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The Participation of Female Immigrants In Vocational Training

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Abstract

This paper studies the transition of female immigrants from the former Soviet Union to the Israeli labor market and their participation in government-sponsored training programs. To study the determinants of the duration to training we estimate a Cox proportional hazard model. We find that higher education leads to a significantly shorter duration to training, whereas immigrants who were older at arrival have a longer duration to training. We formulate a life-cycle model for the integrated labor supply and participation in training decisions. According to the model, the investment in human capital is endogenous and takes two forms: accumulating occupation-specific work experience through an active participation in the Israeli labor market and participating in a government-sponsored classroom training, during which, the immigrant is not allowed to work. Simulating the model under the assumption that training administrators allow free entry to training programs, we are able to generate the observed peak in the participation in training during the third and fourth quarter after arrival, and a moderate decline in the participation rate after one year of residency in Israel.

1 Introduction

This paper studies the transition of female immigrants from the former Soviet Union to the Israeli labor market and their participation in government-sponsored training programs. The state of Israel provided the new immigrants with Hebrew language schools (Ulpan) and government-sponsored vocational classroom training(CT) programs. These policy interventions, are aimed to enhance the integratation of the immigrants in the labor market and to adjust their skills to those demanded in the Israeli labor market.

Our data is taken from two retrospective surveys that were conducted by The Brookdale Institute of Gerontology and Human Development. We focus on female immigrants who came in the initial wave (1989-1992) and were 25-55 years old at arrival.[1] These immigrants have an average of 14.5 years of schooling and 76% of them had worked in white collar occupations in the former Soviet-Union. About 43% of the of the immigrants in our sample, have participated in a CT program during their first five years of residency in Israel. Most of them, have done so during the first year in Israel. The average unemployment rate[2] of these immigrants during their first year in Israel was over 50%. This rate has dropped considerably with tenure in Israel, and stabilized on 16% after four years of residency in Israel. Participation rate of female immigrants in CT, as well as their unemployment rate, are substantially higher than those of male immigrants.

We estimate the conditional hazard to training using a Cox proportional model which corrects for censoring and allows the baseline hazard to vary between different age groups. We find higher education leads to a significantly shorter duration to training, whereas marital status and number of children do not have a significant effect on the duration to training. Even after allowing for different levels of baseline hazards for immigrants who were over 40 years old at arrival in Israel, immigrants who were older at arrival (within age groups) have a longer duration to training. Adding employment history variables as explanatory variables in the duration regression, suggest that immigrants who have gained work experience in Israel, also have a substantial longer duration to training. As expected, the conditional hazard to training is decreasing with seniority in Israel. However, this decrease is not monotonic. After

[1] We focus only on female immigrants who have actively searched for a job in Israel since arrival.

[2] Immigrants who attend training are not considered to be unemployed.

three years of residency in Israel, the hazard increases. This finding may indicate that some of the immigrants who failed to find a desirable job, eventually decided to improve their labor market status via a late participation in training.

Since the decisions regarding labor supply and participation in training are likely to be simultaneously determined, we propose in this paper a life-cycle model for the integrated labor supply and human capital investment decisions. According to this model, each immigrant sequentially chooses among working in two broadly-defined occupations, attending a CT program and not working, in order to maximize her life-cycle discounted expected utility. Under our setting, the investment in human capital is endogenous and takes two forms: accumulating occupation-specific work experience through an active participation in the Israeli labor market and participating in a government-sponsored CT, during which, the immigrant is not allowed to work. The effect of past and current investment decisions on future wage offers and on the availability of job offers is explicitly taken into account in this forward looking optimizing model. We simulate the model using the Brookdale data and succeed in reproducing the observed pattern of participation in training. In particular, under the assumption that training administrators do not select immigrants for training and allow free entry to training, we find a set of parameters that generate the observed peak in the participation in training during the third and fourth quarter after arrival, and a moderate decline in the participation rate after one year of residency in Israel.

The suggested dynamic choice model has several advantages: (1) It allows us to motivate training not only as a conventional investment decision (as human capital theory implies), but also as a form of job search, as it affects the arrival rate of job offers and the distribution of wage offers. Recognizing the role of training in job search, distinguish the training decision from schooling decision; (2) It allows training to affect also the non-participants as their labor supply decisions take into account the *option* to participate in training; (3) Training evaluations tend to value labor supply in the non-market sector at a zero wage. Individuals, on the other hand, value their labor supply in the non-market sector as their reservation wage. Ignoring the value of non market activities leads social planners to evaluate training differently from the individual who participates in the program. The event of participation in CT, by itself, does not indicate the individual chose to participate because she gains from training. Individual may have attended training, since she prefers it to un-

employment. Using a dynamic choice model is an attempt to evaluate training in the same manner the individual does; (4) As indicated in Heckman, Smith and LaLonde (1999), most of previous evaluations did not include employment history variables as explanatory variables in the participation decision. However, several studies suggest that previous labor force status of the individual and changes in this status affect participation in training. Card and Sullivan(1988) observed that trainees employment rates declined prior to entering training. Heckman and Smith(1998) found that unemployment is a powerful predictor of participation and that people who recently changed their labor force status have the highest probabilities of participating. We study the simultaneous decisions to work and to participate in CT, in a life-cycle framework. Hence, the decision to participate in training is affected by past activities the immigrant engaged in the labor market and by current and expected future employment opportunities. Previous activity is therefore endogenous, rather than exogenous, in our model; (5) While estimation of the return to various human capital stocks in a Mincer wage regression treats the stocks as exogenous, estimation of the offered wage as a part of a dynamic choice model allows these stocks to be endogenously determined by the individual and affect her wage growth. The dynamic selectivity is therefore embedded in the model. The wage growth in the dynamic choice model framework is viewed as an outcome of the individual's choices over her life cycle.

2 Data

The Brookdale Institute of Gerontology and Human Development conducted a retrospective employment survey in 1992 on a random sample of immigrants who arrived in Israel between 1989-1992 form the former Soviet-Union. These immigrants were re-sampled during 1994-1995. We use the two surveys to construct a panel of 502 female immigrants who were 25-55 years old at arrival and who have actively searched for a job in Israel since their arrival.[3] We follow these immigrants for, at most, their first 20 quarters in Israel. The surveys enable us to built the complete history of jobs from arrival until the last interview, including wages.[4] For each job, we have information about the starting and ending dates, occupation and weekly

[3] We excluded 13 women whose work pattern is inconsistent with the model assumptions.

[4] In the first survey of 1992, the immigrants were asked only about the wage in the last job they reported.

hours worked. The surveys also contain detailed information on immigrants' participation in government-sponsored vocational CT. The information includes the dates and the duration of participation in the program, the weekly hours, the occupation studied and its relation to the occupation held in the former Soviet-Union. The immigrants also provided information on their participation in Hebrew classes (Ulpan). Background information on occupation held in the former Soviet-Union, years of schooling, Hebrew knowledge before migration and residency in the former Soviet-Union, was reported as well. The data was originally gathered on a monthly basis and was converted into quarterly data.

An important feature of our data set is data on *actual* work experience accumulated in Israel in various occupations. This data is essential for the study of female immigrants, since both female and immigrants may have relatively frequent unemployment spells over their life cycle[5].

Table 1 presents the sample means for the entire sample and by participation in training. 218 of the women in the sample (43%) have participated in a government-sponsored CT program since their arrival. These programs were offered by The Ministry of Labor and The Ministry of Absorption as a part of an 'Absorption package' each immigrant was entitled to upon arrival in Israel. The training programs include courses in sales, cosmetics, diamond cutting, computers etc. The average length of these programs is six months and the average weekly hours is 25.6 (For comparison, in the UK and the US, classroom training typically lasts about 3 months). It is interesting to note that despite the relative long duration of the Israeli programs, less than 5% dropped out from training.[6] The low dropout rate might be due to the importance the immigrants attribute to training, or due to the lack of alternative activities the immigrants can engage in. It can also indicate that the prior information the immigrants obtain about the program, matches, rather well, the actual content of the program. The participants are, on the average, younger at arrival and have more years of schooling.

