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# Estimating the return to training and occupational experience: The case of female immigrants

Sarit Cohen-Goldner [a,b,*], Zvi Eckstein [c]

[a] Bar Ilan University, Israel

[b] IZA, Germany

[c] Bank of Israel, Tel-Aviv University and CEPR, Israel

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ABSTRACT

We formulate a dynamic discrete choice model of training and employment to measure the personal and social benefits from government provided training for a sample of high-skilled female immigrants from the Former Soviet Union in Israel. We find that training has a significant impact on the mean offered wage in white-collar occupations, but not in blue-collar occupations. Training substantially increases the job-offer rates in both occupations. Counterfactual policy simulations show a substantial social gain from increasing the access to training programs, and the estimated model provides a good fit for within-sample, out-of-sample and aggregate trends using cross-sectional survey data.

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## 1. Introduction

Do government-provided training programs benefit the participants and/or society? Heckman et al. (1999) give the following answer: "As currently constituted, these programs are often ineffective on both counts". The evidence for this conclusion is based almost entirely on low-skilled workers. We address this question in the context of highly-skilled female immigrants from the Former Soviet Union (FSU) in Israel who first learn a new language (Hebrew) and then choose whether to work or attend government provided training, where the availability of both options is uncertain. Conditional on participation in training, the immigrant decides whether to accept a white- or blue-collar job if one or both are offered. The job offer rate and the associated wage depend on occupation and participation in a training program. Within this framework, we measure the benefit to the female immigrant and the social return to government-sponsored vocational classroom training (CT) programs.

This paper contributes to the literature on the measurement of gains from training in three ways: (1) By distinguishing between direct human capital gain as measured by the effect of training on wages and the direct impact of training on reducing labor market friction through its effect on job offer probability.[1] (2) By estimating the effect of training programs on both skilled and unskilled workers and (3) by facilitating a dynamic cost-benefit analysis in which the effect of training is not constant but rather evolves over time as participants move between employment and unemployment as well as between occupations.[2] In addition, we extend the literature on the integration of immigrants in the labor market. In particular, the distinction between the impact of training on job-offer rates and on wages enables us to better measure the economic sources of potential benefits from training programs. In other words, it allows us to determine whether these programs provide greater access to jobs or whether they increase potential human capital.

* Corresponding address: Bar Ilan University, Department of Economics, Ramat-Gan 52900, Israel. Tel.: +972 3 5318948; fax: +972 3 7384034.
*E-mail address:* cohens1@mail.biu.ac.il (S. Cohen-Goldner).

1 Heckman et al. (1999) cite studies that have estimated the individual and social benefit from training using either its effect on the mean wage or on employment (unemployment) probability. Despite the difference in approaches numerous experimental and non-experimental studies in OECD countries have lead to the same conclusion: the return to training (measured by increase in wages) is approximately zero. However, training programs in Europe usually do have a significant effect on the employment rates.

2 Heckman and Vytlacil (2005) provide a comprehensive analysis of the estimation of treatment parameters for policy evaluation and the importance of structural econometric studies which have an important bearing on the cost-benefit analysis of alternative Active Labor Market Policies (ALMP). The papers by Blundell et al. (2004) and Lise et al. (2005) on ALMP discuss the importance of the impact of training on transitional dynamics in evaluating the policy benefit.

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Specifically, we formulate an estimable stochastic dynamic discrete choice model of training and employment. The model constructs dynamic selection rules that are consistent with the individual's optimal choices. In addition, each female immigrant sequentially chooses among working in a white- or blue-collar job, attending a training program or not working in order to maximize her discounted expected utility, where job offers, access to training programs and wage offers are random. Investment in local human capital is accomplished through participation in training, and the accumulation of occupation-specific local work experience. This investment affects the mean offered wage and the job-offer probability in these occupations. The estimated social and individual benefit from training depend on both the estimated parameters of the model and the predicted individual decisions conditional on these parameters.[3]

In estimating the effect of training on the mean wage, the dynamic programming (DP) model provides a conditional probability for both the selection to the training program and the selection of jobs after the training program.[4] We use actual quarterly labor market data for female immigrants during the first five years after their arrival in Israel.[5] This rich panel contains data on training, employment and wages, and enables us to identify the wage functions and both the preference parameters and the offer rates for alternative occupations based on training and experience. Do we need additional instruments in order to identify the causal effect of training on wages? The answer is no. Given the implicit selection rule of the DP model for the choice of training, we can consistently estimate the probability of participation in training for each individual. This predicted training choice probability serves as an "instrument" in the wage equation for the individual training status. Finally, the likelihood function uses these moments and restrictions to estimate the parameters of the model.[6]

The estimated model provides a good fit for the aggregate division of the female labor force between the two occupations, training and unemployment during the first five years following arrival. Furthermore, we validate the quality of the estimated model by simulating it for an additional five years out-of-sample (for a total of 40 quarters following arrival) and comparing the results to labor market trends obtained from samples of female immigrants not used in the estimation. The results (see Section 6) provide new support for using estimated structural dynamic labor supply models.

