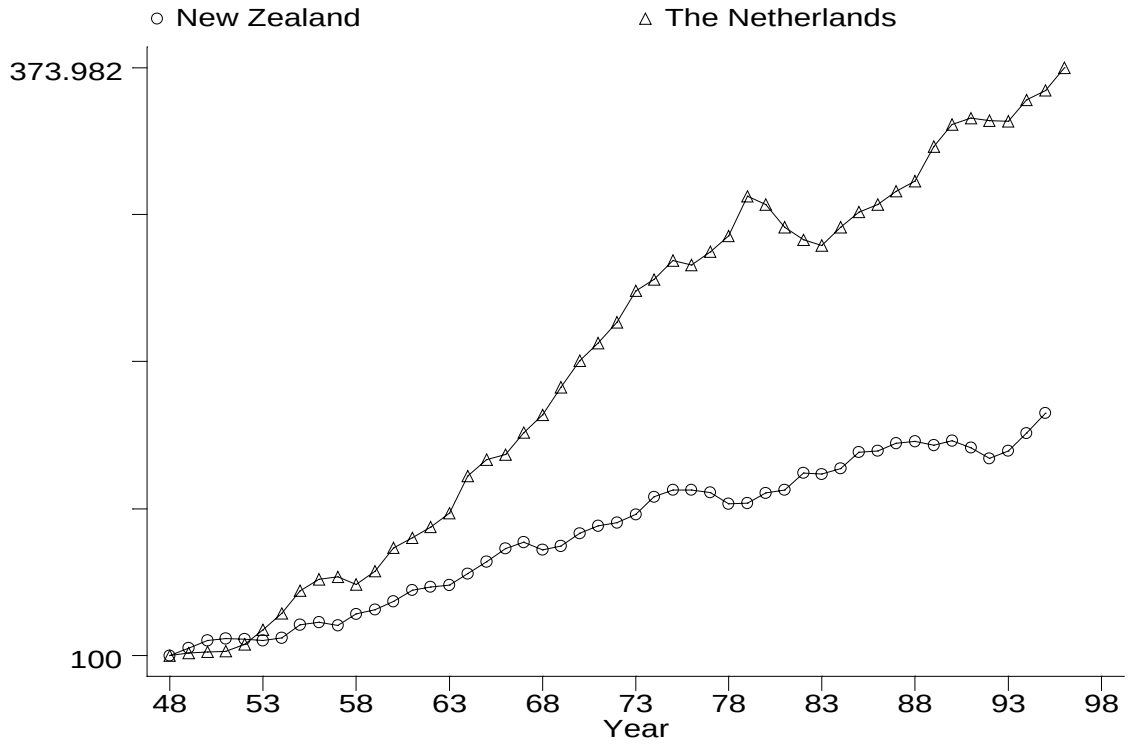
Figure 2.

Duration of migration for return migrants, Canada, Australia, New Zealand, two departure cohorts, in 1980