[5]For example, see a theoretical work by Weiss and Gronau (1981). They study the difference between the experience of men and women and its implications on investment in human capital and on wage.

[6]For comparison, in experiments in the US dropout can reach 40% of the treatment group.

Table 1- Summary Statistics

Variable	Entire sample	Not trained	Trained
Number of observations	502	284	218
Age at arrival	37.2 (8.5)	38.9 (8.9)	35.0 (7.4)
Years of schooling	14.5 (2.4)	13.9 (2.5)	15.2 (2.0)
Number of children	1.05 (0.8)	1.01 (0.9)	1.1 (0.8)
Number of jobs since arrival	1.8 (1.0)	1.6 (0.9)	2.0 (1.0)
Seniority in Israel (months)	43.2 (14.0)	40.5 (15.6)	46.7 (10.9)
Unemployed*(%)	15.1	21.1	7.3
Had Hebrew knowledge before migration(%)	15.7	12.0	20.6
Worked in white-collar job before migration(%)	75.7	69.3	83.9
Married(%)	76.5	77.1	75.7

Standard Deviation in parenthesis

* Percentage of immigrants who have been permanently unemployed since their arrival

We divide the various occupations into two groups: academic, managerial, technical and other white collar occupations[7] (referred to as white-collar, or WC occupation) and all other occupations (referred to as blue-collar, or BC occupation). About 97% of the women in our sample worked in the former Soviet-Union. 76% worked in WC occupation and 21% in BC occupation. 85% of the immigrants have worked in Israel at least at one point since their arrival. Participation in training is particularly high among immigrants who worked in WC occupation in the former Soviet-Union. 48% of those who had worked in WC occupation before migration, attended training, compared to 24% of those who had worked in BC occupation in the former Soviet-Union.

Table 2 and figure 1 present the evolvement of immigrants' employment in WC and BC occupations, unemployment and participation in training over time. The share of employed increases sharply during the first two years in Israel and continues to increase subsequently at a moderate rate. One year (4 quarters) after migration, 37% (=0.069+0.299) of the women

[7] Codes 000-299 in the 1972 occupation classification.

were employed, 46% were unemployed and 17% attended training. After four years in Israel, 82% of the immigrants were employed while 16% were unemployed and only 2% attended training. Training attendance increases after arrival, peaks after one year of residency in Israel, and moderately decreases in latter periods.

Table 2: Proportion of Immigrants by Labor Market Activity.

Quarter since arrival	White Collar	Blue Collar	Training	Unemployed	Observations
1	0.010	0.064	0.002	0.924	502
2	0.026	0.149	0.016	0.809	502
3	0.044	0.263	0.121	0.572	495
4	0.069	0.299	0.169	0.463	476
5	0.082	0.333	0.150	0.436	466
6	0.13	0.372	0.116	0.409	457
7	0.132	0.399	0.085	0.383	446
8	0.147	0.449	0.072	0.333	430
9	0.168	0.472	0.059	0.301	422
10	0.194	0.496	0.046	0.264	417
11	0.194	0.517	0.032	0.257	412
12	0.213	0.525	0.020	0.243	408
13	0.233	0.536	0.013	0.218	386
14	0.251	0.537	0.025	0.186	354
15	0.252	0.533	0.034	0.181	321
16	0.256	0.562	0.021	0.160	281
17	0.295	0.541	0.005	0.159	207
18	0.323	0.528	0.008	0.142	127
19	0.397	0.444	0.000	0.159	63
20	0.433	0.400	0.000	0.167	30
Total:	14.86	39.61	6.11	39.42	7205

The share of immigrants in each occupation as a percentage of total employment is presented in Figure 2. We find that most of the immigrants are absorbed, upon arrival,

in BC occupation (81% of employed after one year). This proportion, however, decreases with seniority in Israel to 69%, four years after arrival. Correspondingly, the portion of immigrants employed in WC occupation increases from 19% after one year in Israel to 31% after four years. Table 3 presents the distribution of number of jobs the immigrant had held in Israel prior to her participation in training. The table shows that about 60% (i.e. 52.75+7.34) of the immigrants who participated in training, had chosen to do so before they ever worked in Israel. This pattern is consistent with predictions of human capital theory, where individuals choose first to invest in human capital and enjoy the return for a longer time. However, the causality is not clear. It might, as well, be the case those immigrants who failed to find a job, eventually 'were forced' to attend training in order to improve their employment opportunities.

Table 3: Distribution of Number of Jobs Prior to Participation in Training

Number of jobs prior to participation in training	Number of Observations	%
0	115	52.75
1	63	28.90
2	18	8.26
3	4	1.83
4	2	0.92
99[a]	16	7.34
Total	218	100.00

a-women who have never worked in Israel since their arrival, but have actively searched for a job.

Table 4 presents the estimates from Logit regressions for the *static* decision to participate in training. The Logit estimates, in both specifications, show that a higher level of education and work in WC occupation in former Soviet-Union lead to a higher propensity to participate in training. These results suggest that those who arrived with a high level of human capital (as measured by schooling and occupation in the former Soviet-Union) tend to invest more, via training, maybe because their imported human capital is more specific. As expected, the tendency to participate in training goes down with age at arrival. Marital status and number

of children both have a negative impact on participation and are statistically insignificant. Adding a dummy that indicates if the immigrant arrived in Israel during 1989-1990 (column 2), we find that controlling for family characteristics and imported human capital variables, immigrants who arrived early, have a higher propensity to participate in training. One should bear in mind the supply of training programs declined with the decreasing inflow of immigrants, so those who came earlier may have faced a higher supply of training.

Table 4: Participation in Training- Logit Estimates

(S.D. in parenthesis)

Variable	Estimate(1)	Estimate(2)
Constant	-1.3701^{b} (0.8106)	-1.6630^{a} (0.8307)
Age at arrival	-0.0762^{a} (0.0135)	-0.0723^{a} (0.0136)
Married	-0.0946 (0.2375)	-0.1455 (0.2401)
Number of children	-0.0611 (0.1314)	-0.0534 (0.1315)
WC occupation in former Soviet-Union	0.5199^{a} (0.2657)	0.4942^{b} (0.2673)
Years of schooling	0.2500^{a} (0.0495)	0.2485^{a} (0.0497)
Alia year 1989-1990		0.3760^{b} (0.2031)
Number of observations	502	502
Pseudo R^2	0.1101	0.1151
Log likelihood	-305.76	-304.05

a - significant at 5% level
b - significant at 10% level

Age at arrival plays a major role in participate in training both due to the self-selection of the immigrants themselves into training and due to the selection of the programs administrators. The average age at arrival of immigrants who entered a training program during their first two years of residency in Israel is 34.8, compared to an average of 38.2 among those who entered training after, at least, two years of residency in Israel. Figure 3 plots

the actual hazard to training by two age groups, immigrants who were above 40 at their arrival and those who were 40 years old or less at arrival. Clearly the younger group has a higher hazard. One should note that administrative restrictions require immigrants should have some Hebrew knowledge before they enroll in a training program. Since most of the immigrants (84%) had no Hebrew knowledge upon arrival, we observe only a few entries to training during the first two quarters. 94% of the immigrants attended Hebrew school (Ulpan) during their first 4-6 months in Israel. After two quarters all the immigrants were eligible to participate in training programs, and most of the entries to training are therefore recorded in the 3rd quarter. Since the eligibility of immigrants to participate in government sponsored training is denied after a few years, we observe increasing hazard to training after three years of residency in Israel for both age groups.