The estimates of the wage function imply that training has no significant impact on the mean offered wage in blue-collar (BC) occupations, but that it does increase the mean offered wage in white-collar (WC) occupation (by 19%). Training substantially increases job-offer rates in both types of occupation. The probability of an unemployed immigrant with no work experience receiving a WC (BC) job offer in the quarter subsequent to training is 5.6 (3.4) times higher than the probability of an immigrant who did not attend training. Furthermore, the effect of training on WC job-offer probabilities in later quarters, varies from 179% for an unemployed immigrant with no WC experience, to 38% for a female immigrant who has accumulated 20 quarters of WC experience.[7]

The estimated model allows for a limited availability of government provided training programs and we find that in each quarter training was available with a 0.14 (0.06) probability for a female immigrant who was younger (older) than 40 on arrival. We compare the outcomes for the female immigrant in this estimated ("benchmark") economy to an economy in which no training is available and to an economy in which training is always available (i.e., the offer rate for training is one). We find that the annual mean earnings for the economy without training is reduced by 18.2% relative to the benchmark economy, while a policy of always-available training increases annual mean earnings by 13.1% relative to the benchmark economy. Hence, training programs lead to an increase of 31.3% of the wage, which constitutes the gross social gain from training programs for female immigrants. Furthermore, we find that most of this gain is due to the increase in white-collar job offer rates and the accomplished reduction in unemployment. Almost none of this gain is due to the direct impact of training on wages.

The model predicts that about 50% of the females in the benchmark economy participate in training compared to the observed 47% participation rate. However, if training were always available, about 80% of the females would participate.[8] Moreover, under this training policy the average expected present value of female immigrant utility increased by 50%, though if no training were available, it would decrease by 41%. These results suggest that the main impact of training is through reduced unemployment and higher paying jobs for blue-collar immigrants through the improvement in job-offer arrival rates.

We find that the distinction between white-collar and blue-collar specific work experience plays a major role in explaining wage growth. The accumulation of blue-collar work experience does not contribute to wage growth in either types of occupation and does not affect the probability of receiving blue-collar job offers. On the other hand, an additional quarter of white-collar experience increases the probability of receiving a white-collar job offer by 9%–20% and increases the wage in white-collar jobs by 4%.

In summary, our findings validate the paper's contribution to the measurement of the social and individual gain from training. First, the training participation decision and the mean and variance of employment and wages are affected by the availability of training and by the impact of training on job offers. Second, the analysis of the individual and social gain from training requires the joint analysis of employment and wages. Third, the main

3 The model is similar to that of Cohen and Eckstein (2008) which adopts the framework of Keane and Wolpin (1997) and Eckstein and Wolpin (1999). Heckman et al. (1999) propose a stationary continuous time search model to analyze the duration and choice of training programs. They use the model to rationalize results from reduced form regressions for employment and training duration outcomes (e.g. Card and Sullivan, 1988), but do not formulate a model for structural estimation.

4 The DP model provides the selection probability for all events related to training: the choice of the worker whether to attend training; the probability of having a training program available; the job-offer rate following training; and the job acceptance decision. The existing literature (see Heckman et al., 1999; Manski, 1995) studied only the first two. We in fact implement a dynamic version of the structural approach that is proposed by Heckman and Vytlacil (2005).

5 The sample consists of 502 female immigrants who arrived in the initial wave of immigrants during the period of 1989–1992. Following these immigrants for up to twenty quarters provides us with 7205 observations on labor state outcomes. These immigrants have an average of 14.5 years of schooling (Table 1). The average unemployment rate in the sample during their first year in Israel was over 50% which dropped considerably in subsequent years. About 43% of the sample participated in a CT program, for the most part during the first year in Israel.

6 It should be noted that it is the data that identify the parameters and not the functional forms of the model. We justify this claim when examining the identification of the model and its results. The fact that a specification with two unobserved types (as in Heckman and Singer, 1984) is rejected by a likelihood test supports this claim. See also the recent paper by Heckman and Navarro (2005) on identification of dynamic treatment effect models.

7 These findings are fully consistent with the existing literature (Heckman et al., 1999). In other words, the effect of training on the mean wage offer for lower-skilled workers is close to zero. However, training significantly affects the employment probability (Ham and LaLonde, 1996). Furthermore, these findings are qualitatively and quantitatively similar to those for male immigrants by Cohen and Eckstein (2008).

8 The actual number of participants in training is 218. The benchmark economy refers to the prediction based on the estimated model, assuming that all 502 females are observed for 20 quarters.

**Table 1**
Summary statistics.

| Variable | Full sample | Not trained | Trained |
|---|---|---|---|
| Number of observations | 502 | 284 | 218 |
| Age on arrival | 37.2 (8.5) | 38.9 (8.9) | 35 (7.4) |
| Years of schooling | 14.5 (2.4) | 13.9 (2.5) | 15.2 (2) |
| Number of children | 1.05 (0.8) | 1.01 (0.9) | 1.1 (0.8) |
| Number of jobs since arrival | 1.9 (1) | 1.6 (0.9) | 2.1 (1) |
| Time in Israel (months) | 43.2 (14.1) | 40.5 (15.6) | 46.7 (10.9) |
| Unemployed[a] (%) | 15.1 | 21.1 | 7.3 |
| Worked in white-collar job prior to immigrating (%) | 75.7 | 69.4 | 83.9 |
| Married (%) | 76.5 | 77.1 | 75.7 |
| Had knowledge of Hebrew prior to immigrating (%) | 15.7 | 12.0 | 20.6 |
| Hebrew fluency index — first survey | 2.99 (0.78) | 2.71 (0.77) | 3.36 (0.62) |
| Hebrew fluency index — second survey | 3.3 (0.75) | 3 (0.83) | 3.62 (0.48) |

Source: Brookdale Employment Survey. Standard deviations appear in parentheses.
[a] Percentage of immigrants unemployed since their arrival and actively searching for a job.

economic cost of investment in training (education) is not the cost of the program (tuition) but rather the foregone accumulation of experience.

