Training and Occupational Choice of Highly Skilled Immigrants¤

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1 Introduction

The transition pattern of post schooling individuals, displaced workers and immigrants to the labor market has similar characteristics. Unemployment falls quickly as workers …rst …nd blue-collar jobs, followed by a gradual movement to white-collar occupations. For immigrants the transition includes the learning of the new country language as well as the skills demanded by the new labor market. This paper focuses on male immigrants who moved from the former Soviet Union to Israel and are characterized by their high levels of skills, education and age. [see table 1]. We study the impact of participation in training programs, job search, occupational choice and language acquisition of immigrants on their integration to the new labor market. In particular, we formulate a dynamic choice model for employment in blue and white collar occupations and training, where the labor market randomly o¤ered opportunities are a¤ected by the immigrant past choices.[1] The model provides a labor supply pattern that is consistent with the observed choices and enables us to estimate the rate of return for training.

Government sponsored training programs are commonly viewed as the best method for subsidizing human capital investment for displaced workers and immigrants. The vast literature on the return to government sponsored training program has been heavily occupied by the sample selection problem and the result that the estimated return for training treatment is not signi…cantly di¤erent from zero.[2] While that literature is mainly based on data regarding low skills disadvantaged workers, this paper considers a sample of highly skilled immigrants who unexpectedly moved to a completely di¤erent labor market. Standard regression analysis, using our data, indicates a large but insigni…cant estimates for the rate of return to training.[3] In order to further investigate the role of training in the labor market transition of workers, we formulate a model that jointly considers alternative motives for the participation in training programs. In particular, the participation in training, which we separate by the broadly de…ned blue and white-collar occupations, a¤ects the wage o¤ers and the job o¤ers

[1] White collar cccupations include engineers, physicians, professors, other professionals with an academic degree, managers, teachers, technicians, nurses, artists and other professionals; blue collar occupation include unskilled workers.

[2] See the recent survey by Heckman, LaLond and Smith (1999).

[3] This is the common result in the literature (see a survey by Lalonde(1995)).

probabilities di¤erently in each occupation. Furthermore, the individual may have direct utility from participating in training and we allow for each of these elements to be di¤erent for two unobserved types of individuals (Heckman and Singer (1984)).

We follow a sample of about 400 men immigrants, who arrived to Israel between 1989-1992, for at most their …rst 20 quarters (…ve years) in Israel. Most of them studied Hebrew extensively during their …rst two quarters in Israel and then searched for work. Depending on availability, they could attend one government sponsored training program that is supposed to adjust or transform their imported skills. The participation in training started at the third quarter, picked at the forth and ended after 3 years in Israel. Only about 30 percent attained any training. Most immigrants left unemployment to blue collar occupations, although about 70 percent of them were working in white-collar jobs before the former USSR. After more than three years the unemployment rate, which was initially about 28%, was stabilized at about 10% (above national average) and the transition to white-collar jobs continued throughout the …fth year after migration. The mean wage per hour growth rate is about 9% annually, which is 2.6% higher than the rate we …nd in a larger sample given by the income survey of the CBS (See Eckstein and Weiss (1998)).

The point estimates

The rest of the introduction goes by the description of the results.

2. …t of the pattern.
3. policy and counterfactual experiments
4. comparison to the literature on training and the immigrants wage convergence.

2 Labor Supply Description: Data

Data

The data for this study is based on a survey conducted by the JDC - Brookdale Institute of Gerontology and Human Development. The …rst survey was conducted during the summer of 1992 on a random sample of 1,200 immigrants from the former USSR who entered Israel between October 1989 and January 1992. The second survey was done in 1995 and only 901

of these immigrants were re-sampled. The original sample consists of immigrants in working-ages (25-65) residing in 31 di¤erent locations in Israel at the time of the …rst survey. These immigrants reported their residence, occupation, schooling and some other demographic characteristics in the former USSR. Both surveys contain a complete history of jobs held from the date of arrival to Israel until the interview. They also provide information on wages in each job and detailed information on the participation in government sponsored training programs. Furthermore, the data contains a detailed information on their knowledge of Hebrew at arrival, the participation in the Hebrew learning classes (ULPAN in Hebrew) and the Hebrew knowledge at the date of the surveys.

Our study is restricted to 419 male immigrants that at their arrival to Israel were 23 to 58 years old. Non of the individuals returned to be full time students and they were actively looking for a job in Israel. The survey labor market history is based on a monthly report which we converted to quarterly (three months) data set. For 316 of the immigrants we have data from both surveys.

Skills at Arrival

Table 1 provides the descriptive information on the characteristics of the sample at their arrival to Israel. The average schooling level is 14.6 years and it is high relatively to the Israeli males (12.5 years of schooling). We divide jobs to two broad occupations, white and blue collar. White collar jobs are related to work that require more than 12 years of schooling such as managers, teachers, nurses, engineers, artist and other high skilled professionals and about. The blue collar occupations consists of all other jobs which require mainly basic knowledge of reading and writing. 68% of the males worked in the former USSR in jobs related to the white collar occupation, while after four years in Israel only about 30% of the working males have white collar jobs.

The knowledge of language is measured by four questions on the ability to understand, to speak, to read and to write the language. The immigrants were asked these questions both on Hebrew and English. We use an index that gives equal weights for all questions and has a lowest value of one for those that have no knowledge and the number four for being ‡uent in using the language. In table 1 we report the mean value of the English knowledge that is collected at the …rst survey. We assume that this level of English is the same as the knowledge the immigrants had as they arrived in Israel.

Table 1. Summary Statistics at Arrival

	Obs.	Percent	Mean	SD
Schooling	419	–	14.58	2.74
Age at arrival	419	–	38.05	9.15
White collar USSR	284	67.78	–	–
Blue collar USSR	127	30.31	–	–
Did not work in USSR	8	1.91		
Married	363	86.63	–	–
English	419	–	1.76	0.94

Hebrew

The knowledge of Hebrew is measured at the two interviews as explained above. In table 2 we provide a summary of the knowledge of Hebrew. 12% of the immigrants were able to make a simple conversation in Hebrew before their arrival. 92% went to learn Hebrew in the special program called "ulpan" and 79% completed the program. The indices of the Hebrew knowledge at the two surveys, which are about two years apart, show a 10% increase for the average individual. It should be noted that the standard length at the basic Hebrew training (Ulpan) is two quarters and almost all immigrants attend it immediately after their arrival.[4]

Table 2. Hebrew Knowledge

	Obs.	Percent	Mean	SD
Hebrew before migration	50	11.9	–	–
Ulpan Attendance	386	92.3	–	–
Ulpan completion	332	79.2	–	–
Ulpan Length (months)	387	–	4.6	1.34
Hebrew1 (…rst survey)	419	–	2.71	0.82
Hebrew2 (second survey)	316	–	2.98	0.83

[4] Also note that the immigrants arrived at di¤erent dates and therefore have di¤erent tanure in Israel at the time of survey.

In Table 3 we present results from the pooled regression where the dependent variable is the index of Hebrew knowledge at the time of the …rst and second survey (thus the number of observations is 419+316=735). As seen in the table, time since arrival is a signi…cant indicator of Hebrew knowledge. Using the regression in table 3 we form a predicted Hebrew index for each individual in the sample based on the regression. The main impact on the predicted index are the time in Israel plus the individual residual (which we assume to be invariant over time).

Table 3: Hebrew regression

Variable	Estimate
b_{cons}	$1{:}6954$ $0{:}1690$
b_{Ulpan_length}	$0{:}0915$ $0{:}0145$
$b_{Hebrew\ before\ migration}$	$0{:}6574$ $0{:}0886$
$b_{time\ in\ Israel}$	$0{:}0714$ $0{:}0307$
$b_{time\ in\ Israel\_square}$	$¡\ 0{:}0014$ $0{:}0013$
Num. of Obs.	735
R^2	0.1680

Labor Market Choices

We organized the data such that the labor market state in the data …t the state in the model. At each quarter the immigrant could be in one out of …ve labor market states: unemployed (UE), working in a white collar job (WC), working in a blue collar job (BC), attending a training course in a white collar occupation (TW) or attending a training course in a blue collar occupation (TB). Training in white collar jobs include courses in using computers, adjusting knowledge of engineers in a certain area and technicians in certain …elds. Training in blue collar jobs include courses in sales, cosmetics, diamond cutters, electricians, travel agents, etc.. Table 4 presents the actual proportion of individuals in each state at each quarter since the date of arrival to Israel for at most …ve years (20 quarters).Figures 1a and 1b describe the actual proportions.