Table 5 reports the estimates from two specifications of a Cox proportional hazard model for the duration to training. The Hazard model has the form

$$H(t) = H_0(t)\exp(x'\beta) \tag{1}$$

where t is time(quarter) since arrival, $H_0(t)$ is the baseline hazard and x is the vector of regressors. The model corrects for censoring and the variance-covariance calculation is clustered on each individual. We further allow the baseline hazard to vary between immigrants who were over 40 years old at arrival and those who were younger at arrival. The last property implies the reported coefficients($\exp\beta$) are equal across groups, but the baseline hazard is different for each age categories.

Table 5: Cox Proportional Hazard Estimates
(robust S.D. clustered on individuals in parenthesis)

Variable	*Estimate* (1)	*Estimate* (2)
Married	0.9389 (0.1595)	0.9563 (0.1621)
Number of children	0.9248 (0.0919)	0.9225 (0.0906)
Age at arrival	0.9559[a] (0.1350)	0.9389[a] (0.1595)
WC occupation in former Soviet-Union	1.3067 (0.2628)	1.2917 (0.2685)
Years of schooling	1.1818[a] (0.0358)	1.1734[a] (0.0387)
Accumulated work experience in WC		0.8671[a] (0.0497)
Accumulated work experience in BC		0.8727[a] (0.0276)
Number of observations	502	502
NUmber of failures (training)	218	218
Log likelihood	−1116.8	−1107.1

a significant at 5% level

The first column presents the estimates from a regression where the human capital regressors, education and occupation prior to immigration, are those the immigrant had brought from the former Soviet Union. We find that even after controlling for the different baseline hazard for the two age groups, immigrants who were older at arrival (within the two age groups) have a longer duration to training. Higher education leads to a significantly shorter duration to training whereas marital status, number of children and employment in a WC occupation in the former Soviet-Union do not have a significant effect on the duration to training. The second column presents the results from a specification that includes the work experience the immigrant has accumulated in Israel in WC and BC occupations as regressors. The two employment history variables suggest that conditional on imported skills, immigrants who have gained work experience in either WC or BC in Israel, have a substantial longer duration to training. Obviously, the longer an immigrant is employed,

the longer is her duration to training. However, this result may also imply that immigrants who found a job in Israel, have less incentives to participate in training. The coefficients of the other variables remained unchanged compared to the first specification[8]. Clearly, as long as the employment decisions, and therefore work experience variables, are endogenous in the training decision, the estimates in the second column are biased. In the next section we present an estimable model for the integrated labor supply and participation in training decisions in a life-cycle framework.

Figure 4a plots the predicted hazard[9] for an average individual in the older age group who worked in WC occupation in the Soviet-Union. This individual was 46 years old at arrival and has 14 years of schooling. *ho* is the predicted hazard, based on the first regression (column 1). *h1o* is the predicted hazard based on the second regression, for an individual with the same characteristics and no work experience in either WC or BC. The later hazard (*h1o*) is consistently and substantially higher than *ho* and the actual hazard. *hqw4o* and *hqb4o* are the predicted hazards from the second regression for an individual who has accumulated 4 quarters of experience in WC or BC, respectively.[10] As seen in the figure, these two predictions are almost identical, implying the impact of work experience on the duration to training is independent of occupation.

Similarly, figure 4b plots the predicted hazard for an average individual in the younger age group who had worked in WC occupation in the Soviet-Union, was 32 years old at arrival and has 14 years of schooling. *hy* is the predicted baseline hazard from the first regression. The predicted hazard from the second specification for an individual with the same imported characteristics and no work experience in either WC or BC, denoted as *h1y*, is consistently and substantially higher than *hy* and the actual hazard. Plotting the predicted hazard from the second regression for an individual who has accumulated 4 quarters of experience in either WC or in BC (*hqw4y* and *hqb4y*, respectively), reveals again that work experience in either WC or BC play the same role in the hazard to training.

[8] Alia year was found to have no significant effect on the duration to training.

[9] The hazard is predicted only in periods we observe actual entries to training.

[10] Note we can plot the hazard only for fixed values of the regressors. Hence, there is no meaning to the predicted hazards *hqb4o* and *hqw4o* in the first four quarters, since it was not feasible to accumulate four quarters of experience unless the immigrant spent at least four quarters in Israel.

Transitions

Table 6 presents the number of quarter-to-quarter transitions. The elements on the diagonal are clearly dominant.[11] Specifically, we find a strong state dependence in occupation-specific employment, as 95.6%(92.9%) of the immigrants who worked in a white-collar(blue collar) occupation, continue to work in the same occupation in the subsequent quarter. The table also reveals a prominent state dependence in unemployment. Direct transitions from one occupation to the other are rare. However, these transitions may occur indirectly through training and unemployment. Direct transitions from training to WC and BC are considerably higher than the transitions from unemployment to the two employment states.

Table 6:Actual Quarterly Transitions

(row percentage in parenthesis)

From \ *To*	White Collar		Blue Collar		Training		Unemployment		Total
White Collar	918	(95.6%)	7	(0.7%)	12	(1.3%)	23	(2.4%)	960
Blue Collar	14	(0.5%)	2414	(92.9%)	51	(2.0%)	120	(4.6%)	2599
Training	33	(7.6%)	71	(16.5%)	222	(51.5%)	105	(24.4%)	431
Unemployment	101	(3.7%)	330	(12.2%)	154	(5.7%)	2128	(78.4%)	2713
Total	1066		2822		439		2376		6703

Wages

As noted above, the Brookdale surveys provide data on wages. In the 1992 survey, the immigrant was asked about the last wage she received in the last job she reported. In the 1995 survey, she was asked about the last wage she received in *each* job she reported in the second survey. Since 46% of the immigrants who have ever worked in Israel, had only one job since their arrival, for most of the immigrants we have only one wage observation (at most we have four wage observations for an individual). Overall, we have a total of 649 wage observations. The wages in white-collar jobs are more volatile than those in blue-collar jobs. The mean wage is increasing over time in WC occupations, but is roughly constant in BC occupations. The mean wage in WC(BC) occupation is about 12.5(11.6) NIS per hour

[11]Transition form training to training implies that the immigrant participated in a program that lasted more than one quarter.

during the first year in Israel. During the fifth year of residency in Israel, the mean wage in WC(BC) occupation is about 22.1(10.8) NIS per hour. All wages are in July 1995 prices

Wage regressions with robust standard errors are presented in Table 7. The dependent variable is the log of the hourly wage. Clearly, these regressions do not correct for all the selections biases implied by the individual's choices. Training dummy equals 1 only if the wage was reported after the graduation of the program. In columns (1) and (2) we report results from a pooled wage regression, without and with a dummy for occupation, respectively. The first regression implies the only difference between wage in WC and BC occupations is due to the occupation-specific accumulated work experience. Under this specification, the return to training is large (8.5%) and significant at 5% level. However, when adding a dummy for wages in WC occupation (column (2)), training as well as the occupation-specific accumulated work experience variables become insignificant at 5% level. The wage premium for working in WC occupation vs. BC, is 37% and is strongly significant. The latter finding suggests that when the occupational dummy is omitted, the training dummy captures some of the wage differences between the two occupations, whereas when the occupational dummy is included, the return to training is smaller and less significant. Columns (3) and (4) report the results from separated wage regressions for WC and BC, respectively. Almost all the variables in these regressions are statistically insignificant. The return to training in WC occupation (column (3)) is large, 15.6%, and significantly different from zero at 10% level. The returns to imported human capital variables (schooling and age at arrival[12]) are small and statistically insignificant in all the regressions.

[12]Age at arrival is used to control for potential work experience in the former Soviet-Union.