The rest of the paper is organized as follows: In Section 2, we describe the data and present the main facts that the model should fit and which motivate the model's structure. In Section 3, we formulate and solve an estimable model for the analysis of training and occupational choice. Section 4 describes the results and Section 5 analyzes active labor market policies. In Section 6 we present out of sample predictions of our model and Section 7 concludes.

## 2. The data

The data for this study is based on a panel from two retrospective surveys of the same sample carried out by the Brookdale Institute.[9] The first survey was conducted during the summer of 1992 on a random sample of 1200 male and female immigrants from the Former Soviet Union (FSU) who arrived in 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 of working age (25–65) residing in 31 different locations in Israel at the time of the first survey. Both surveys contain a monthly history of the employment and wages for each immigrant from the date of arrival in Israel until the interview. The surveys also provide detailed information on participation in government-sponsored training programs, knowledge of Hebrew on arrival, participation in Hebrew classes and Hebrew knowledge at the time of the surveys. For our purposes, we converted the monthly labor market data into a quarterly data set.

We use the two surveys to construct a panel of 502 female immigrants who were aged 25–55 on arrival and who actively searched for a job in Israel following their arrival.[10] The data tracks these immigrants for their first 20 quarters (at most) in Israel and enables us to construct their job profiles from arrival until the last interview. The data set contains information on the dates of employment, occupation, weekly hours and wage for each job. There are 7205 observations on labor market states and 649 wage observations.[11] An important feature of our data set is the information on *actual* work experience accumulated in Israel in various occupations, which is essential in the study of the female life-cycle labor supply.

The surveys also contain detailed information on immigrants' participation in government-sponsored vocational classroom training (CT) and in Hebrew classes (called "Ulpan" in Hebrew). The immigrants also provided background information such as occupation in the FSU, years of schooling, Hebrew knowledge before migration and place of residence in the FSU. Table 1 presents the means of the key variables for the full sample and by participation in training.

As Table 1 indicates, 43% (218) of the women in the sample participated in a CT program since their arrival. These programs were offered by The Ministry of Labor and The Ministry of Absorption as a part of the "absorption package" every immigrant is entitled to upon arrival in Israel. Government training programs in Israel take the form of classroom vocational training. They are relatively intensive in comparison to similar programs in Western countries. The average duration of the programs is six months (compared to three months in the UK and the US). The courses involve 26 hours of study per week and participants are not permitted to work while attending the program. During the program the participants study the theoretical background of the profession as well as its practical aspects. In addition, at some point during the program the participants visit potential workplaces or alternatively visit the training centers to speak about skill requirements and job conditions. Thus, participants are also exposed to potential work opportunities in the field they are studying. The training programs include courses such as sales, cosmetics, diamond cutting and computers. Despite the long duration of the Israeli training programs, less than 5% of the participants dropped out of the training course.[12] The low dropout rate may be due to the importance attributed to training by immigrants, or to the immigrants' lack of alternatives. According to Table 1, the trainees are,on average, younger on arrival and have more years of schooling.

We divide the various occupations into two groups: white-collar (WC) occupations which include academic, managerial, technical and other similar occupations and blue-collar (BC) occupations which include all other occupations. About 97% of the women in our sample worked in the FSU — 76% worked in WC occupations while only 21% worked in BC occupations. Of those who worked in WC occupations before migration, almost half attended a training program as compared to 24% of those who had worked in BC occupations in the FSU.[13] The Hebrew