Table 4. Proportion of Immigrants by Labor Market Activity.

Quarter Since arrival	UE	WC	BC	TW	TB	Observations
1	71.84	3.10	24.82	0.24	0.00	419
2	48.21	8.11	43.44	0.24	0.00	419
3	27.88	13.70	50.48	5.29	2.64	416
4	23.02	15.35	51.98	6.44	3.22	404
5	23.72	17.60	49.23	5.10	4.34	392
6	21.75	20.69	49.87	3.71	3.98	377
7	19.95	21.31	53.83	2.73	2.19	366
8	16.13	21.11	57.48	3.52	1.76	341
9	13.94	20.61	60.30	2.42	2.73	330
10	14.64	19.94	61.37	2.80	1.25	321
11	14.51	20.82	61.20	1.89	1.58	317
12	12.97	22.15	62.34	1.58	0.95	316
13	9.60	26.16	62.91	0.66	0.66	302
14	9.68	27.96	61.29	0.36	0.72	279
15	7.11	29.71	62.76	0.00	0.42	239
16	9.57	28.71	60.29	0.96	0.48	209
17	9.32	34.78	54.04	1.24	0.62	161
18	4.85	41.75	52.43	0.97	0.00	103
19	8.00	42.00	46.00	2.00	2.00	50
20	11.76	47.06	41.18	0.00	0.00	17
Total:						5778

The unemployment rate reaches 23% after a year and stabilize at about 10% after 13 quarters (more than 3 years) in Israel. A substantial number of immigrants join the labor force and work in blue collar jobs during the …rst two years in Israel. The proportion of these individuals reach more than 60 percent after two and a half years in Israel and stay at this level for almost additional two years. However, we observe that during the …fth year in Israel the proportion of working in blue collar jobs is reduced by almost 20% and the proportion of white collar jobs increases in almost the same proportion. Hence, the movement between occupations is long process. This pattern of slow dynamic transition is similar to what is believed to be typical of immigrants behavior (Chiswick, (1992), Eckstein and Weiss (1998)). Moreover, it is similar to the transition to work of high school graduates as described by Keane and Wolpin (1997).

What might seem as a substantial reduction in job quality after 4 years in the new country, gets a signi…cant change after four years in the new country.[5] What could make it to happen? Note that the participation in training programs peak between the fourth to the sixth quarter after arrival and then the proportion goes down to almost no participation after more than three and a half years in Israel (see …g.1b). What is the role of training in a¤ecting the increase in working in white collar jobs? Alternatively, it is possible that the availability of jobs or the accumulated experience and knowledge of the local labor market that cause the late move to white collar jobs. The early peak in training is consistent with the human capital theory which shows clearly that if you wish to study, then it is better to do it as soon as possible.

The transitions between the …ve labor market states are summarized in table 5.

[5] It should be noted that the number of observations at the …fth year is low.

Table 5: Transitions among the Labor Market States

	Quarters 8 and 9					
Quarters 3 and 4	WC	BC	TW	TB	UE	Obs.
WC	79.57	10.76	3.22	2.15	4.30	93
BC	2.57	80.86	1.72	2.85	12.00	350
TW	51.28	28.20	0.00	0.00	20.51	39
TB	25.00	50.00	0.00	0.00	25.00	20
UE	18.94	47.93	6.51	1.77	24.85	169

	Quarters 14 and 15					
Quarters 8 and 9	WC	BC	TW	TB	UE	Obs.
WC	90.52	6.90	0.00	0.86	1.72	116
BC	4.57	91.87	0.035	0.007	3.51	285
TW	41.20	41.20	0.00	0.00	17.60	17
TB	25.00	66.66	0.00	0.00	8.34	12
UE	23.86	44.33	0.00	0.00	31.81	88

	Quarters 18 and 19					
Quarters 14 and 15	WC	BC	TW	TB	UE	Obs.
WC	96.72	3.27	0.00	–	0.00	61
BC	2.47	90.12	2.47	–	4.94	81
TW	–	–	–	–	–	–
TB	0.00	100.00	0.00	–	0.00	1
UE	30.00	20.00	0.00	–	50.00	10

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[6]*The upper right box in the …rst matrix was created by calculating the number of people who worked in occupation "white collar" in the 3rd(4th) quarter and worked in the same occupation in the 8th(9th) quarter and averaging the two numbers by numbers of observations working in "white collar" in the 3rd and 4th quarter.

The main observation is that there is high persistence in occupational distribution. The rate of remaining in white collar occupations (blue collar occupations) starts at 80% (81%), increases to 91% (92%) and further increases to 97% (drops to 90%). This increase persistence in white collar occupation account for much of the later increase in the proportion of workers at this occupation. The transition from white collar jobs to blue collar jobs is decreasing substantially over time. The rate of transition from work to unemployment, after more than two and a half years in Israel, is about 5%, which is substantially lower than the transition to unemployment from any other state. A job in white collar occupation shows more stability than a blue collar job. The transitions from blue collar to white collar jobs starts at a low rate, then increases to 4.6% and then goes down back to about 2.5%. These transitions probabilities show that for an immigrant, who does not …nd a white collar job, we observe frequent transitions between di¤erent labor market locations.

Training

A key aspect of this paper is the role of training in the life time career decision of the high skilled immigrants. The length of the training programs is distributed between one to three quarters where training in blue collar jobs are shorter (see table 6). We view the value of the program to be of the same, independently of the length. We assume that the actual length is a function of an institutional setting that is exogenously determined.

Table 6. Distribution of Length in Training in Quarters.

Num: of Quarers	Training in White Collar	Training in Blue Collar	Observations
1	16:9	14:5	39
2	27:4	15:3	53
3	14:6	11:3	32
Total	58:9	41:6	124

Table 7 shows that 37% of immigrants who were working before migration in white collar jobs and participated in training, took training in blue collar jobs. This observation indicates the none trivial way the immigrants perceived their labor market opportunities in Israel. 84%

of the immigrants who went to training had worked in white collar jobs in the former USSR. Hence, immigrants who arrived with more skills have a higher tendency to go to training. Yet, a signi…cant number of immigrants are willing to downgrade their occupation. But, as can be seen in table 8, it does not mean that they will necessarily end up working in blue collar jobs.

Table 7. Transition Matrix from Occupation in Former USSR to Training in Israel.

Occupation in Former USSR	Training in White Collar	Training in Blue Collar	Proportions	Observations
White Collar	54.03	30.65	84.68	105
Blue Collar	4.84	10.48	15.32	19
Proportions	58.87	41.13	100.00	–
Observations	73	51	–	124

Table 8 shows that the …rst job after training is not in the same occupation as the occupation of the training program. There is more downgrading than upgrading. However, we can not learn from that on the long term impact of training on the transition to the occupation related to that training.

Table 8. First Job After Training in Israel According to the Sector of Training.

First Job After Training	Training in White Collar	Training in Blue Collar	Proportions	Observations
White Collar	34.26	9.26	43.52	47
Blue Collar	25.93	30.56	56.48	61
Proportions	60.19	39.81	100.00	–
Observations	65	43	–	108

*16 immigrants haven't found a job after training (out of 124 who have participated in training)

A pooled multinomial logit regression for the immigrants' choices in di¤erent periods is presented in Table 9. The dependent variable indicates whether the immigrant was working in WC, BC or was unemployed in time t. Note that each immigrant appears in this regression several times and there is no individual …xed e¤ect.