Table 7: Wage Regression

Variable	All Wages No WC dummy (1)	All Wages with WC dummy (2)	Wage in WC Occupation (3)	Wage in BC Occupation (4)
Constant	2.0996 (0.1185)	2.0649 (0.1174)	2.0027 (0.4127)	2.1328 (0.1240)
Schooling	0.0091 (0.0073)	0.0081 (0.0071)	0.0229 (0.0213)	0.0081 (0.0077)
WC experience	0.1107 (0.0196)	0.0314 (0.0275)	0.0322 (0.0368)	0.0841 (0.1177)
WC experience^2	-0.0042 (0.0016)	0.0004 (0.0019)	0.0004 (0.0023)	-0.0068 (0.0149)
BC experience	-0.0343 (0.0141)	-0.0134 (0.0148)	0.0382 (0.0515)	-0.0207 (0.0161)
BC experience^2	0.0024 (0.0008)	0.0013 (0.0008)	-0.0044 (0.0049)	0.0017 (0.0009)
Training	0.0855 (0.0400)	0.0621 (0.0400)	0.1558 (0.0945)	0.0221 (0.0432)
Age at arrival	0.0018 (0.0021)	0.0012 (0.0022)	0.0046 (0.0061)	0.0003 (0.0021)
WC occupation	–	0.3679 (0.1037)	–	–
No. of Observations	649	649	148	481
R^2	0.27	0.29	0.09	0.02

Standard errors in parenthesis

3 The Model

In this section we formulate a finite-horizon dynamic discrete choice model for the integrated labor supply and human capital investment decisions of female immigrants. The model follows the dynamic programing models of labor supply and schooling (for example, Keane and Wolpin (1997) and Eckstein and Wolpin(1999)), where an individual sequentially chooses among a finite set of mutually exclusive alternatives over a finite horizon, in order to maximize the discounted expected utility. The model incorporates observed heterogeneity,

such as, marital status, number of children, schooling, age at arrival and occupation prior to migration, as well as unobserved heterogeneity (Heckman and Singer (1984)).

Each immigrant has a finite decision horizon, starting at arrival in Israel and ending at retirement. In each period t the immigrant chooses an element a among her choice set A, which contains, at most, four alternatives: employment in white-collar occupation[13] (a=1), employment in blue-collar occupation[14] (a=2), participation in training (a=3) and unemployment (a=4). The choice variable, d_{at}, equals 1 if the a element was chosen in period t and equals zero otherwise.[15] The four alternatives are mutually exclusive, implying $\sum_{a=1}^{4} d_{at} = 1$ for every t. The constraints of the optimization problem lie in the transition probabilities to switch from one alternative to another, as both the availability of jobs in WC and BC occupations and the availability of training programs are random and depend on the immigrant's characteristics, as well as on her current and past decisions.

The objective of the immigrant is, thus, to maximize

$$E\left[\sum_{t=1}^{T}\beta^t U_t(d_{at}) \mid S(0)\right] \tag{2}$$

by choosing a sequence of the control variables d_{at} for all $t = 1, ..., T$, where t is time since arrival, T is the retirement period and β is the discount factor. U_t is the stochastic periodic utility at time t and $S(t)$ is the individual's state space at time t which contains all the variables that are known to the immigrant at time t and affect either her current or future utility.

The household's budget constraint in each period t, $t = 1, .., T$ is

$$d_{1t}w_{1t} + d_{2t}w_{2t} + d_{3t}TW + d_{4t}UB + AI_t = C_t + g_1 N \cdot (d_{1t} + d_{2t}) + g_2 N \cdot d_{3t} + g_3 N \cdot d_{4t} \tag{3}$$

where w_{at} is the immigrant's wage in WC occupation ($a = 1$) or BC occupation ($a = 2$), TW is the subsidy the immigrant receives while attending CT and UB is the unemployment

[13] WC occupation is also referred to as occupation 1 in this section.
[14] BC occupation is also referred to as occupation 2 in this section.
[15] For notation simplicity, we omit the individual index in this section.

benefit. AI_t represents the household's additional sources of income that do not depend on the immigrant's choice, such as the husband's earnings. C_t is the consumption of a composite good in period t, and N indicates the number of children. The cost of children, g_a may differ if the immigrant works($a = 1\ 2$), participates in training($a = 3$) or is unemployed ($a = 3$) at time t.

The stochastic offered wage in occupation j, w_{jt}, ($j = 1\ 2$) follows a standard quadratic Mincer wage function with cross-experience terms:

$$\begin{aligned} w_{jt} &= \exp\left(\alpha_{0j}+\alpha_{1j}SC + \alpha_{2j}k_{1,t-1}+\alpha_{3j}k^2_{1,t-1}+\alpha_{4j}k_{2,t-1}+\alpha_{5j}k^2_{2,t-1}+\alpha_{6j}dt_t+\alpha_{7j}AGE + \varepsilon_{jt}\right) \quad (4) \\ j &= 1\ 2 \end{aligned}$$

where SC denotes the immigrant's imported years of schooling. The endowment of schooling is assumed to be exogenous as the option to migrate to Israel was not feasible when the schooling decision was made. $k_{j,t-1}$ is the *actual* work experience that the immigrant has accumulated in occupation j since her arrival until period t. dt_t is an indicator equals one if the immigrant has completed a training program before period t. AGE is the immigrant's age at arrival. The literature on training evaluations has focused on the parameter α_{6j}, which is known as the mean return to training. α_{2j} α_{3j} α_{4j} α_{5j} and α_{6j} measure the contribution of different forms of human capital that the immigrant accumulates in Israel to her potential earnings. ε_{jt} is a time varying occupation-specific shock, which is assumed to be serially uncorrelated. Under the last assumption, time dependence in wages is related to the immigrant's decisions via work experience accumulation and participation in CT and not to randomness.

The occupation-specific work experience stocks evolve according to

$$\begin{aligned} k_{1,t} &= k_{1,t-1} + d_{1t} \\ k_{2,t} &= k_{2,t-1} + d_{2t} \end{aligned} \quad (5)$$

The initial values of the endogenous human capital variables are given by the level of these variables at arrival in Israel, implying $k_{1,0} = k_{2,0} = dt_0 = 0$. Women's choices take into account that future job opportunities and wage offers depend on the endogenously accumulated occupation-specific work experience and training status.

The periodic utility, U_t is assumed to be linear and additive in consumption and leisure. It is given by

$$\begin{aligned} U_t &= (\gamma_{1m}M + \gamma_{1c}N)(d_{1t} + d_{2t}) + \gamma_{1l}d_{1t} + \gamma_{2l}d_{2t} \\ &\quad +(\gamma_{2m}M + \gamma_{2c}N + \gamma_{3l} + \varepsilon_{3t})d_{3t} \\ &\quad +(\gamma_{3m}M + \gamma_{3c}N + \gamma_{4l} + \varepsilon_{4t})d_{4t} \\ &\quad +C_t \end{aligned} \tag{6}$$

where M is an indicator equals 1 if the immigrant is married. Both marital status and number of children are assumed to be exogenous.[16] We restrict the utility from children and marriage while working (γ_{1c} and γ_{1m} respectively) to be independent of the occupation chosen. However, the immigrant's utility from leisure while working, γ_{jl}, $j = 1\ 2$ may depend on the occupation j. Differences between γ_{1l} and γ_{2l} can reflect, for example, differences in satisfaction the immigrant gets from working in WC occupation as opposed to working in BC occupation. γ_{jl} $j = 1\ 2$ can also be negative, implying the immigrant has disutility from working in occupation j. The utility from children, marriage and leisure can differ if the immigrant is attending training or being unemployed. We further allow for time varying correlated shocks to preferences, ε_{at}, while participating in training (a=) or not working (a=4).