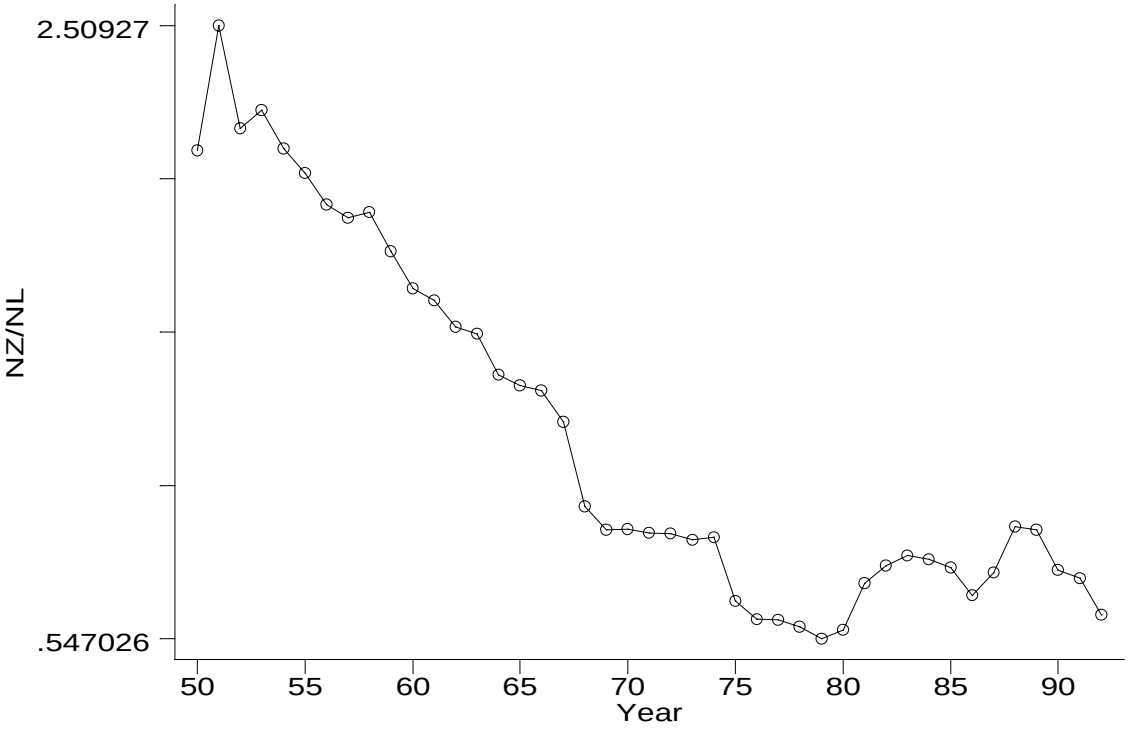
Source: Elich and Blauw (1981), p. 6

Figure 3. Index of real per-capital income



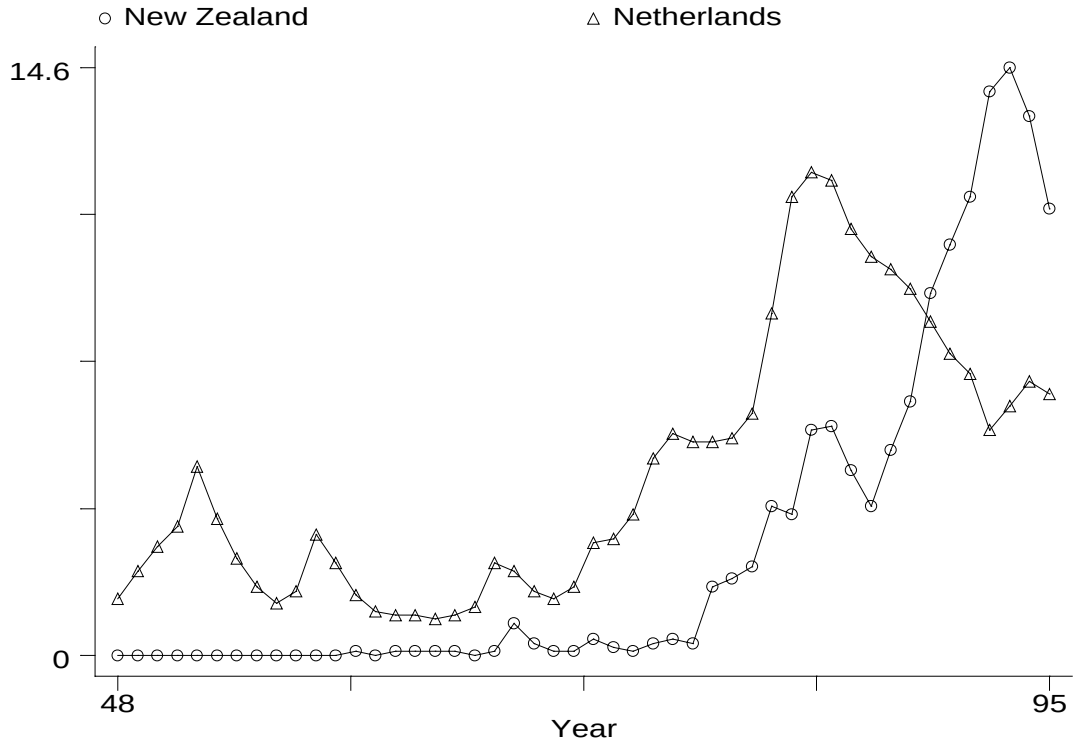
Source: IFS statistics, Statistical Yearbooks, various issues.

Figure 4. Nominal per capita income in New Zealand relative to nominal per-capita income in The Netherlands at current exchange rates.



Source: Penn World Tables.

Figure 5. Unemployment Rates over time



Source: Statistical Yearbooks, various issues.