The knowledge of Hebrew and English, age at arrival and working in white collar occupation in the USSR increase the probability of both working in white collar job and being unemployed relative to working in blue collar jobs. Education (years of schooling) has no signi…cant e¤ect on these probabilities. The variable training in WC (BC) occupation is a dummy variable that equals 1 if the immigrant has graduated in TW (TB) before time t and equals zero otherwise. Training in white collar occupations increases the probability of working in white collar job and being unemployed. While training in blue collar only affects positively the probability of being unemployed. Work experience in Israel reduces the probability of being unemployed. It is interesting to note that all variables that are related to the level of human capital increase the probability of working in white collar jobs as well as being unemployed. This observation indicates that the skilled immigrants invest more in search assuming that search while unemployed is more intensive. However, this aspect will be investigated by the structural model.

Table 9: Multinomial-logit on employment and unemployment

Variable	White collar Occupation	Unemployed
b_{cons}	¡ 4:4424 (0:5034)	¡ 0:4753 (0:4804)
b_{Hebrew}	0:9612 (0:0761)	0:1342 (0:0701)
$b_{english}$	0:6563 (0:0428)	0:1529 (0:0497)
$b_{age\ at\ arrival}$	0:0135 (0:0055)	0:0205 (0:0052)
$b_{years\ of\ schooling}$	0:0331 (0:0212)	0:0332 (0:0190)
$b_{training\ in\ WC}$	0:9421 (0:1153)	0:8183 (0:1658)
$b_{training\ in\ BC}$	¡ 0:2101 (0:1594)	0:9586 (0:1815)
$b_{accumulated\ experience}$	¡ 0:0046 (0:0100)	¡ 0:6807 (0:0233)
$b_{occupation\ in\ USSR}$	1:4837 (0:1417)	0:2156 (0:1137)
Num. of Obs.	5536	
Log likelihood	-3558.40	

* the comparison group is employment in blue collar

Wages

Figure 2 displays the average wage in each quarter for both occupations. The wages in white collar jobs are more volatile than those in blue collar jobs, and it is clear that the wage is increasing in both occupations. The mean wage in both occupation is about 11 IS per hour during the …rst 4 quarters in Israel and it is 17 IS per hour during the 5'th year in Israel. The quarterly wage growth estimated by a simple regression of the means on time is 2.2-3% per quarter. This growth rate is about 9% annually, which is 2.6% higher than the rate we …nd in a larger sample given by the income survey of the CBS (See Eckstein and Weiss (1998)). A simple pooled log wage regression is given in Table 10. Clearly we do not correct for all the selections biases implied by the choices made by the individual. Training enters as dummy only for wages reported after the graduation of the course. It is interesting to note that this regression shows that training has no impact on wages. This result is consistent with

the …nding in the literature (see, e.g., Heckman et.al.). An additional year of experience in Israel has a one percent wage return which is much lower than the coe¢cient on experience for native Israelis (see Eckstein and Weiss (1998)). The rates of return on Hebrew and English are substantial. The highest level of the Hebrew index is four which implies a return of 6% above that of an average Hebrew knowledge, which is the level of 2.8. The premium for working in white collar jobs rather than blue collar jobs, is 30% , but the return to education and experience (age) at arrival to Israel, is zero.

Table 10: Ln Wage Regression

Variable	ln hourly wage dummy occupation	ln hourly wage in white collar occupation	ln hourly wage in blue collar occupation
b_{cons}	2:0029 (0:1215)	1:0475 (0:4261)	2:1663 (0:1237)
b_{Hebrew}	0:0542 (0:0252)	0:1274 (0:0614)	0:0506 (0:0270)
$b_{english}$	0:0340 (0:0183)	0:1311 (0:0363)	¡ 0:0100 (0:0217)
$b_{age\ at\ arrival}$	¡ 0:0003 (0:0019)	0:0132 (0:0052)	¡ 0:0029 (0:0020)
$b_{years\ of\ schooling}$	0:0068 (0:0062)	0:0214 (0:0225)	0:0083 (0:0062)
$b_{training\ WC}$	0:0339 (0:0480)	0:1146 (0:0796)	¡ 0:0010 (0:0625)
$b_{training\ BC}$	0:0209 (0:0515)	¡ 0:0485 (0:1301)	0:0642 (0:0550)
$b_{accumulated\ experience}$	0:0101 (0:0125)	0:0300 (0:0358)	0:0075 (0:0128)
$b_{accumulated\ experience^2}$	0:0008 (0:0007)	¡ 0:0007 (0:0019)	0:0009 (0:0007)
$b_{white\ collar\ occupation}$	0:3023 (0:0405)	i i	i i
Num. of Obs.	574	132	442
R^2	0.277	0.230	0.156

3 The Model

The model follows the dynamic programing models of labor supply and schooling (for example, Eckstein and Wolpin (1999) and Keane and Wolpin (1997)), where an individual chooses among a …nite set of mutually exclusive alternatives in each period over a …nite horizon. Search is represented by allowing immigrants to randomly receive job o¤ers and training programs o¤ers in di¤erent occupations, which they can reject or accept. The random o¤er probabilities depend on the individual's current employment state, however, the continuation of working at the same occupation is random as well. The occupational choice allows workers to select among two broad occupational classes - white collar and blue collar. Training programs are classi…ed in the same way. Labor market conditions (such as job availability) are captured by allowing occupational speci…c time varying indicators to in‡uence the o¤er probabilities of jobs and training programs. Finally, the model incorporates observed heterogeneity, such as, schooling, occupation prior to immigration and other demographic characteristics as well as unobserved heterogeneity (Heckman and Singer (1984)).

An immigrant i who arrives in Israel in time D_i at age $¿_i$ and is expected to live L periods, is facing a …nite horizon planning period of duration $T_i = L ¡ ¿_i$ quarters. In each period (quarter), t; $t = 1; 2:::T_i$ he can choose one of …ve labor market alternatives. The index j; $j = 0; 1; 2:::J$, $J = 4$;describes the alternatives. the index $j = 1; 2$; correspond to working in the alternative two occupations; occupation 1 = white collar and occupation 2 = blue collar. The index $j = 3; 4$ denote the two types of training programs, and $j = 0$ represents unemployment. Let d^j_{it} equal one if the individual chooses alternative j at time t, and be zero otherwise, When $d^j_{it} = 1$;and $j = 1; 2$; the individual works in occupation j. When $d^j_{it} = 1$; and $j = 3; 4$; the individual acquires training relevant for occupation $j ¡ 2$. When $d^0_{it} = 1$; the immigrant neither works nor does he attend a training program. We denote by d_{it} the row vector of length $J + 1$, consisting of a single one and J zeros to indicate which activity is chosen in period t.

A job o¤er is an opportunity to work in occupation j where we assume that there an occupation speci…c separation rate. Regular jobs are usually associated with a wage path, including promotions. Subsidized training programs usually pay some …xed positive income and the opportunity to be o¤ered a training program is also uncertain.

Consider an individual i who chose alternative r in period $t ¡ 1$. At the end of this period

he will receive o¤ers from the set $J+1=5$ alternatives. The conditional probability that this o¤er will be from alternative j is:

$$P_{it}^{rj} = P^{rj}(m^{j}_{D_i+t};\ x_{it};t): \tag{1}$$

The vector $m^{j}_{D_i+t}$ represents time varying occupation speci…c demand indicators, such as unemployment rates, number of immigrants relative to natives, and entry requirements for training programs. Note that chronological time is given by $D_i + t$, re‡ecting the fact that immigrants arrive at di¤erent dates and therefore, the same tenure in Israel, t; may be associated with di¤erent market conditions. The vector x_{it} represents individual characteristics, such as occupation in the country of origin, knowledge of Hebrew or/and English, age at arrival and, most important, whether the individual has completed training program in a certain occupation and general work experience in the new labor market.