Given (6), we can write U_t as

$$U_t = \sum_{a=1}^{4} U_{at}d_{at} \tag{7}$$

where U_{at} is the periodic utility associated with choosing alternative a at time t $a \in A$.

[16] Studies that modeled female life-cycle marital status and labor supply decisions (Van Der Klaauw (1996)), or life-cycle fertility and labor supply decisions (Hotz and Miller (1988), Eckstein and Wolpin(1989)), treated female's labor supply as a binary decision (i.e. the women either works or not). In this paper we focus on different labor market activities the woman can engage in (i.e. not only does she work, but also in what occupation does she work etc.). We therefore do not incorporate the marriage and fertility decisions into our model.

Substituting C_t obtained from (??) in (6), the alternative-specific utilities at time t are

$$\begin{aligned} U_{1t} &= w_{1t} - g_1 N + \gamma_{1m} M + \gamma_{1c} N + \gamma_{1l} \\ U_{2t} &= w_{2t} - g_1 N + \gamma_{1m} M + \gamma_{1c} N + \gamma_{2l} \\ U_{3t} &= TW - g_2 N + \gamma_{2m} M + \gamma_{2c} N + \gamma_{3l} + \varepsilon_{3t} \\ U_{4t} &= UB - g_3 N + \gamma_{3m} M + \gamma_{3c} N + \gamma_{4l} + \varepsilon_{4t} \end{aligned} \tag{8}$$

Note that under the assumption the utility is additive and separable in consumption, the additional sources of income in (??) AI_t are neutral across the four alternative and do not affect immigrant's choices.[17] The random elements $\varepsilon_t = [\varepsilon_{1t}\ \varepsilon_{2t}\ \varepsilon_{3t}\ \varepsilon_{4t}]$ are assumed to be joint normal and serially independent. That is $\varepsilon_t \backsim iid\ N(0\ \Omega)$ where Ω is not restricted.

As mentioned above, not all the four alternatives are available to the immigrant at each period, as offers to participate in training and job offers in BC and WC occupations are random and limit the transitions to switch from one alternative to another. In particular,

1.The Institutional design of training programs imposes restrictions on participation in training. Each immigrant is eligible to participate in only one government-sponsored training program during her first five years of residency in Israel. The periodic probability of receiving an offer to participate in training (during the first 5 years) depends on the immigrant's age at arrival and is given by

$$\begin{aligned} pt_1 &= \frac{\exp(p_1)}{1+\exp(p_1)} \text{ if } AGE < 40 \\ pt_2 &= \frac{\exp(p_2)}{1+\exp(p_2)} \text{ if } AGE \geq 40 \end{aligned} \tag{9}$$

this training offer probability is independent of job offers and layoffs. The length of a

[17]No data on husband's wage and employment status (i.e. employed, unemployed) is available from the Brookdale surveys. The assumption the husband always works is too strong for immigrants who have just arrived in a new country and enter a new labor market. In order to account for potential impact of husband's wage on the wife's decisions, additional assumptions about the predicted patterns of the husband's wage and employment have to be made (for example, see Baker and Benjamin (1997) and Duleep, et al. (1999)).

training program varies between one to three quarters and is exogenously determined[18]. We further assume programs of different length have the same impact on wages and job-offer probabilities.[19]

2. In each period, the immigrant can receive job offers in occupation 1 and 2, independently. The probability of receiving a job offer in occupation j, $j = 1, 2$ at time t, depends on the labor market activity the immigrant engaged in during the previous period ($d_{a\,t-1}$), as well as on the immigrant's years of schooling, age at arrival, participation in training, occupation in the former Soviet-Union(denoted by UOC) and accumulated work experience in occupation j. We adopt the logistic form for the job offers, implying

$$\begin{aligned} \lambda_{jt} &= \frac{\exp(b_{10j}(d_{3t-1}+d_{4t-1})+b_{11j}d_{-jt-1}+b_{2j}SC+b_{3j}AGE+b_{4j}dt_t+b_{5j}UOC+b_{6j}k_{j,t-1})}{1+\exp(b_{10j}(d_{3t-1}+d_{4t-1})+b_{11j}d_{-jt-1}+b_{2j}SC+b_{3j}AGE+b_{4j}dt_t+b_{5j}UOC+b_{6j}k_{j,t-1})} \\ j &= 1,2 \end{aligned} \tag{10}$$

where $d_{-j\,t-1} = 1$ if the immigrant was employed in occupation other than j at $t-1$.

3. In each period there is an exogenous probability, s_j, for an employed immigrant to be separated from her job in occupation j, $j = 1, 2$.

4. The immigrant can always choose to be unemployed.

The optimization problem (2) can be represented by a set of alternative-specific value functions, each obeys Bellman equation (Bellman(1957)):

$$V_a(S(t),t) = U_{at} + \beta E\{\underset{x\in A}{MAX}(V_x(S(t+1),t+1)|S(t),d_{at}=1\}, a \in A \tag{11}$$

where $V_a(S(t),t)$ is the maximum expected present value if alternative a is chosen at time t, for a given element of the state space $S(t)$. As seen in (11), future decisions are assumed to be made optimally for any current choice a, $a \in A$.

[18]To reduce computational burden, in the simulation we assume the actual length of the program is realized only after the immigrant's decision to participate in training is made. This implies that only the expected value of participation in training matters in the decision. Allowing the length of the training program to be realized before the decision is made, involves an increase of the state space by a factor of 3.

[19]This assumption is based on discussions we had with the administrators of the training programs. They indicated to us that the length of the program does not necessarily imply that the longer program covered more study-material, but rather, the same material was taught in a different pace.

Finally, under our setting, the state space in period t can be written as

$$S(t) = \{d_{a\,t-1}, k_{1,t}\ , k_{2,t}\ dt_t, SC, AGE, N, M, UOC, \Omega, \varepsilon_t\} \tag{12}$$

4 Solution Method

In each period the immigrant chooses one element from her choice set, A, for which the value function in (11) is maximized. The decision rules in a finite horizon model are not stationary and depend, among others, on the number of periods until retirement. The model is solved recursively from the last period back to the first. Denote by $\overline{S}(t)$ the deterministic elements of the state space (12). Consider an immigrant entering the last decision period T with $\overline{S}(T)$. The value functions at T are known up to a random draw from the multivariate normal distribution of the alternative-specific shocks ,ε_T. Given a draw from this distribution, all the terminal value functions can be calculated and the immigrant chooses the alternative a that gives her the highest realized value, $V_a(S(T), T)$. However, when entering period T-1 with $\overline{S}(T-1)$, in order to calculate of the value functions at T-1, the immigrant has to first calculate

$$\begin{aligned} & E\max\{V_1(S(T),T), V_2(S(T),T), V_3(S(T),T), V_4(S(T),T)|S(T-1), d_{aT-1}\} \\ = & \int_{\varepsilon_{1T}}\int_{\varepsilon_{2T}}\int_{\varepsilon_{3T}}\int_{\varepsilon_{4T}} \max\{V_1(S(T),T), V_2(S(T),T), V_3(S(T),T), V_4(S(T),T)|S(T-1), d_{aT-1}\} \times \\ & f(\varepsilon_{1T},\varepsilon_{2T},\varepsilon_{3T}\varepsilon_{4T})\partial\varepsilon_{1T}\partial\varepsilon_{2T}\partial\varepsilon_{3T}\partial\varepsilon_{4T} \end{aligned} \tag{13}$$

This calculation has to be done for every possible a, since each choice a in $T-1$ leads to a different point in the state space in T. (Thus, the Emax should be calculated at each of the potential four state space points at T she can reach given $\overline{S}(T-1)$). After calculating the Emax for each possible choice at $T-1$, the value functions at $T-1$ are known up to a random draw from the multivariate normal distribution of ε_{T-1}. Given a draw of ε_{T-1}, the immigrant chooses the alternative a for which $V_a(S(T-1), T-1)$ is the highest. The

same calculation is done as we move backwards. The value functions in period t should be computed for any possible point, $\overline{S}(t+1)$ in the state space, that can arise given $\overline{S}(t)$ and d_{at}.