Figure 6. Marginal Benefits and Marginal Cost of Increasing Age at Migration.

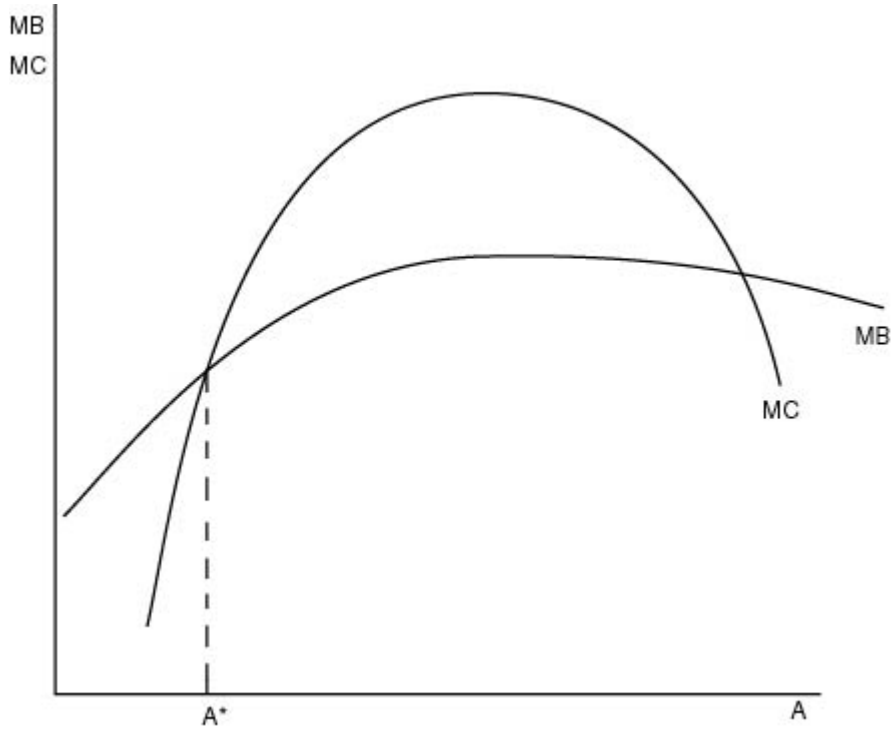


Figure 7.