The dependence of the o¤er probability on the current work activity, introduces a dynamic element whereby training or work in a particular job can in‡uence the probability of alternative job o¤ers. For instance, an immigrant who is working or is in training has less time to search for a new job, therefore, his chance of receiving o¤ers for alternative jobs is lower than if he would be unemployed. Similarly, the probability of receiving a job o¤er in an academic occupation may be lower if one works in a non-academic job than if he would be unemployed.

Time in the new country, t; is allowed to in‡uence the o¤er probability in two ways. First, there is a seniority e¤ect, representing the immigrant's learning of local market conditions and acquisition of language. This individual learning process must be distinguished from the exogenous changes captured by $m^{j}_{D_i+t}$ which a¤ect all individuals at a given chronological time. In addition to labor market conditions, these variables represent changes in the eligibility to subsidized training program. Typically, eligibility expires after a period of 5 years. We assume that the immigrant can attains a training program if he had not been in training before and he is allowed to attain only one training program in his life time. In our data time in Israel is distinguished from the work experience. That allows us to identify the direct experience e¤ect from the tine e¤ect.

The wage o¤ered for jobs in occupation j; $j = 1;2$ in period t is a function of: (i) the person's occupation-speci…c human capital, K_t^j and (ii) a temporal i:i:d shock, z_t^j. The wage o¤ered in occupation j, $j = 1;2$ at time t can be expressed by

$$\ln w_{it}^{j} = K_{it}^{j} + z_{it}^{j} \tag{2}$$

The random variable z_{it}^{j} can be interpreted in two di¤erent ways. Under the search interpretation, it re‡ects heterogeneity in the distribution of wage o¤ers, implying that the particular wage that an individual will receive, if an o¤er arrives, is random. Under the human capital interpretation, z_{it}^{j} represent random shocks to productivity.

The accumulation of human capital for each j, $j = 1;2$ is determined by the following process

$$K_{it}^{j} = ®_{0j} + ®_{ej} EX_{it} + ®_{e1} d_{it}^{1} EX_{it} + ®_{e2j} EX_{it}^{2} + ®_{c1j} C_{it}^{1} + ®_{c2j} C_{it}^{2} + ®_{Hj} L_{it}^{H} + ®_{Fj} L_{i}^{F} + ®_{sj} K_{i}^{f} \tag{3}$$

where EX_{it} is the general experience in the Israeli labor market, C_{it}^{j} is an indicator that equals one if the worker has taken a training course in occupation j; $j = 1;2$. The parameters $®_{ej}$ and $®_{cj}$ represent the contribution of on the job learning and formal training in the formation of human capital. The variables L_{it}^{H} and L_{i}^{F} indicate the level of Hebrew skill acquisition and the English knowledge at arrival, respectively, which, for simplicity, we assume to be exogenous. The parameters $®_{Hj}$ and $®_{Fj}$ describe the contribution of the two languages to the earning capacity. The initial level of human capital from the foreign country at arrival to Israel is $K_{i:}^{f}$ $®_{sj}$ measures the value of that human capital at arrival to the new labor market. The imported human capital, $K_{i:}^{f}$; depends on the immigrant's personal characteristics, x_{it}, which includes variables such as schooling, age or experience at arrival and the existing knowledge of English.

The "wage" associated with a training program, $j = 3;4$ and with unemployment, $j = 0$, is determined exogenously by the government (typically, the government subsidizes these activities) and it is indicated by tr^{j}; $j = 3;4$. The unemployment bene…t is set as ue: Let K_{it} denote the vector of occupation speci…c human capital, that is, $K_{it} = (K_{it}^{1}; K_{it}^{2})$: To be concrete, current utility from labor market state j for individual i at time t in the new country

(U_{it}^{j}) is given by,

$$\begin{aligned} U_{it}^{0} &= ue + \varepsilon_{it}^{o} \\ U_{it}^{j} &= w_{it}^{j}; \quad for \ \ j = 1;2 \\ U_{it}^{j} &= tr^{j} + \varepsilon_{it}^{j}; \quad for \ \ j = 3;4 \end{aligned} \tag{4}$$

where the vector $\varepsilon_{i} = [\varepsilon_{it}^{0}; z_{it}^{1}, z_{it}^{2}; \varepsilon_{it}^{3}; \varepsilon_{it}^{4}] \sim N(o;\Omega)$; where Ω is not restricted.

The Optimization Problem

The immigrant is assumed to maximize the expected present value of life time utility

$$E\left[\sum_{t=\tau_{i}}^{} \beta^{t-\tau_{i}} \sum_{j\in J+1} U_{it}^{j} d_{it}^{j} \mid S_{it}\right] \tag{5}$$

by the choice of d_{t}^{j} for all $t = \tau_{i};:::;L$ and where S_{it} is the vector of all the relevant state variables. E denotes the expectation taken over the joint distribution of ε and the transition probabilities P_{it}^{rj}.[7] The state vector is given by $S_{it} = [EX_{it}; C_{it}^{j}; L_{it}^{H}; L_{i}^{F}; K_{i}^{f}; d_{t-1}^{j}; \varepsilon_{i};$ for $j = 0;1;2;3;4]$: The state variables in t are the realized values of the shocks, ε_{i}; and the given values of the state variables in $t - 1$; according to equations (2) and (3). Note that the realizations of the random variables occur at the beginning of period t. These shocks will influence, according to (2) the new wages that a person draws in each alternative. β is a discount factor, $0 < \beta < 1$.

Let $V_{i}^{j}(S_{it};t)$ be the maximum expected life time utility given by equation (5) such that $d_{t}^{r} = 1$, for an immigrant i. This value can be defined recursively, for $t = \tau_{i};:::;L$ using the Bellman equation,

$$V_{i}^{r}(S_{it};t) = U_{it}^{r} + \beta E \max\{V_{i}^{j}(S_{it+1};t+1); for \ \ j = 0;::;4 \mid S_{it};t;d_{it}^{r} = 1\}: \tag{6}$$

[7] The optimization problem (5) is in the same format as in Eckstien and Wolpin(1989).

To simplify the model we assume that the optimization problem is divided to two sub periods. During the …rst 20 quarters the model is solved explicitly. At the 21'st quarter the immigrant utility is given by $V_i^j(S_{iL+1}; t = 21)$, which is assumed to be a given function of $(S_{iL+1}; ¿_i)$ for $j = 0; 1; :::4$ (see Eckstein and Wolpin(1999)): The operator E denotes the expectation taken over the joint distribution of ";

Note that, for a given time in Israel, t, the value associated with each state depends on the immigrants date of arrival and on his age at arrival, respectively. The t subscript on the value function, indicates that for given S_{it} changes in t are associated with changes in the demand shifters, $m^j_{D_i+t}$, as well as potential horizon e¤ects. Further more, perfect foresight is assumed concerning the future behavior of the demand shifters.

Solution Method

The model does not admit to analytical solution. Using the end conditions, and assuming a known distribution of $"_i$ and a functional form for the job o¤er probability functions, it is possible to solve numerically for the set of optimal decisions, using backwards induction for any given values of the parameters. We solve the problem at each point of the state space. To be speci…c, we …rst separate between the expectation operator taken in (6) on the transition probabilities de…ned by (1) and the joint distribution of ²: Given the transition probabilities, P^{rj}_{it}; at each date t and state S there are at most 16 possible outcomes of feasible choice sets.[8] At each choice set we can choose between being unemployed, $j = 0$; and possible outcome of the four alternative labor market activities. Let g_s be the feasible choice set s; $s = 1; :::; 16$; and let $P(g^s_{it+1} \mid S_{it}; t; d^r_{it})$ be the conditional probability of the choice set g^s_{it+1}, at time $t + 1$: Now we can rewrite (6) as follows,

$$V_i^j(S_{it}; t) = U^j_{it} + \sum_{s=1}^{16} P(g^s_{it+1} \mid S_{it}; t; d^r_{it}) E(\max\{g^s_{it+1} \mid S_{it}; t; d^r_{it} = 1\}): \qquad (7)$$

where E is the expectation operator taken only on the joint distribution of ²: The numerical complexity arises because of the value function requires high-dimensional integrations for the computation of the Emax function on the right hand side of (7). We follow the procedure

[8] We assume that the the individaul can always choose to be unemployed. Therefore, there are only 16 possible independent transition probablities each is given by (1)

in Keane and Wolpin (1994), using Monte Carlo integrations to evaluate the integrals that appear in (7).[9]

In the analysis of the initial transition period in Israel, we shall use quarterly data. Such data is available for at most …ve years for each observation. The model assumes that decisions within the sample period re‡ect expected circumstances and choices in subsequent periods. As explained above, we split the planning horizon between the …rst 20 quarters in Israel and the rest of the life time. As indicated above the value at t = 21 is assumed to be a linear function of the state vector S_{i20} and the remaining periods of life, L ¡ 21 ¡ ¿¡. We then apply the Bellman equation (6) and calculate the optimal policy backwards for $t = 20; ::; 1$ recursively.