Under the assumption that the alternative-specific shocks are distributed multivariate normal (13) doesn't have a closed form expression. Full numerical computation of (13) requires high-dimensional integrations. Following Keane and Wolpin (1994), Monte Carlo integration is used to numerically approximate (13). That is, D draws from the multivariate normal distribution of ε_T are taken and for each draw, the maximum of the value functions is calculated. The maximum values are averaged, implying

$$\begin{aligned} & E\max\{V_1(S(T),T), V_2(S(T),T), V_3(S(T),T), V_4(S(T),T)|S(T-1), d_{aT-1}\} \qquad (14) \\ = \; & \frac{1}{D}\sum_{d=1}^{D}\max\{V_1(S(T),T), V_2(S(T),T), V_3(S(T),T), V_4(S(T),T)|S(T-1), d_{aT-1}\} \end{aligned}$$

Full solution of the dynamic programing problem, from the immigrant's arrival until retirement, for all potential points in the state space that may arise, involves enormous computational burden. To reduce this burden, we split the horizon to two sub-periods. During the first 20 quarters, the model is solved explicitly, as described above. The value functions in the 21'st quarter, $V_a(S(21),21)$ are assumed to be a parametrized function of the immigrant's state space at the 20th quarter, $S(21)$. In particular, we assume

$$V_a(S(21),21) = \delta_1 k_{1,20} + \delta_2 k_{2,20} + \delta_{3m} AGE + \delta_4 dt_{20} + \delta_5 \qquad (15)$$

4.1 Simulation

In this section we present results from simulations of the model under the following simplifying assumptions:

(1) The wage parameters in (4) are the OLS estimates reported in columns 3 and 4 in table 7.

(2) The utility while attending training is equal to the utility while not working.

(3) Marital status and number of children do not affect decisions.

(4) The probability to receive an offer to participate in training equals 1 each quarter, regardless of age at arrival.

(5) The variance-covariance matrix, Ω, is diagonal.

(6) There is no unobserved heterogeneity in the population.

(7) $\gamma_{il} = 0$ for $i = 1, .., 4$.

The values of the other parameters are presented in appendix 1.

The restricted model is simulated using the Brookdale data. For each of the 502 immigrants in our sample, we calculate the $Emax$ in 3,080 points in the state space that may arise during the 20 period planning horizon (which means 3,080 combinations of k_1, k_2 and dt). In each of these 3,080 points, we use 150 Monte-Carlo draws to calculate the $EMAX$ as defined in (14).

The simulated and actual labor market choices are presented in figure 5. The bold lines are the actual figures. As the figure shows, the restricted model can generate the employment and participation in training patterns we observe in the data. The simulations generate a peak in the participation in training during the third and fourth quarter after arrival, and a moderate decline in the participation rate after one year of residency in Israel. Note that assumption (4) above implies the simulated participation pattern is governed only by the self selection of the immigrants into the programs and not by the selection of the administrators.

References

[1] Ashenfelter, O. (1978), "Estimating the Effect of Training Programs on Earnings," **Review of Economics and Statistics**, 6(1), 47-57.

[2] Bellman, R. (1957), "Dynamic Programming," Princeton, New-Jersey, Princeton University Press.

[3] Card .D. and .D. Sullivan (1988) , "Measuring the Effects of CETA Participation on Movements In and Out of Employment," **Econometrica**, 56, 497-530.

[4] Duleep, H., Reget M. and S. Sanders (1999), "A New Look at the Human Capital Investment: A Study of Asian Immigrants and their Family Ties", Kalmazzo, MI: Upjohn Institute of Economic Research.

[5] Eckstein, Z. and Wolpin, K. I.(1989), "The dynamics of Labour Force Participation of Married Women and Endogenous Work Experience," **Review of Economic Studies**,56, 375-390.

[6] Eckstein and K.I. Wolpin (1999), "Why Youth Drop Out of High School: The Impact of Preferences, Opportunities and Abilities," **Econometrica** (forthcoming).

[7] Ham J.C. and R.J. LaLonde (1996), "The Effect of Sample Selection and Initial Conditions in Duration Models: Evidence from Experimental Data on Training," **Econometrica,** 64(1), 175-207.

[8] Heckman, J., LaLonde, R.J. and J.A.Smith (1999) "The Economics and Econometrics of Active Labor Market Programs," **Handbook of Labor Economics**, forthcoming, 174-178.

[9] Heckman, J. and B. Singer (1984), "A Method for Minimizing the Impact of Distributional Assumptions in Econometric Models for Duration Data," **Econometrica**, 52(2), 271-320.

[10] Heckman, J. and J.A. Smith(1999), "The Pre-Program Earnings Dip and the Determinants of Participation in a Social Program: Implications for Simple Program Evaluation Strategies," **NBER Working Paper** No. W6983

[11] Hotz V. J. and, R.A. Miller(1988) "An Empirical Analysis of Life Cycle Fertility and Female Labor Supply," **Econometrica**, 56(1), 91-118.

[12] Keane, M. P. and K. I. Wolpin (1994), "The solution and Estimation of Discrete Choice Dynamic Programming Models by Simulation and Interpolation: Monte Carlo Evidence", **Review of Economics and Statistics**, 76, 648-672

[13] Keane, M. P. and K. I. Wolpin (1997), "The Career Decision of Young Men," **Journal of Political Economy,** 105, 473-522.

[14] LaLonde R.J. (1995) "The Promise of Public Sector-Sponsored Training Programs," **Journal of Economic Perspectives,** 9.22, 149-168.

[15] McFadden, D. (1989), "A Method of Simulated Moments for Estimation of Discrete Response Models Without Numerical Integration," **Econometrica**, 57(5), 995-1026.

[16] Van Der Klaauw W.(1996) "Female Labour Supply and Marital Status Decisions: A life-Cycle Model,"**Review of Economic Studies,** 63,199-235.

[17] Weiss, Y. and Reuben Gronau (1981), "Expected Interruptions in Labour Force Participation and Sex-Related Differences in Earnings Growth," **Review of Economic Studies**, 48(4), 607-619.

Appendix 1: Parameters used in simulation

Job offer parameters	**Offer Probability** $j=1$	**Offer Probability** $j=2$
b_{10j}- did not work at $t-1$	-4.522	-2.350
b_{111}- work in BC at $t-1$	-3.501	$-$
b_{112}- work in WC at $t-1$	$-$	-1.900
b_{2j}- years of schooling	0.048	$9.8e-4$
b_{3j}- age at arrival	-0.019	0.003
b_{4j}- training	1.870	0.192
b_{5j}- WC occupation in Soviet Union	0.500	-0.238
b_{6j}- accumulated experience in occupation j	0.160	0.087
s_j- separation rate from occupation j	0.109	0.050

Terminal value parameters	
δ_1- accumulated experience in WC	22.077
δ_2- accumulated experience in BC	31.098
δ_3- age at arrival	-1.005
δ_4- training	35.000
δ_5- constant	800.00