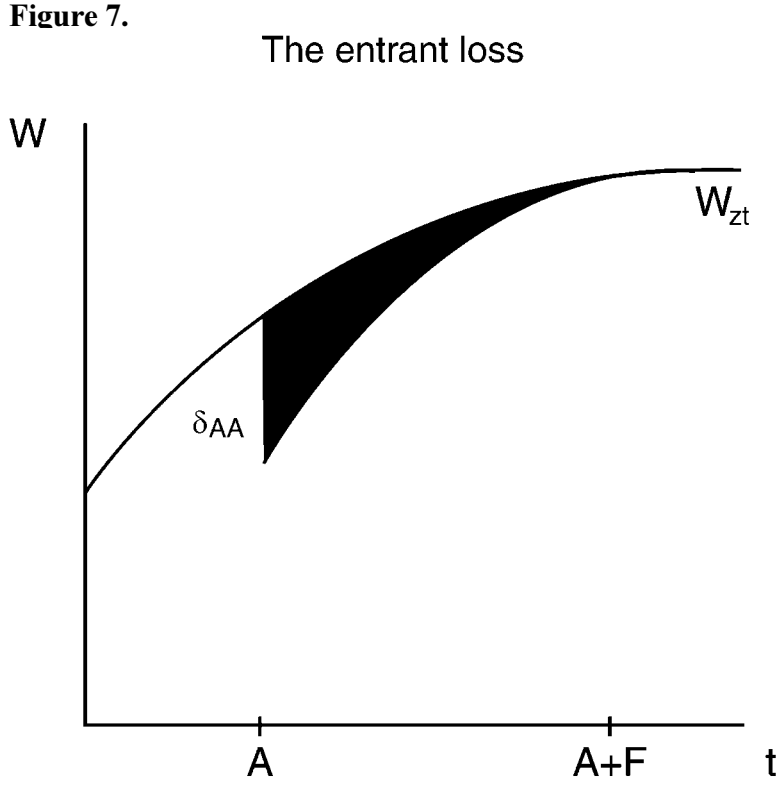
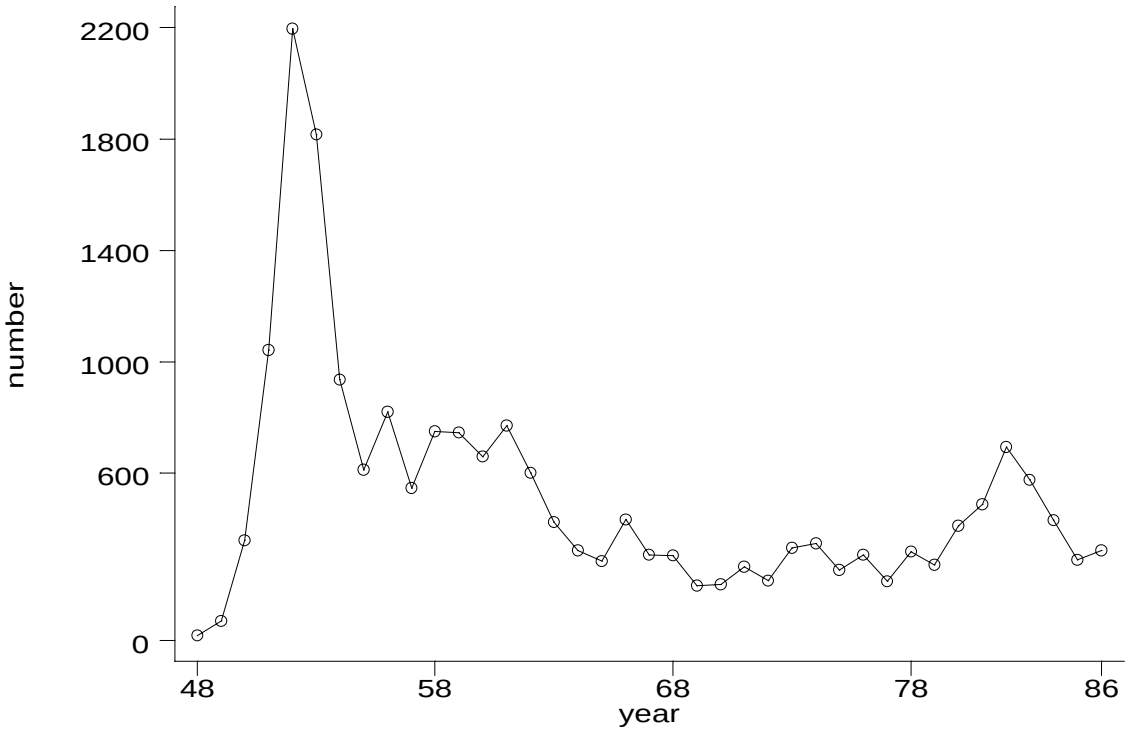


Figure 8. Number of Dutch Working Age Immigrants Living in New Zealand in 1986 by Year of Arrival.



Source:1986 New Zealand Census of Population and Dwellings

Figure 9. Sample Mean Age at Arrival by Year of Arrival (Dutch Working-Age Immigrants in 1986 Census)