9 The JDC-Brookdale Institute of Gerontology and Human Development, Jerusalem, Israel.

10 We excluded 13 women whose work patterns were inconsistent with the model's assumptions.

11 In the first survey in 1992, the immigrants were asked only about the wage in the last job which they reported.

12 In some experiments in the US, dropout rates reached 40% of the treatment group (Heckman et al., 1999).

13 Codes 000-299 in the 1972 occupation classification of the Israel Central Bureau of Statistics (CBS).

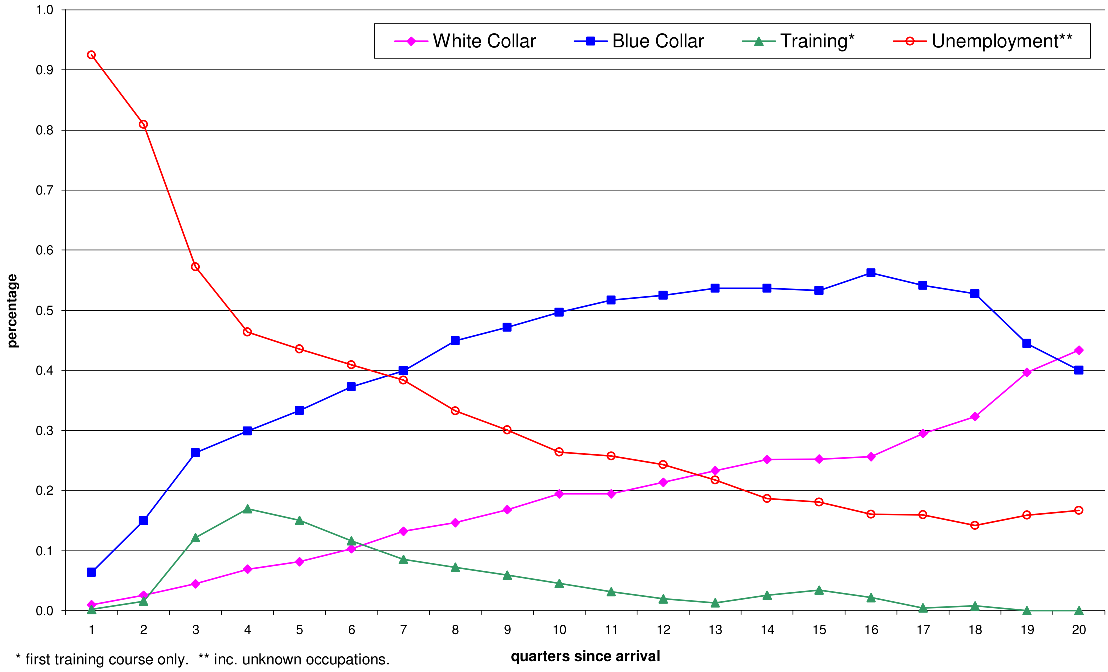


**Fig. 1.** Actual choice distribution.

index variable is based on four questions that were asked in the two surveys concerning the immigrant's proficiency in the local language. This index ranges from 1 (no knowledge) to four (fluent in Hebrew). Knowledge of Hebrew is a prerequisite for training participation and the programs are taught only in Hebrew. The share of immigrants who possessed some Hebrew skills before migration is higher among participants than among non-participants (20.6% vs. 12%).

### *2.1. Labor market states*

Fig. 1 presents the breakdown over time of immigrants between employment in WC and BC occupations, unemployment and participation in training. The proportion of the employed increased sharply during the first two years in Israel and continued to increase subsequently at a moderate rate. A year after migration, 37%(=0.069 + 0.299) of the women were employed, 46% were unemployed and 17% were attending training. After four years in Israel, 82% of the immigrants were employed while 16% were unemployed and only 2% were attending training. Training attendance increases following arrival, peaks after one year of residency in Israel, and slowly declines in later periods. A substantial proportion (56%) of immigrants worked in BC jobs after four years in Israel. What might seem to be a substantial occupational downgrading during the first 4 years in the new country is reversed subsequently. Thus, during the fifth year in Israel, the share of immigrants who work in BC jobs is reduced by 16% and the share of those employed in white-collar jobs increases by almost the same amount. Hence, the mobility across occupations is a prolonged dynamic process.[14] Is this change in trend evidence for occupational upgrading during the fifth year following migration, or is it a result of the characteristics of the 1989/1990 immigrants, which we observe for five years, relative to the 1991/2 immigrants, which we observe for four years? The answer to this question requires an estimable model which is capable of distinguishing between these two alternatives which we develop below.

**Table 2**
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 |

Source: Brookdale Employment Survey.
[a] Women who have not worked since their arrival in Israel, but have actively searched for a job.

### *2.2. Training*

Table 2 presents the breakdown of jobs held by the immigrant prior to participation in training. The table shows that about 60% (i.e. 52.75 + 7.34) of the trainees participated in training before they ever worked in Israel. This pattern is consistent with predictions of human capital theory, according to which individuals choose to invest in human capital early in their life-cycle and enjoy the return for a longer period. However, the causality is unclear. It might be the case that those immigrants who failed to find a job were "forced" to attend training in order to improve their employment opportunities.

Fig. 2 plots the actual hazard rate to training as a percentage of the non-trained in each quarter. The hazard peaks after three quarters and decreases subsequently, though not monotonically. Immigrants are required to possess knowledge of Hebrew in order to enroll in a training program. Most of the immigrants (84%) had no Hebrew knowledge upon arrival and, therefore, 94% of the immigrants attended Hebrew classes (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 those who chose to, started the program during their third quarter in Israel.

[14] It should be noted that this pattern of switching in the fifth year is observed for men as well. Moreover, the general pattern of labor market activities over the first five years in Israel for females is similar to that for males (see Cohen and Eckstein, 2008), though the magnitudes differ.