Implications

The model has several predictions regarding the dynamic pattern of the proportion of immigrants to be observed at each of the labor market states of the model. Participation in a training course related to each occupation is an investment in skills that are rewarded in that occupation by higher wage as well as an increase in receiving a job o¤er in that occupation. So far the standard human capital theory emphasized the earning impact of training. On the other hand, labor market practice indicates that the impact of training might be more important as a formal screening and licencing instruments in a¤ecting job availability than direct wage gain. Both rewards to training investment are for the entire future, and therefore, it is expected that training participation will take place next to arrival in Israel. In a dynamic setting training can be viewed as a form of job search, and therefore, participation in training could be expected in later periods. Moreover, the availability of training is random and, therefore, it is possible to observe training in later periods.

The endogenous process of accumulating work experience can also be viewed in this model as an investment in skills which are used in the labor market, since job o¤ers depend positively on the general experience. Assuming that the availability of blue collar jobs is higher than that of white collar jobs (more blue collar positions in the Israeli market), the model predicts that initially the workers who arrive with high potential human capital (high schooling) will initially invest by working in blue collar jobs and attain training, and later would …nd a job in a white collar occupation. In general, the model predicts that the accumulation of work experience and participation in a training program a¤ect future wages faced by the individual

[9] To compute the Emax function we simulate 150 draws at each point of the state space.

as well as work possibilities, which in turn a¤ect future participation and wages in the labor market.

Estimation Method

Conditional on values for the parameters and the observed state space of a given individual the dynamic Bellman equation (6) looks like a standard indirect utility function in a multinomial choice model for panel data. The main complications here, comparing to the multinomial logit case, stem from the theory that does not permit additivity and independence of the errors and, hence, the choices for each individual are correlated. Furthermore, we allow for measurement error in observed wages . Speci…cally, We assume the log of the observed wage of individual i at time t in occupation j , lnw_{it}^{jo}; is of the form: $lnw_{it}^{jo} = lnw_{it}^{j} + \acute{}_{it}^{j}$, where $\acute{}_{it}^{j} \sim N(0; \sigma_{\acute{}}^2)$ is the multiplicative measurement error.

The model is estimated using smooth maximum likelihood (SML) (McFadden(1989) and Keane and Wolpin (1997)). Let I be the number of individuals in the sample and each individual is observed over the sample periods 1 to t_i: The vector of observed outcomes for individual i at date t is given by $[d_{it}^{j}; w_{it}^{jo}]$: Note that the vector of parameters of the model enters the likelihood through its e¤ect on the choice probabilities, the wage is observed only while working and for each individual the sample is truncated at time t_i. As such the likelihood for a sample of I individuals is given by,

$$L(\mu) = \prod_{i=1}^{I} \Pr(d_{i1}^{j}; w_{i1}^{jo}; d_{i2}^{j}; w_{i2}^{jo}; :::::; d_{it_i}^{j}; w_{it_i}^{jo} \mid S_{i0}) \tag{8}$$

where μ is the vector of parameters to be estimated. Given the assumption of joint serial independence of the vector of errors, the likelihood function (8) can be written as a product of within period conditional joint probabilities of the choices and the wage. These probabilities are computed from the solution of the dynamic programming as explained above. To achieve asymptotically e¢cient estimators using the simulated probabilities we smooth the probability in the way suggested by Keane and Wolpin(1997).[10]

[10] For example, for the probability that $d_{it}^{j} = 1$; we use the Kernel smoothing function: $\exp(\frac{(V_i^j(S_{it};t) - \max(V_i^a(S_{it};t))}{\lambda}) / \sum_{k=0}^{4} \exp(\frac{(V_i^k(S_{it};t) - \max(V_i^a(S_{it};t))}{\lambda})$

Unobserved Heterogeneity

So far the heterogeneity in the model is captured by the imported skills of the immigrants, the knowledge of Hebrew and the arrival period. It is possible that individual gains from working in certain occupation, the gain from training and the utility while being unemployed is valued di¤erently among the immigrants. To capture the possible heterogeneity that is unobserved (by us), we allow for M types of individuals, each comprising ¼m fraction of the population (Heckman and Singer (1984)). We allow for this heterogeneity to enter to the utility from each of the …ve choices as well as a¤ecting the job o¤er probabilities. As such the model is solved for each type independently and the likelihood function is a weighted average of the likelihood of each type, that is,

$$L(\mu) = \prod_{i=1}^{N} \sum_{m=1}^{M} \Pr(d^j_{i1m}; w^{jo}_{i1m}; d^j_{i2m}; w^{jo}_{i2m}; :::; d^j_{it_im}; w^{jo}_{it_im} \mid S_{iM0}; \text{type} = m) \pounds ¼_m: \qquad (9)$$

Speci…c Parameterization

In this section we provide the explicit functional forms that we use in the estimation of the model.

The wage o¤er functions: A wage o¤er in occupation j , $j = 1; 2$, is as we specify in (3) with the following speci…c form:

$$\begin{aligned} w^j_{it} \;=\; & \exp\{®_{0jm} + ®_{ej} EX_{it} + ®_{e2j} EX^2_{it} + ®_{c1jm} C^1_{it} + ®_{c2jm} C^2_{it} + ®_{Hj} L^H_{it} + ®_{Fj} L^F_i + \qquad (10) \\ & ®_{Aj} AGE_i + ®_{Sj} EDUC_i + z^j_{it}\} \end{aligned}$$

where AGE_i ($¿_i$) indicates age at arrival and $EDUC_i$ is the imported years of schooling. Here we assume that the unobserved types value di¤erently work in WC and BC occupations. The natural way to model it is by adding a type speci…c parameter to the utility depending on the occupational choice. However, the linearity implies that this parameter can not be identi…ed separately from the constant in wage. Hence, we assume that the constant in the wage o¤er function above, $®_{0jm}$; depends on the type m and so is the return to training.

The job o¤er rates:

The probabilities to receive job o¤ers in WC and BC have the following logistic form:

$$P_{it}^{rj} = \frac{\exp\{Q_{ijt}\}}{1+\exp\{Q_{ijt}\}}; (j = 1; 2) \tag{11}$$

where the speci…cation of Q_{ijt} depends on j as speci…ed below.