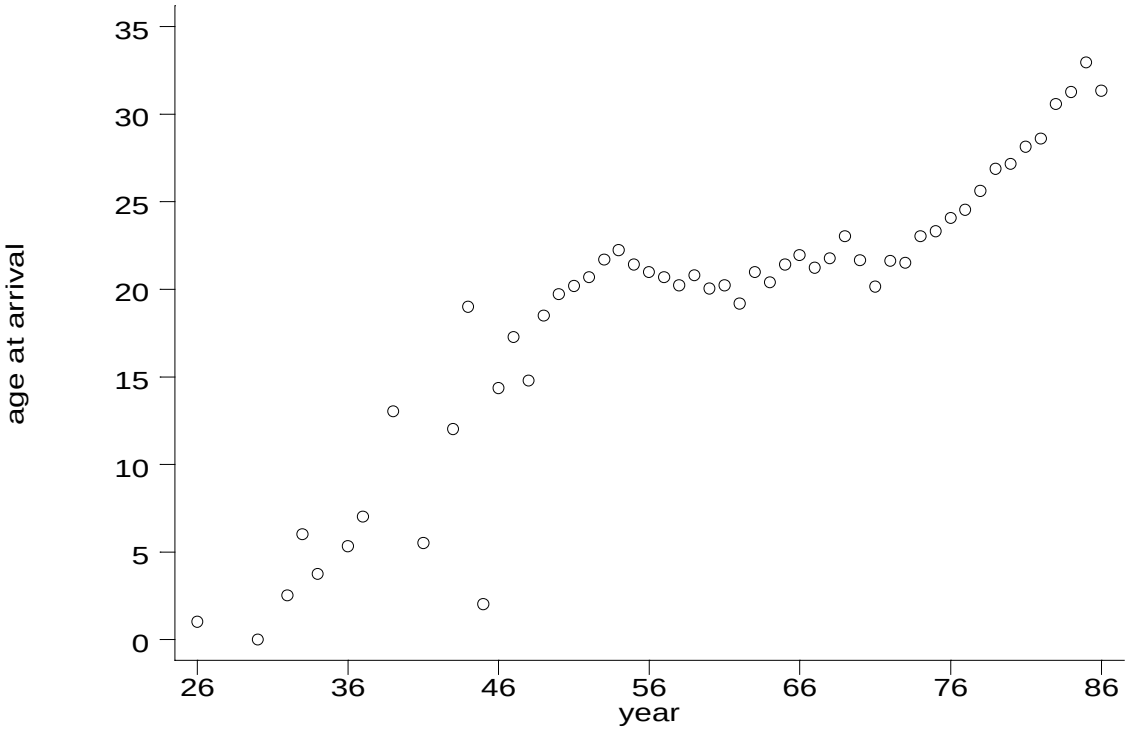


Figure 10. Predicted Earnings Profiles

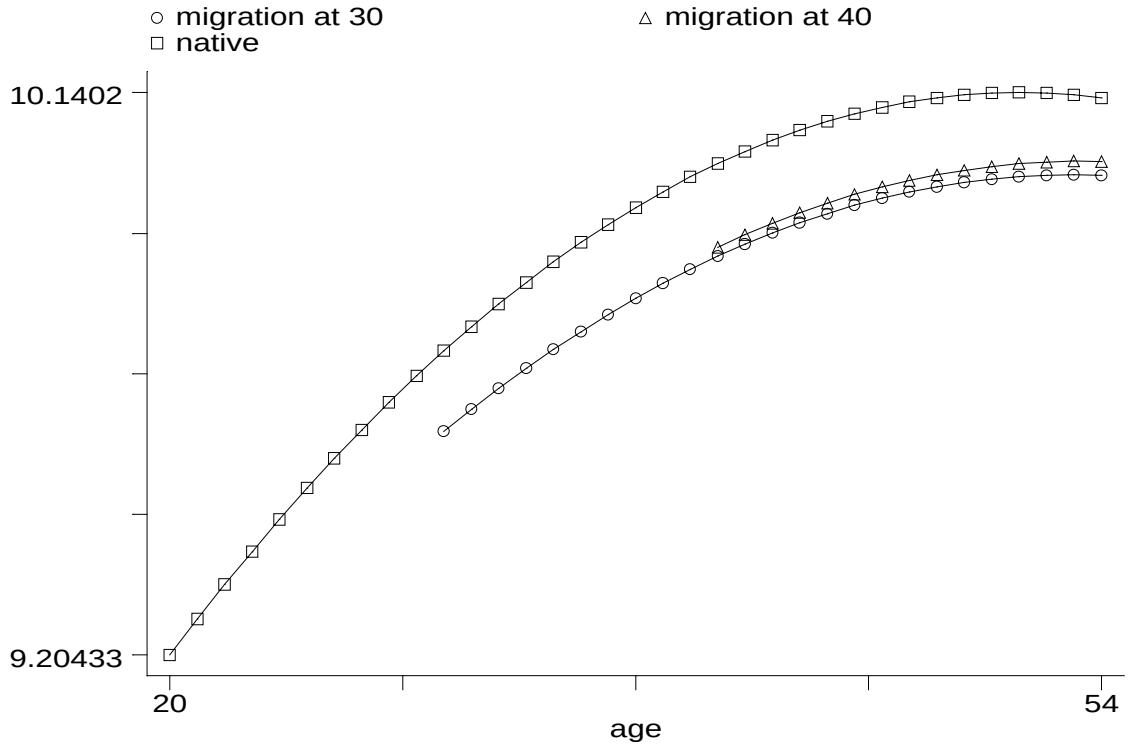


Figure 11.