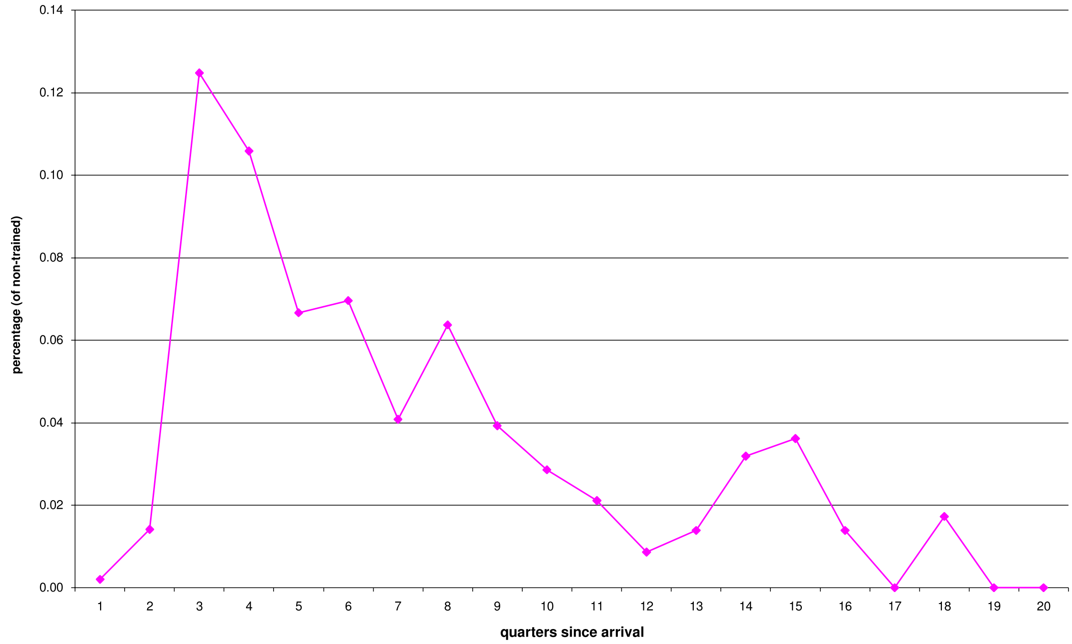


**Fig. 2.** Actual hazard to training.

**Table 3**
Logit results for participation in training.

| Variable | Estimate |
|---|---|
| Constant | −1.3701 (0.8107) |
| Age on arrival | −0.0762 (0.0135) |
| Married | −0.0946 (0.2375) |
| Number of children | −0.0611 (0.1314) |
| WC job in Former Soviet Union | 0.52 (0.2657) |
| Years of schooling | 0.25 (0.0496) |
| Number of observations | 502 |
| Pseudo-$R^2$ | 0.1101 |
| Log likelihood | −305.76 |

Source: Brookdale Employment Survey. Standard errors appear in parentheses.

Since the eligibility of immigrants to participate in government sponsored training is denied after a specified number of years, we observe an increasing hazard to training after three years of residency in Israel.

Table 3 presents data moments (obtained from a logit regression) for the probability of attending training conditional on observed state characteristics on arrival. These estimates show that years of education and previous experience in white-collar jobs prior to immigration are positively correlated with participation in training. Thus, immigrants with more human capital on arrival are more likely to invest in human capital in the host country by participating in training. As expected, the probability to participate in training decreases with age at arrival and number of children and if she is married.

## 2.3. Transitions

Table 4 presents the total number and proportion of quarter-to-quarter transitions between the four labor market states. There is a high level of state dependence in occupation-specific employment, such that 95.6% (92.9%) of the immigrants who worked in a WC (BC) occupation continue to do so in the subsequent quarter.[15] Transitions from one type of occupation to the other are rare. However, some transitions may occur indirectly through training and unemployment. Direct transitions from training to WC and BC are considerably more common than transitions from unemployment to the two employment states, which is an indication of the potential employment gain from training.

## 2.4. Wages

In the 1992 survey, the immigrant was asked about the last salary she had received. In the 1995 survey, she was asked about the salary she received in each of the jobs she reported in that survey. Therefore, there are a total of 649 wage observations. The mean wage in WC (BC) occupations is 12.5 (11.6) NIS per hour during the first year in Israel. During the fifth year in Israel, the mean wage in WC (BC) occupations is 22.1(10.8) NIS per hour.[16] Thus, the mean wage in WC jobs increases over time, whereas that in BC jobs remains roughly constant. Furthermore, wages in white-collar jobs are more volatile than those in blue-collar jobs.

Standard OLS estimations of log hourly wage equations (with robust standard errors) are presented in Table 5.[17] The results implicate that human capital in the form of schooling and experience (age on arrival) imported from the FSU has no impact on the immigrant's wage in Israel. The local occupational WC experience has a large effect on wages in both types of occupation, while BC experience has a zero return in both types of occupation.

The estimated impact of Hebrew knowledge on wages is large and significant (Table 5). In order to measure each immigrant's knowledge of Hebrew, we used the data on Hebrew knowledge from the two surveys (see Table 1). This data is included in order to construct an individual's specific predicted Hebrew knowledge in each quarter following arrival in Israel. Specifically, we use the

15 Transition from training to training means that the immigrant participated in a program that lasted more than one quarter.

16 All wages are in July 1995 prices.

17 Obviously, these regressions do not correct for the selection biases due to the immigrant's self-selection for employment, training and occupation. Using predicted training based on Table 3 (Heckman's correction) does not alter the results. Note that the indicator for training equals 1 only if the wage was reported after graduation from the training program. In addition, due to the small number of wage observations it is not possible to estimate additional parameters based on interaction terms between the included variables.

**Table 4**
Actual quarterly transitions.

| From | To | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | White collar | | Blue collar | | Training | | Unemployment | | |
| 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 | 7.7% | 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 |

Source: Brookdale Employment Survey. Each row totals 100%.

**Table 5**
OLS estimation of wage equation.

| Variable | Wage in WC occupation | Wage in BC occupation |
|---|---|---|
| Constant | 1.7615* (0.7145) | 1.8351* (0.1634) |
| Schooling | 0.0219 (0.0264) | −0.0004 (0.0086) |
| Age on arrival | 0.0057 (0.0065) | 0.0024 (0.0024) |
| WC experience | 0.0372* (0.0122) | 0.0269 (0.0226) |
| BC experience | 0.0006 (0.0198) | 0.0045 (0.0045) |
| Hebrew | 0.0621 (0.1416) | 0.0943* (0.0432) |
| Training | 0.1605** (0.0929) | −0.0149 (0.0416) |
| Number of observations | 168 | 481 |
| $R^2$ | 0.09 | 0.02 |

Source: Brookdale Employment Survey. Standard errors appear in parentheses.
* Significant at 5% level.
** Significant at 10% level.

following estimated pooled regression:

$$\begin{aligned}Heb_{it} = {} & 1.906 + 0.5357 * Heb\_FSU_i + 0.459 * studied\_Ulpan_i \\ & + 0.1802 * finished\_ulpan_i + 0.07924 * t \\ & - 0.0021 * t^2 + fe_i\end{aligned}$$

where $Heb_{it}$ is the Hebrew knowledge of an individual $i$ at the quarter $t$ following arrival, $Heb\_FSU_i$ is a dummy for Hebrew knowledge before migration (Table 1), $studied\_Ulpan_i$ is a dummy for studying in Hebrew classes (Ulpan), $finished\_ulpan_i$ is a dummy for graduating the Hebrew course and $fe_i$ is the individual fixed effect.