Figure 1: Labor Market Activities

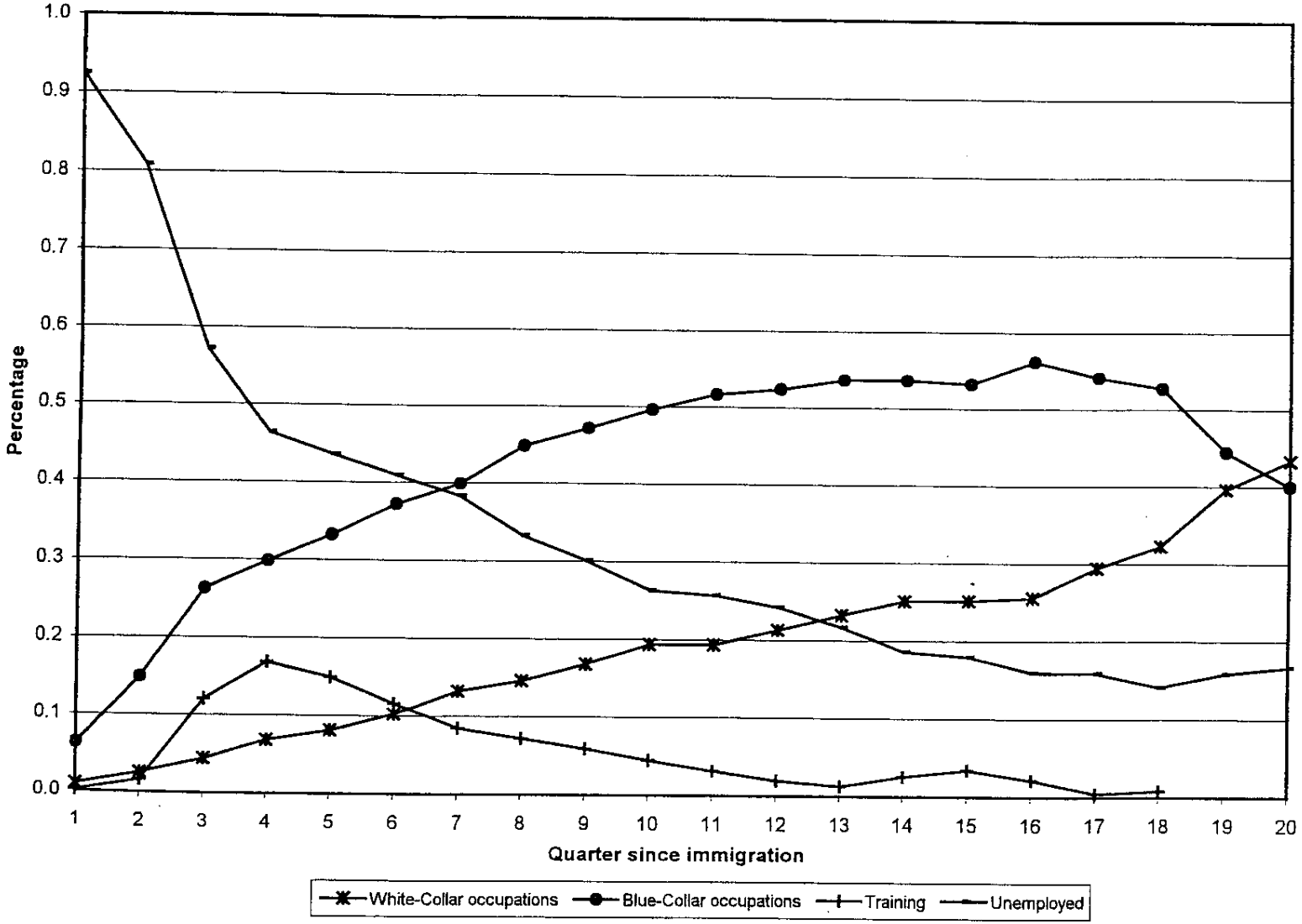


Figure 2: Employment by Occupation (% of Total Employment)