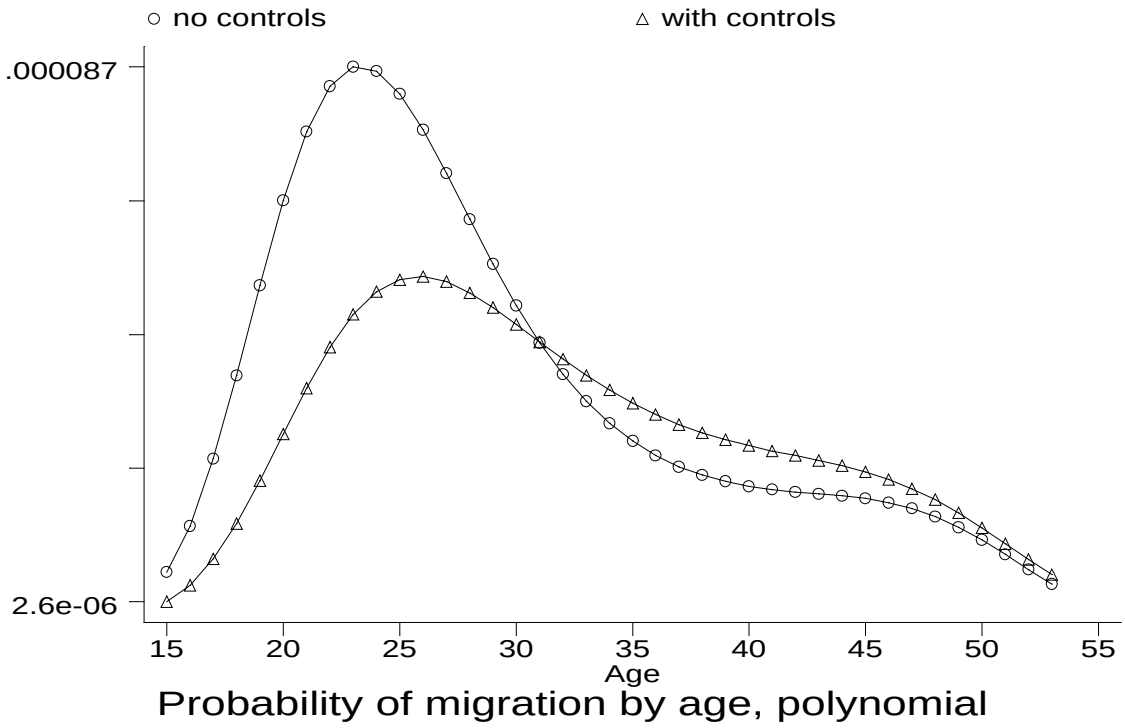


Figure 12a.