The job o¤er rate in WC Occupation: During their …rst two quarters in Israel, only immigrants who had some knowledge of Hebrew upon arrival can get a job o¤er in WC occupation. Otherwise, the probability an individual i who chose alternative r in period $t - 1$would receive a job o¤er in a white collar occupation ($j = 1$) depends on the labor market state of the individual in the previous period (r), the unobserved type of the individual (indexed by m), the knowledge of English, the occupation held before immigration in USSR, ($UOCC_i$), the accumulated experience in Israel, the participation in a white collar training course, age at arrival and Hebrew knowledge. Speci…cally:

$$\begin{aligned} Q_{i1t} = {} & \beta_{01jm} d^1_{t-1;i} + \beta_{02jm} d^2_{t-1;i} + \beta_{03jm}(d^0_{t-1;i} + d^4_{t-1;i} + d^5_{t-1;i}) + \beta_1 L^F_i + \\ & \beta_2 UOCC_i + \beta_{31j} I(EX_{it} = 0) + \beta_{32j} I(1 \le EX_{it} \le 4) + \beta_{4j} C^1_{it} + \\ & \beta_{sj} L^H_i + \beta_{6j} AGE_i \end{aligned} \tag{12}$$

where $I(EX_{it} = 0)$ is an indicator equals one if individual i has accumulated no work-experience in Israel by time t, and $I(1 \le EX_{it} \le 4)$ is an indicator equals one if individual i has accumulated one to four quarters of work-experience in Israel by time t:

The job o¤er rate in BC Occupation: The probability an individual i who chose alternative r in period $t - 1$; would receive a job o¤er in a blue collar occupation ($j = 2$) depends only on activity the individual engaged in the previous period (r), the unobserved type of the individual, accumulated experience in Israel, participation a blue collar training course, age at arrival and Hebrew knowledge. Speci…cally:

$$\begin{aligned} Q_{i2t} = {} & \beta_{01jm} d^1_{t-1;i} + \beta_{02jm} d^2_{t-1;i} + \beta_{03jm}(d^0_{t-1;i} + d^4_{t-1;i} + d^5_{t-1;i}) + \\ & \beta_{31j} I(EX_{it} = 0) + \beta_{32j} I(1 \le EX_{it} \le 4) + \beta_{4j} C^2_{it} + \\ & \beta_{sj} L^H_i + \beta_{6j} AGE_i \end{aligned} \tag{13}$$

Note that the job o¤er rates in WC and BC occupations are independent. That is, an immigrant can get at each period an o¤er in each type of occupation. Furthermore, we assume that the constant terms, b_{01jm}; b_{02jm}; b_{03jm}; vary across the M unobserved type of immigrants ($m = 1; :::; M$). The above o¤er rates depend on the labor market state of the individual, as we indicated in the speci…cation of the model, by being a function of $d^r_{i;t\,i\,1}$, $r = 0; :::; 4$:

The training o¤er rates: The probabilities of receiving an o¤er to participate in a training program related to white collar or blue collar occupation are constant and independent of the job o¤ers. An immigrant who has already participated in WC or BC training since his arrival, does not get another training o¤er.

Utility from being unemployed and utility while participating in a training program ($ue; tr^j$; $j = 1; 2$) di¤er across the unobserved M types.

Value after …ve years: We assume that the present value of utility of the individual i at the 21st quarter takes the following approximation form of the state variables at that period, that is,

$$\begin{aligned} V_i^j\left(S_{iL+1}; t = 21\right) &= \pm_{1m} + \pm_2 EX_{i21} + \pm_{3m} C^1_{i21} + \pm_4 EDUC_i + \pm_5 AGE_i + \\ &\quad \pm_6 L^H_{i21} + \pm_7 L^F_{i21} + \pm_8 d^1_{i20} + \pm_9 d^0_{i20} + \pm_{10m} C^2_{i21} \end{aligned} \tag{14}$$

where m indicates the type of individual.

4 Estimation Fit and Results

In this section we present the processes of estimation. We use three methods. The …rst is the "best …t estimates" for the choices and the wages separately. The second is as the …rst but we use a simple method to correct for the selectivity bias in the estimation of the training treatment a¤ect using the dynamic programing model. The main method is the maximum likelihood that is set above.

MDE estimator

Given the parameters of the wage in WC and BC obtained from OLS regressions (table 10) we construct MDE estimator for the distance between predicted and actual choice probabilities. The objective function is given by,

$$Min \sum_{t=1}^{20} \sum_{j=0}^{4} (prob_{jt}^{p} - prob_{jt}^{r})^2 * obs(t) / \sum_{t=1}^{20} obs(t) \tag{15}$$

where $prob_{jt}^{p}$ is the predicted proportion of individuals in alternative j at time t, $prob\ _{jt}^{r}$ is the proportion of individuals in alternative j at time t in the data and $obs(t)$ is the number of observations in the sample at time t. The actual and predicted proportions of immigrants at each of the labor market states are presented in figures 3a,3b and 3c. The predicted pattern is based on 150 draws of the Emax's in 6. We should also note that estimating the MDE gives a good fit to the pattern of choices, but it does not necessarily fit other moments of the data. For example, for the MDE parameters we obtain, we predict correctly the choices for only 2436 observations out of 5778.

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Figure 1a: Proportion of Immigrants in White Collar Occupation, Blue Collar Occupation and in Unemployment