The most important result in the wage regression is that the return to training in a WC occupation is very large (16%) and significant at the 10% level, while it is zero in BC jobs. Since the regressors are endogenous these estimates are biased, and the correction for the potential bias is an important task of the structural estimation that follows.

## 3. An estimable 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 resembles the dynamic programming models of labor supply and schooling (Keane and Wolpin, 1997; Eckstein and Wolpin, 1999) in which individuals sequentially choose among a finite set of mutually exclusive alternatives over a finite horizon in order to maximize discounted expected utility. The model incorporates initial observed heterogeneity at the time of arrival, such as marital status, number of children, years of schooling, age on arrival and occupation in the FSU. Since the model is estimated using immigrants who came to Israel in the initial wave of 1989–1992 and who had not previously expected to migrate, the standard initial condition problem is not a concern here. Hence, we can treat the imported endowment of human capital (schooling and occupation prior to migration) and age on arrival as exogenous.

Each immigrant in each period $t$, starting on arrival ($t = 1$) in Israel and ending at retirement ($t = T$), chooses an element $a$ from within her choice set $A$ which contains four alternatives: employment in a white-collar (WC) occupation ($a = 1$), employment in a blue-collar (BC) occupation ($a = 2$), participation in training ($a = 3$) and unemployment ($a = 4$).[18] The choice variable, $d_{at}$ equals 1 if the $a$ element was chosen in period $t$ and equals zero otherwise.[19] The four alternatives are mutually exclusive, implying that $\sum_{a=1}^{4} d_{at} = 1$ for every $t$. The periodic utility of a female immigrant, $U_t$, is assumed to be linear and additive in consumption and labor market state, such that,

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

where $M$ is an indicator equal to 1 if the immigrant is married, $N$ is the number of children (both are assumed to be exogenous and constant) and $C_t$ is the consumption of a composite good in period $t$.[20] The utility from children, marriage and leisure depends on employment, participation in training or being unemployed.

The female budget constraint in each period $t$, $t = 1, \ldots, T$, is given by:

$$\begin{aligned}& d_{1t}w_{1t} + d_{2t}w_{2t} + d_{3t}TW + d_{4t}UB + AI_t \\ & \quad = C_t + g_1N_t \cdot (d_{1t} + d_{2t}) + g_2N_t \cdot d_{3t} + g_3N_t \cdot d_{4t}\end{aligned} \tag{2}$$

where $w_{at}$ is the immigrant's wage in a WC occupation ($a = 1$) or in a BC occupation ($a = 2$); $TW$ is the subsidy received by the immigrant while attending training ($a = 3$); $UB$ is the unemployment benefit; $AI_t$ represents additional sources of income that do not depend on the immigrant's choice, such as the earnings of the husband; and $g_aN_t$ denotes the cost of children which takes on different values if the immigrant works ($a = 1, 2$), participates in training ($a = 3$) or is unemployed ($a = 4$). Given the

18 WC and BC occupations are also referred to as occupation 1 and 2, respectively.

19 For notational simplicity, we omit the individual index in this section.

20 Studies that model 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), treat female labor supply as a binary decision (i.e. the women either works or not). In this paper, we focus on the various labor market activities the woman can engage in (i.e. not simply whether she works or not but in what occupation as well). For immigrants, we view the occupational and local human capital choices as the main decisions to be made. Therefore, in order to maintain tractability we do not incorporate marriage and fertility decisions into our model. Finally, note that the average age on arrival is 38.

linearity of preferences we can write the periodic utility, $U_t$, as:

$$U_t = \sum_{a=1}^{4} U_{at} d_{at} \tag{3}$$

where $U_{at}$ is the periodic utility associated with choosing alternative $a$ at time $t$. Substituting $C_t$ (obtained from (2)) into (1), the alternative state-specific utilities at time $t$ are:

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

where $\varepsilon_{3t}$ and $\varepsilon_{4t}$ are the time varying utility shocks that are assumed to be serially uncorrelated. Note that under the assumption that utility is additive and separable in consumption, the additional sources of income in (2), $AI_t$, are neutral across the four alternatives and do not affect immigrants' choices.[21]

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

$$\begin{aligned} w_{jt} = \exp(&\alpha_{0j} + \alpha_{1j} SC + \alpha_{2j} k_{1t-1} + \alpha_{3j} k_{2t-1} + \alpha_{4j} DT_t \\ &+ \alpha_{5j} AGE + \alpha_{6j} Heb_t + \varepsilon_{jt}) \end{aligned} \tag{5}$$

where $SC$ denotes the immigrant's imported years of schooling; $k_{jt-1}$ is the *actual* work experience the immigrant has accumulated in occupation $j$ from the time of her arrival until period $t$; $DT_t$ is an indicator that equals one if the immigrant has completed a training program before period $t$; $AGE$ represents the immigrant's age on arrival; and $Heb_t$ is the immigrant's Hebrew knowledge at time $t$. The training evaluation literature has focused on the parameter $\alpha_{4j}$, which is known as the mean return to training.[22]