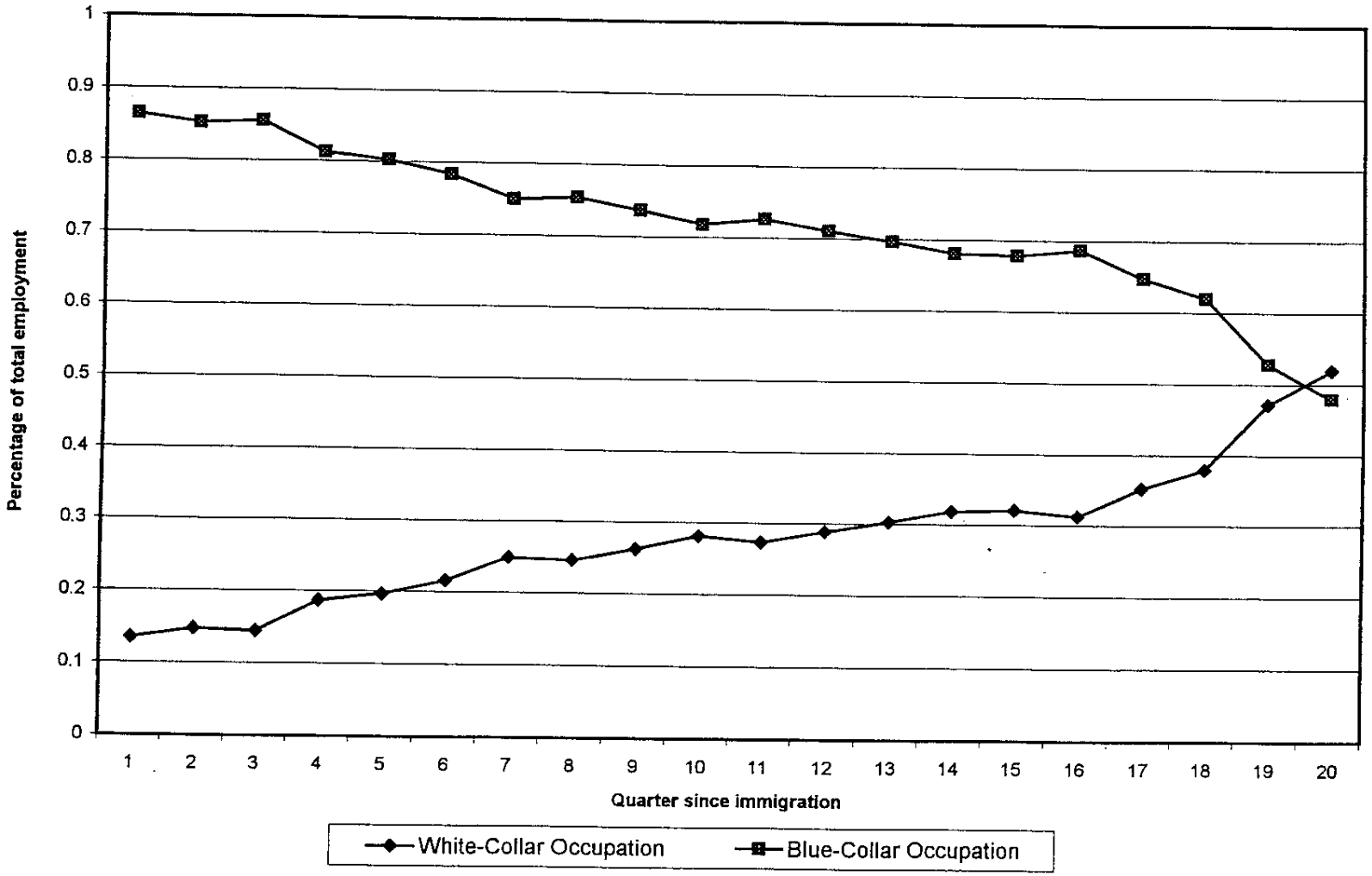


Figure 3: Actual Hazard by Age Groups

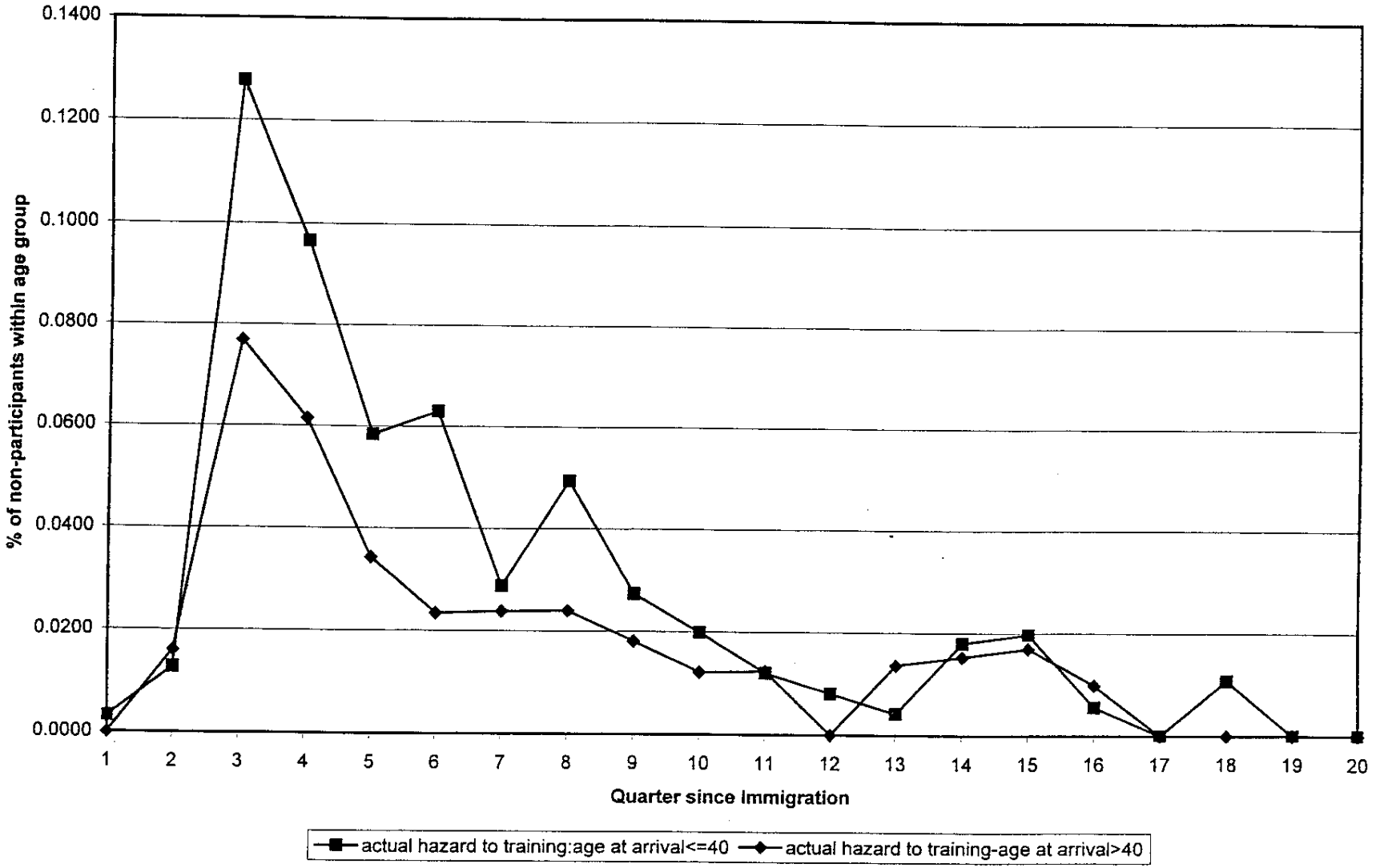
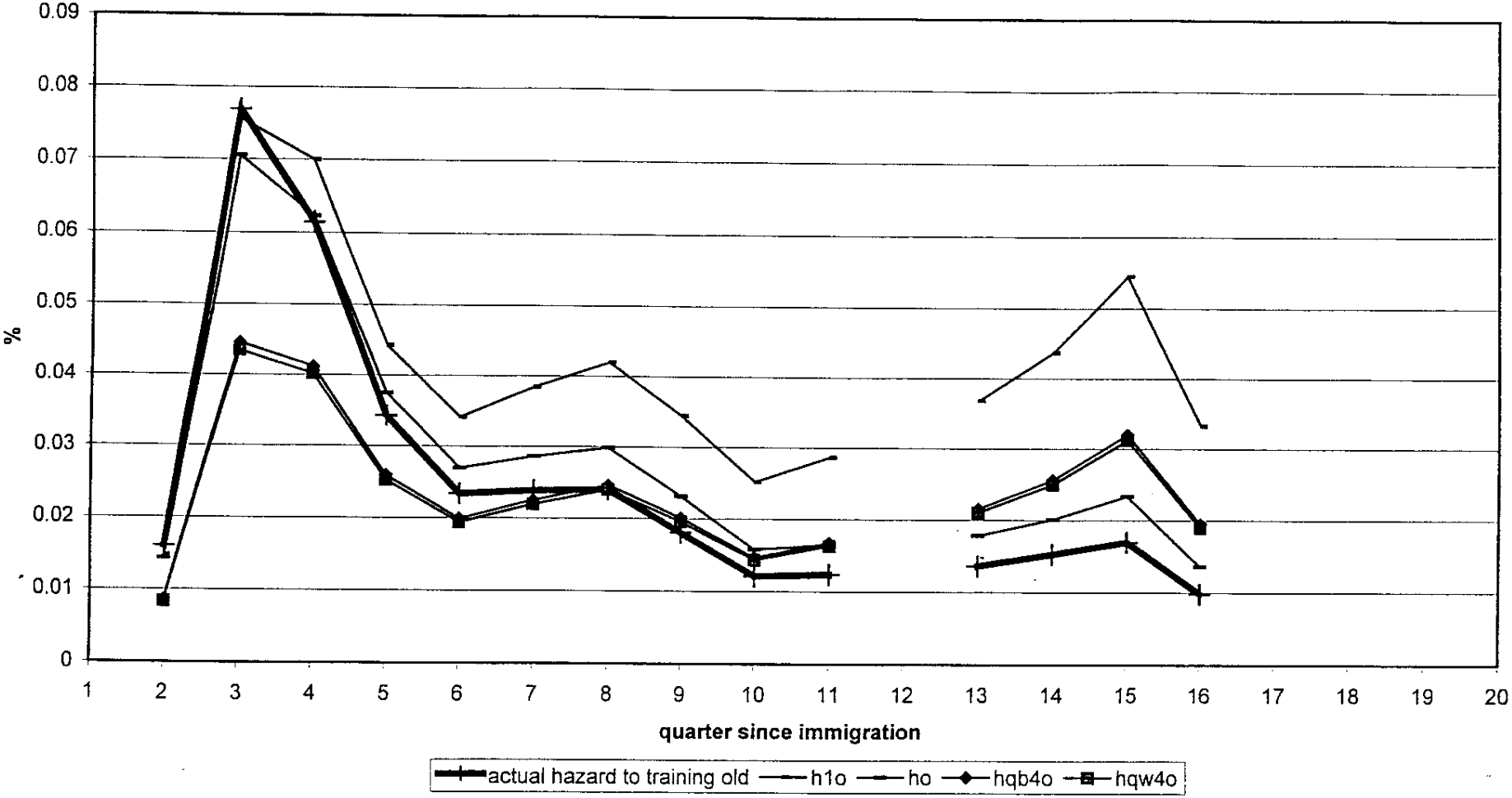


Figure 4a: Predicted Hazards to Training - Age at arrival>40*



Age at arrival 46, schooling=14, WC occupation in USSR.

Figure 4b: Predicted Hazards to Training - Age at arrival<41*

Age at arrival 32, schooling=14, WC occupation in USSR

Figure 5: Actual and Simulated Choice Distribution