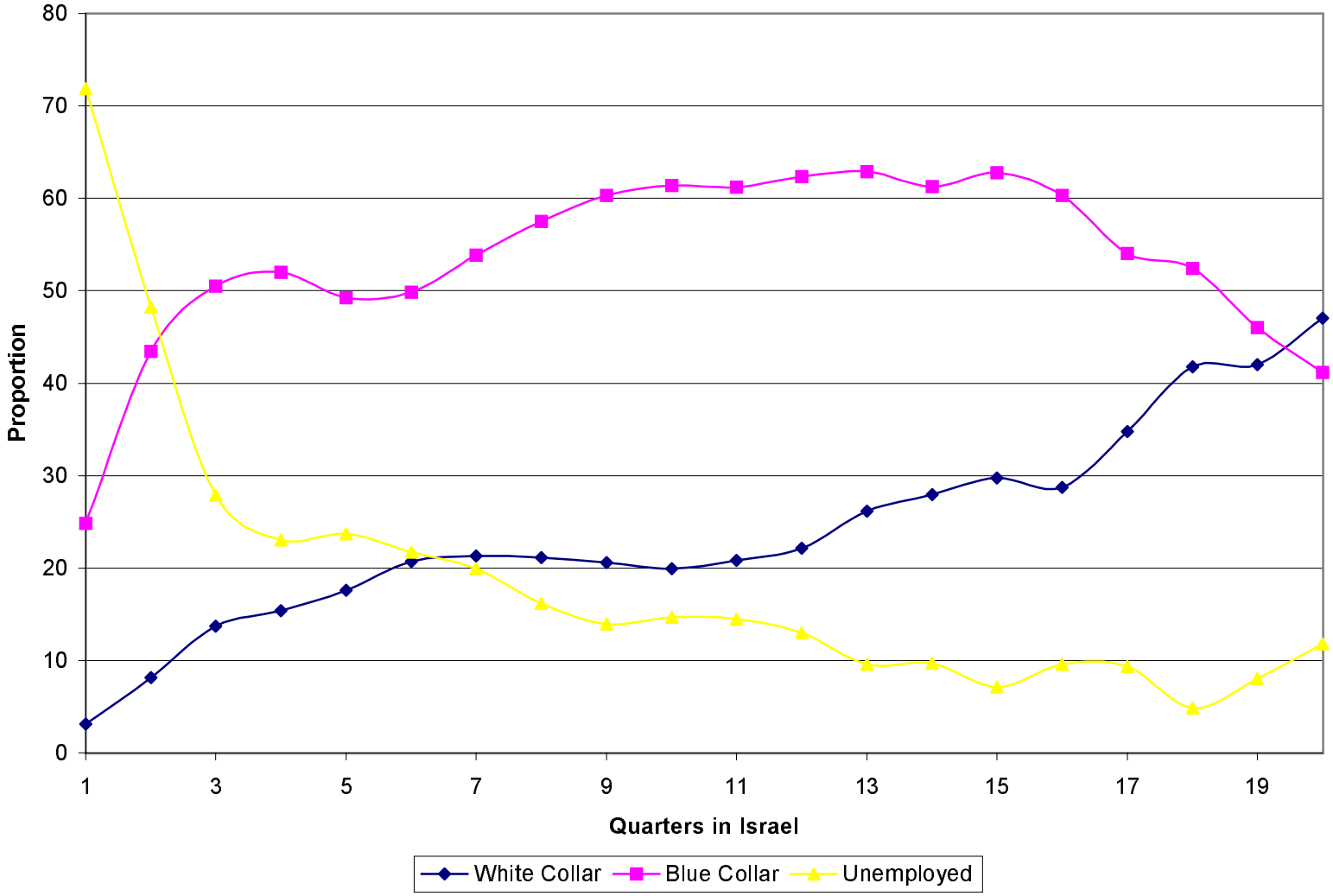

Figure 1b: Participation in Training by Occupation

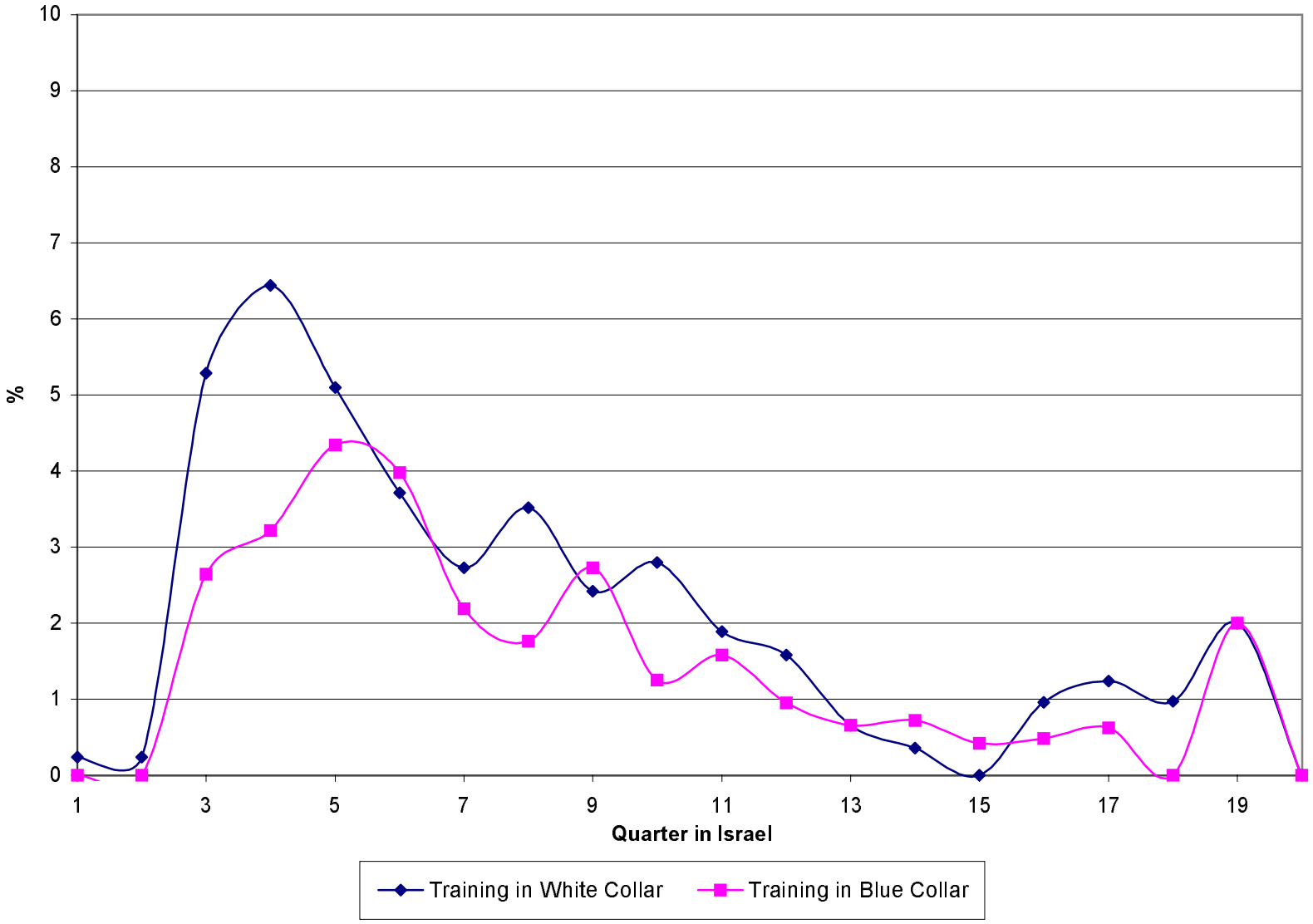

FIgure 2: Mean Hourly Wage by Quarter and Occupation

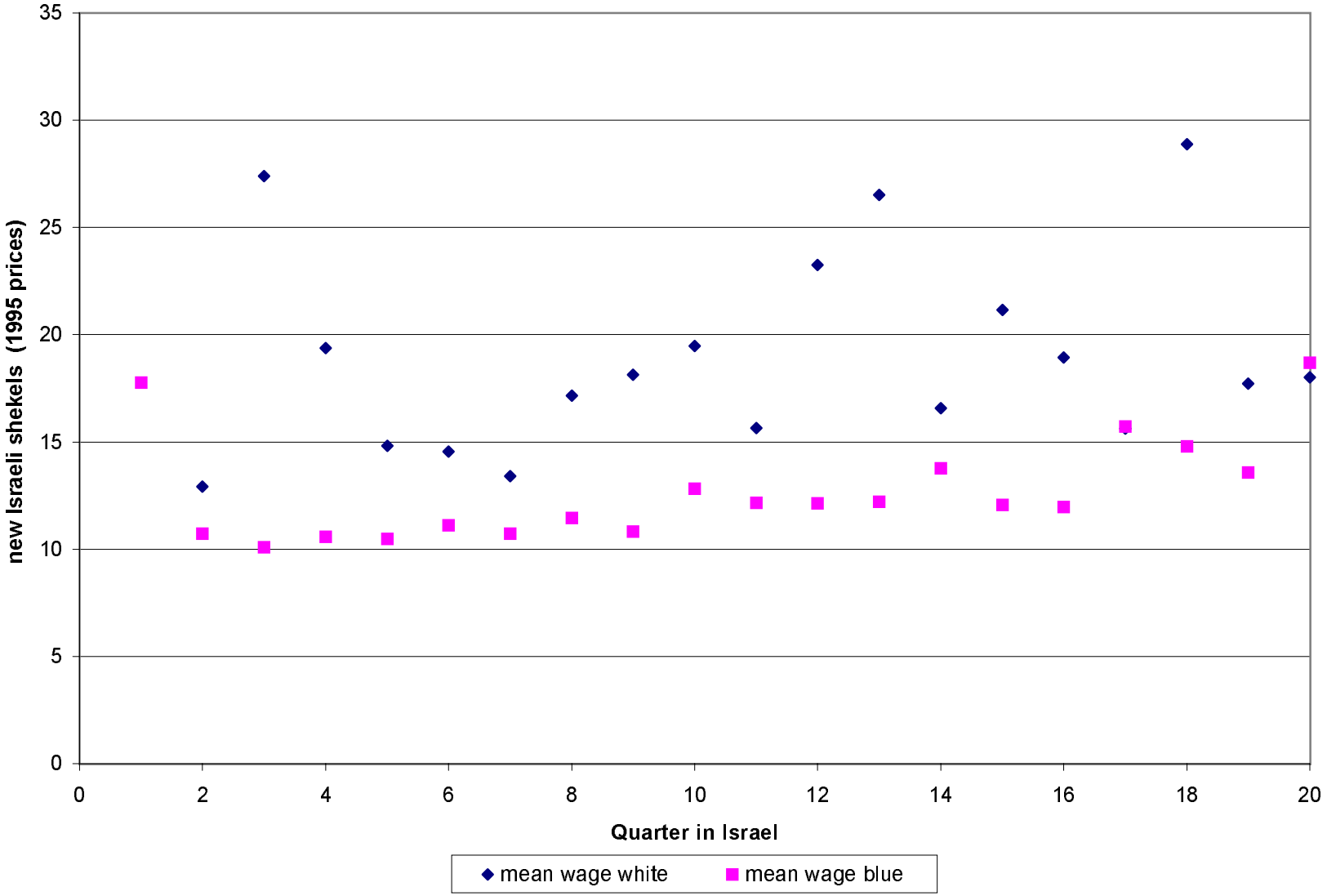