The parameter $\alpha_{0j}$ measures the wage constant and the constant individual utility premium for occupation $j$ (see Eq. (4)). The parameters $\alpha_{2j}, a_{3j}, \alpha_{4j}$ and $\alpha_{6j}$ measure the contribution of different forms of human capital that the immigrant accumulates in Israel to her potential earnings. The parameters $\alpha_{1j}$ and $\alpha_{5j}$ measure the contribution of imported schooling and experience (age on arrival) to her potential earnings. $\varepsilon_{jt}$ is a time varying occupation-specific shock, which is assumed to be serially uncorrelated. Under this last assumption, time-dependence in wages is not random but rather is related to the immigrant's decisions via work experience accumulation and participation in training. The random elements $\varepsilon_t = [\varepsilon_{1t}, \varepsilon_{2t}, \varepsilon_{3t}, \varepsilon_{4t}]$ are assumed to have a joint normal distribution and to be serially independent, such that $\varepsilon_t \backsim iidN(0, \Omega)$, where $\Omega$ is not restricted and allows for within-period correlations between the four choices.

The occupation-specific work experience stocks evolve according to:

$$\begin{aligned} k_{1t} &= k_{1t-1} + d_{1t} \\ k_{2t} &= k_{2t-1} + d_{2t}, \end{aligned} \tag{6}$$

where the initial values of the endogenous human capital variables are given by the level of these variables on arrival in Israel, implying that $k_{1,0} = k_{2,0} = DT_0 = 0$. The immigrant's choices take into account that future job opportunities and wage offers depend on endogenously accumulated occupation-specific work experience and training status.

The objective of the immigrant is therefore to maximize:

$$E\left[\sum_{t=1}^{T} \beta^t \sum_{a=1}^{4} U_{at} d_{at} I_{at} \mid S(0)\right] \tag{7}$$

by choosing a sequence of the control variables $d_{at}$ for all $t = 1, \ldots, T$, where $\beta$ is the discount factor. $I_{at}$ is an indicator function that is equal to 1 if alternative $a$ is available at time $t$.[23] The expectation operator $E[\bullet \mid S(0)]$ is defined over the distribution of $\varepsilon_t$ and the probability of availability of labor market states as defined below. Finally, $S(0)$ is the individual's state space on arrival ($t = 0$) which contains all the variables that are known to the immigrant in this period and affect either her current or future utility.

The availability of labor states at each date $t$ in the optimization of (7) is determined as follows: The immigrant can always choose to be unemployed, such that $I_{4t} = 1$ for all $t$. In each period, the immigrant can receive job offers in occupation 1 and 2 independently. Furthermore, in each period $t$ there is an exogenous probability, $1 - s_j$, that the worker remains in the same occupation, such that $s_j$ is the exogenous probability that an employed immigrant is separated from her job in occupation $j, j = 1, 2$.

The probability of receiving a job offer in occupation $j, j = 1, 2$ at time $t$ depends on the labor market activity that the immigrant engaged in during the previous period ($d_{at-1}$), as well as on the immigrant's years of schooling, age on arrival, participation in training, occupation in the FSU (denoted by $UOC$) and accumulated work experience in occupation $j$. We adopt the following logistic form for job-offer probability:

$$\begin{aligned} \lambda_{jt} &= \frac{\exp(Q_{jt})}{1 + \exp(Q_{jt})}, \quad \text{where } j = 1, 2 \\ Q_{jt} &= b_{10j} d_{3t-1} + b_{11j} d_{4t-1} + b_{12j} d_{-jt-1} + b_{2j} SC + b_{3j} AGE \\ &\quad + b_{4j} DT_t + b_{5j} UOC + b_{6j} k_{jt-1} + b_{7j} Heb_t \end{aligned} \tag{8}$$

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

The institutional design of training programs imposes restrictions on participation in training that are included in the model. Each immigrant is eligible to participate in only one government-sponsored training program during her first five years in Israel. In addition, the individual is eligible to participate in training only after completing Hebrew classes or passing a Hebrew test. We impose these restrictions on the model directly using indicator functions that get the value of zero and one conditional on the relevant state.

While there is in general no uncertainty regarding the availability of the program, uncertainty does exist in each period because even if demand for the program exists there is a great deal of bureaucracy involved in the supply of the programs. In addition, the training programs are not always available in every location. This is particularly true in this case, since the immigrants arrived in Israel continuously while the vocational training programs have a predetermined schedule. In addition, there are institutional restrictions on immigrants' participation in training if they are older than forty. We model this process as a periodic probability of receiving an offer to participate in training that depends on the

21 No data on the husband's wage and employment status were available from the Brookdale surveys. The assumption that the husband always works is too strong for immigrants who have just arrived in a new country and have just entered a new labor market. In order to control for family related effects on the female immigrant's decisions (see Baker and Benjamin, 1997; Duleep et al., 1999), we included the marital status ($M$) and number of children ($N$). In the literature, it is not clear that the husband's wage has a major impact on female labor supply (assortive mating).