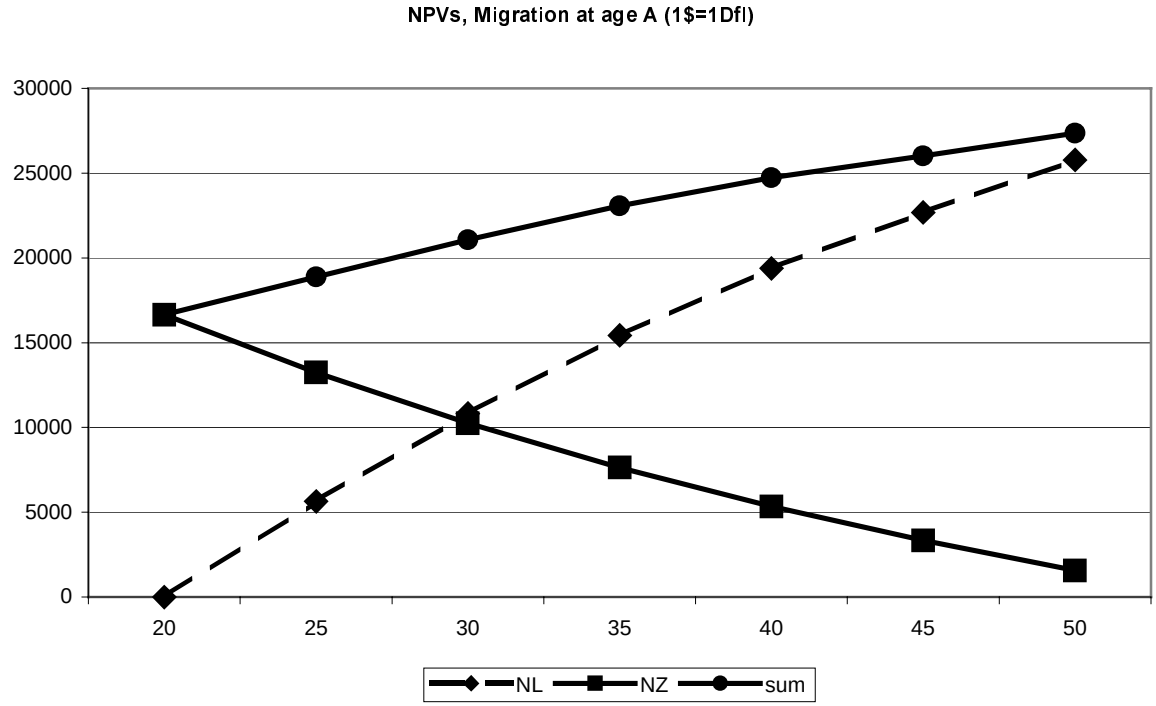
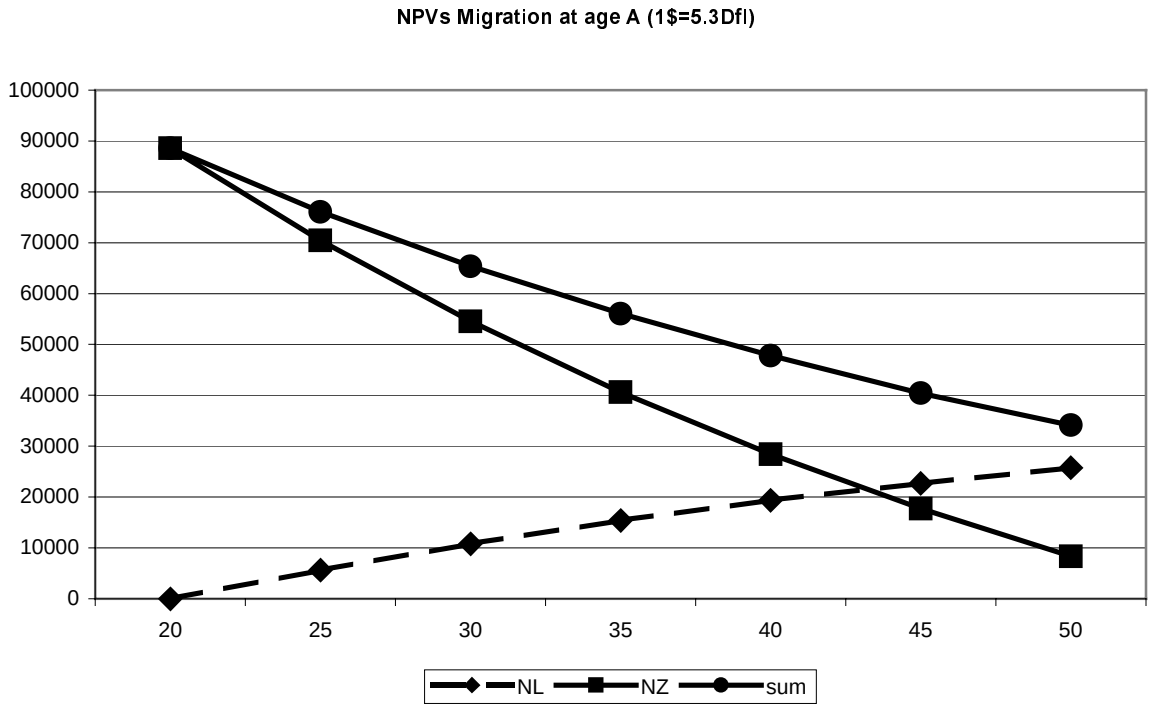


Figure 12b.