Figure 3a: Choice Distribution: Actual and Best-fit

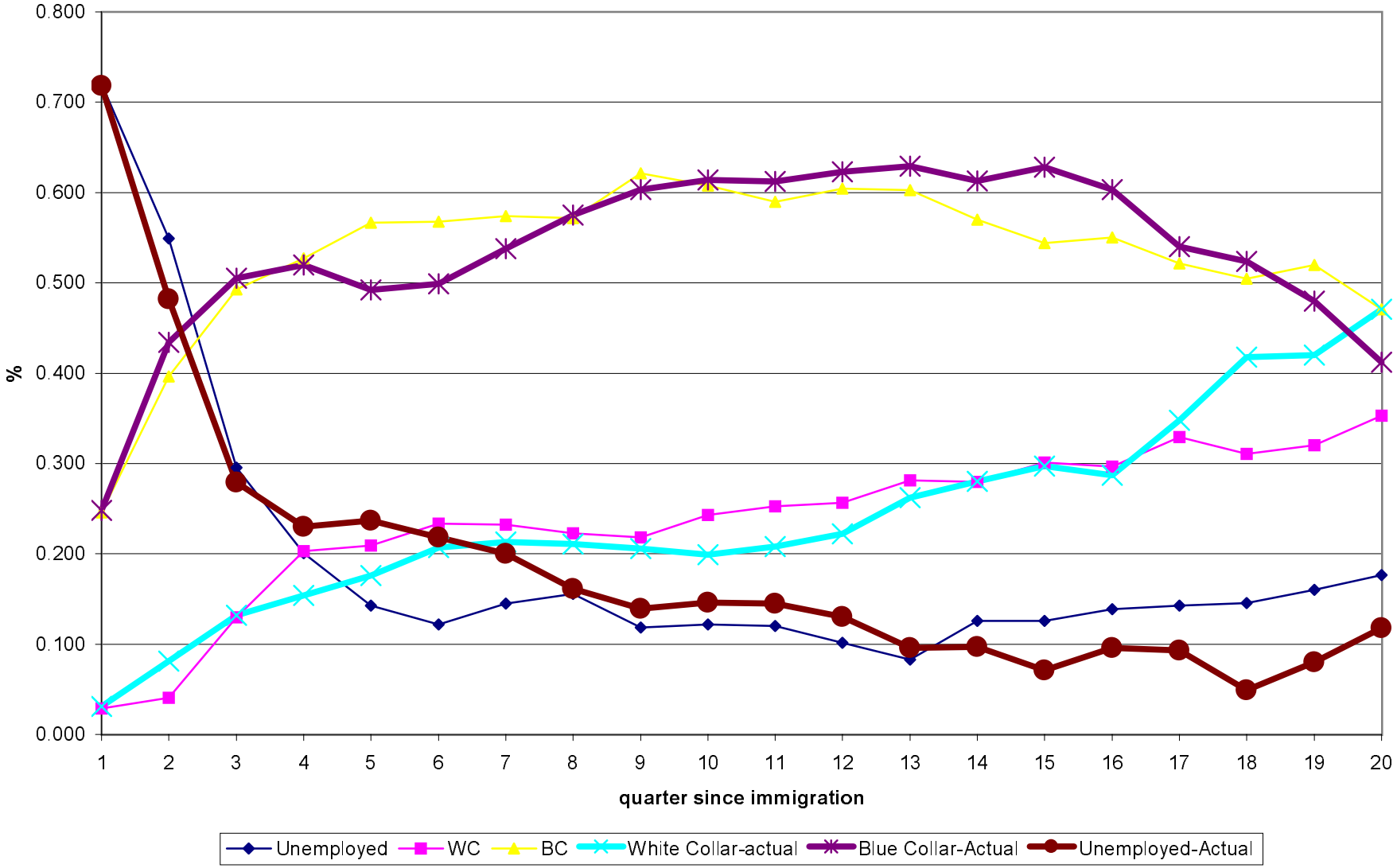

Figure 3b: Proportion in White Collar Training: Actual and Best-fit

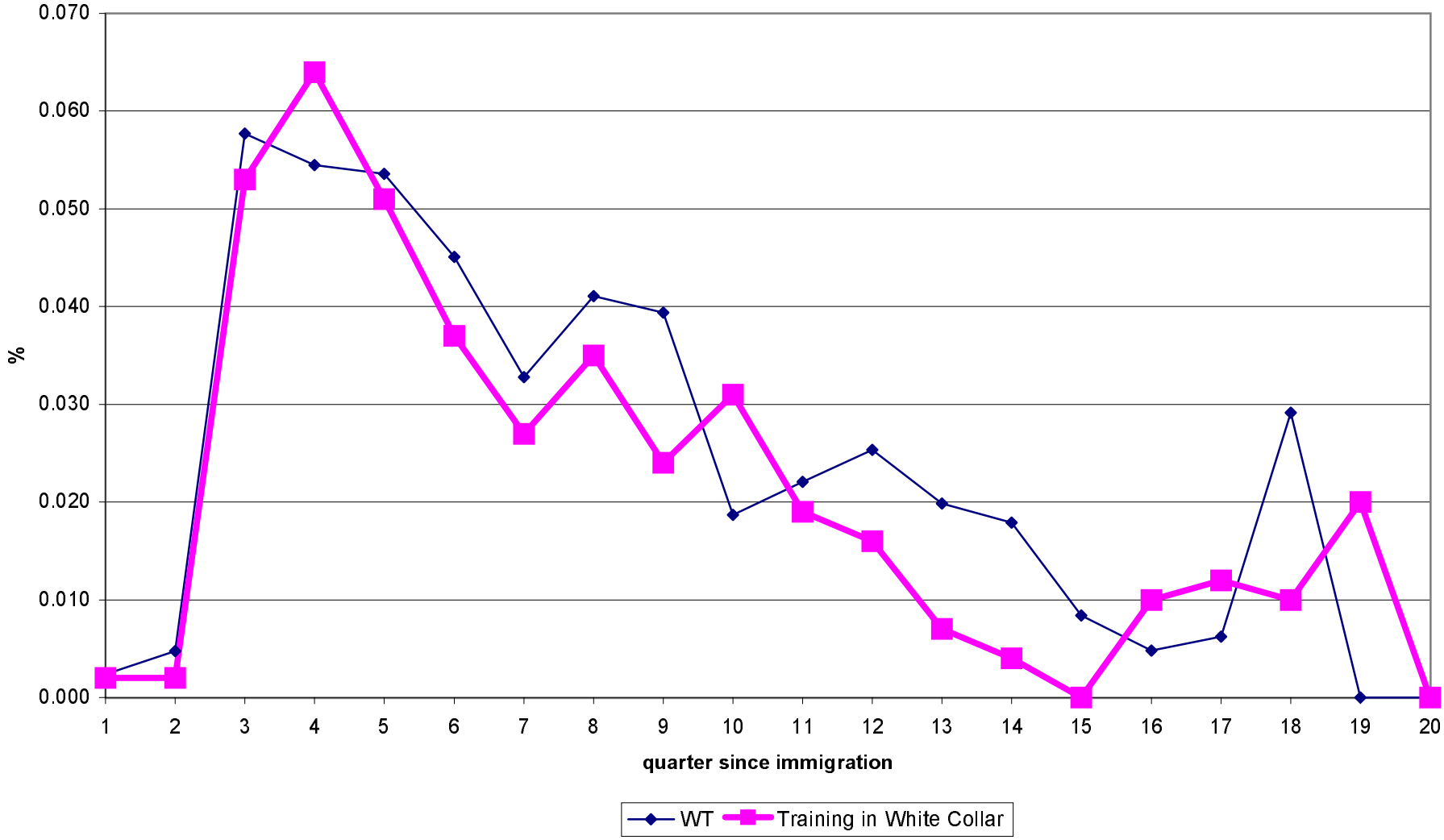

Figure 3c: Proportion in Blue Collar Training: Actual and Best-fit