NPVs Migration at age A (1$=5.3Dfl)
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
20
25
30
35
40
45
50
NL
NZ
sum

APPENDIX

Table A1: Descriptive Statistics

	Male			Female		
	NL	NZ_mig	NZ_nat	NL	NZ_mig	NZ_nat
Age	38.484	46.293	34.565	36.278	43.858	34.826
	(11.314)	(12.701)	(13.897)	(11.109)	(12.848)	(13.885)
Years since Migration		23.543			21.528	
		(11.310)			(11.218)	
Hours of work	39.401	45.623	45.396	27.665	32.695	34.384
	(7.423)	(12.624)	(12.805)	(13.510)	(16.484)	(14.725)
Selfemployed	0.065	0.349	0.220	0.047	0.211	0.100
	(0.246)	(0.477)	(0.414)	(0.211)	(0.408)	(0.300)
Not in Labor Force	0.096	0.127	0.129	0.511	0.448	0.367
	(0.294)	(0.333)	(0.335)	(0.500)	(0.497)	(0.482)
Unemployed	0.050	0.026	0.046	0.053	0.044	0.059
	(0.219)	(0.160)	(0.210)	(0.225)	(0.205)	(0.236)
Part-time Work	0.039	0.041	0.041	0.204	0.188	0.160
	(0.194)	(0.197)	(0.197)	(0.403)	(0.390)	(0.367)
Full-time Work	0.815	0.806	0.784	0.231	0.320	0.414
	(0.388)	(0.395)	(0.411)	(0.422)	(0.466)	(0.493)
No Qualification	0.088	0.214	0.404	0.091	0.280	0.440
	(0.283)	(0.410)	(0.491)	(0.287)	(0.449)	(0.496)
University Qualification	0.191	0.067	0.064	0.120	0.037	0.039
	(0.393)	(0.250)	(0.244)	(0.325)	(0.188)	(0.194)
Years of Schooling	11.423	10.486	9.324	10.954	9.693	8.901
	(2.688)	(2.736)	(3.068)	(2.405)	(2.624)	(2.845)
Logarithmic Income	7.677	9.718	9.552	6.909	8.676	8.747
	(0.372)	(0.720)	(0.879)	(0.680)	(1.129)	(1.109)
Married	0.831	0.807	0.572	0.806	0.804	0.608
	(0.375)	(0.394)	(0.495)	(0.396)	(0.397)	(0.488)
Professional	0.284	0.232	0.186	0.318	0.214	0.198
	(0.451)	(0.422)	(0.389)	(0.466)	(0.410)	(0.398)
Service Worker	0.289	0.206	0.227	0.600	0.542	0.600
	(0.453)	(0.404)	(0.419)	(0.490)	(0.498)	(0.490)
Agricultural Worker	0.031	0.139	0.144	0.012	0.122	0.082
	(0.174)	(0.346)	(0.351)	(0.109)	(0.328)	(0.274)
Blue Collar Worker	0.396	0.423	0.443	0.070	0.122	0.120
	(0.489)	(0.494)	(0.497)	(0.256)	(0.327)	(0.325)

Table gives the sample means; standard errors in parentheses.
Sources: New Zealand Census 1986; OSA 86

Table A2. Selectivity corrected NZ wage equation (employees only)

	Men (1)	Men (2)	Women (1)	Women (2)
log(hours)	0.303	0.317	0.902	0.918
	(0.030)	(0.028)	(0.033)	(0.032)
Years of Schooling	0.040	0.022	0.036	0.011
	(0.003)	(0.003)	(0.008)	(0.009)
NL Experience	0.033	0.030	0.024	0.024
	(0.005)	(0.005)	(0.012)	(0.012)
NL Experience squared	0.000	0.000	-0.001	-0.001
	(0.000)	(0.000)	(0.000)	(0.000)
NZ Experience	0.046	0.037	0.017	0.011
	(0.004)	(0.004)	(0.010)	(0.010)
NZ Experience squared	-0.001	-0.001	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
NL Experience*NZ Experience	-0.001	-0.001	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Married	0.193	0.183	-0.126	-0.086
	(0.021)	(0.019)	(0.045)	(0.044)
Occupation: Professional		0.281		0.480
		(0.017)		(0.068)
Occupation: Service		0.030		0.143
		(0.017)		(0.063)
Occupation: Agricultur		-0.389		-0.303
		(0.036)		(0.105)
lambda	-0.013	0.020	0.030	0.094
	(0.063)	(0.055)	(0.151)	(0.170)
Log-likelihood	-46533.5	-45508.7	-14675.8	-14277.3

Notes:
(1) selection equation includes ys, age polynomial and macro variables
(2) selection equation includes in addition occupational dummies
This model is based on equations (27) and (28) in the text, where it was assumed that u_{Zi} and u_i have a bivariate normal distribution.

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