22 The common assumption in the literature is that the return to training is independent of occupation.

23 Institutional and other considerations imply specific values for $I_{at}$ which are explained below.

immigrant's age on arrival:

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

where $p_1$ and $p_2$ are parameters.[24]

The optimization problem (7) can be represented by a set of alternative-specific value functions, each obeying the Bellman (1957) equation:

$$V_a(S(t), t) = U_{at} + \beta E\{\max_{x\in A}(V_x(S(t+1), t+1))|S(t), d_{at} = 1\},$$
$$a \in A \tag{10}$$

where $V_a(S(t), t)$ is the maximum expected present value of utility if alternative $a$ is chosen at time $t$ for a given element of the state space $S(t)$. As can be seen from (10), future decisions are assumed to be made optimally for any current choice $a$, $a \in A$.

Finally, in this setting, the state space in period $t$ can be written as:

$$S(t) = \{d_{1t-1}, d_{2t-1}, d_{3t-1}, d_{4t-1}, k_{1t-1}, k_{2t-1}DT_t, SC, AGE, N, M, UOC, Heb_t, Heb\_FSU, \varepsilon_t\}. \tag{11}$$

At this stage it is important to outline the elements of the model that enable it to explain the observed dynamics in Fig. 1 and the pattern of wage growth. The immigrant starts with some given initial characteristics but with no job. The random arrival of job offers, training programs and the immediate and expected return that determine choices jointly impose the particular transition between states. The dynamic optimal solution implies that each immigrant prefers to attend training earlier, rather than later, but that the gain from local experience creates a large opportunity cost for working immigrants to attend training programs. These results imply that we can expect early training attendance among the unemployed and transitions to jobs that are more frequently offered. Since individuals choose optimally between potential current and future states, the model predicts that over time the number of transitions will diminish and greater stability can be expected.

### 3.1. Solution

In each period the immigrant chooses one element from within her choice set $A$, for which the value function in (10) is maximized. The decision rules in a finite horizon model are not stationary and depend on, among other things, the number of periods until retirement. The model is solved recursively from the last period back to the first. Under the assumption that the alternative-specific shocks have a multivariate normal distribution, the *Emax* in (10) does not have a closed form expression. Following Keane and Wolpin (1994), we numerically approximate the *Emax* in (10) using Monte Carlo integration. That is, we take $D$ draws from the multivariate normal distribution of $\varepsilon_t$ and calculate the maximum of the value functions for each. The maximum values are then averaged, implying that:

$$E\max\{V_1(S(t), t), V_2(S(t), t), V_3(S(t), t), V_4(S(t), t)| S(t-1), d_{at-1}\} = \frac{1}{D}\sum_{d=1}^{D}\max\{V_1(S(t), t), V_2(S(t), t), V_3(S(t), t), V_4(S(t), t)|S(t-1), d_{at-1}\}. \tag{12}$$

A full solution of the dynamic programming problem, from the immigrant's arrival until retirement, for all potential points in the state space that may arise, involves an enormous computational burden, especially since we use quarterly rather than annual data. To reduce this burden, we split the horizon into 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 $S(20)$, the state space in the 20th quarter. In particular, we assume the following terminal value function[25]:

$$V_a(S(21), 21) = \delta_1 k_{1,20} + \delta_2 k_{2,20} + \delta_{3m}(60 - AGE) + \delta_4 DT_{20} + \delta_5 + \delta_6 d_{1,20} + \delta_7 d_{2,20} + \delta_8 SC + \delta_9 N + \delta_{10} M + \delta_{11} UOC + \delta_{12} Heb_{20}. \tag{13}$$

### 3.2. Estimation method

The model is estimated using smooth maximum likelihood (SML) following McFadden (1989) and Keane and Wolpin (1997). Let $t_i$ be the length of time we observe immigrant $i$. Given data on the choices of individual $i$ ($d^i_{at}$; $t = 1, \ldots, t_i$; $a = 1, \ldots, 4$), and her wage, $w^{io}_{jt}$, in occupation $j$, ($t = 1, \ldots, t_i, j = 1, 2$) if chosen, the solution of the dynamic programming problem serves as input in the estimation procedure. As such, all the parameters of the model enter into the likelihood function through their effect on choice probabilities and wages. Given the observed variance in wages, we allow for a multiplicative measurement error in observed wages (Keane and Wolpin, 1997), such that $\ln w^{io}_{jt}$, the log of the observed wage of individual $i$ at time $t$ in occupation $j$, is of the form: $\ln w^{io}_{jt} = \ln w^i_{jt} + \eta^i_{jt}$, where $\eta^i_{jt} \sim N(0, \sigma^2_\eta)$ is the measurement error.

The likelihood for a sample of $I$ individuals is given by:

$$L(\nu) = \prod_{i=1}^{I}\Pr(d^i_{a1}, w^{io}_{j1}, d^i_{a2}, w^{io}_{j2}, \ldots, d^i_{at_i}, w^{io}_{jt} \mid S^i(0)) \tag{14}$$

where $\nu$ is the vector of parameters to be estimated. Given the assumption of joint serial independence of the vector of errors, the likelihood function (14) can be written as a product of within-period conditional joint probabilities of the immigrant's choices and observed wage. These probabilities are computed from the solution of the dynamic programming as explained above. To achieve asymptotically efficient estimators using the simulated probabilities, we smooth the conditional probabilities.[26]

### 3.3. Identification

Given data on the immigrant's wages during the period since their arrival in white- or blue-collar occupations, all the wage parameters in (5), can be identified using the conditional mean moments of wages (OLS regression moments; see Table 5). These

24 The CT programs last from 1 to 3 quarters. To reduce the computational burden in the estimation procedure we assume that 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. We also assume that programs of different length have the same impact on wages and on job-offer probabilities. This assumption is based on conversations with the administrators of the training programs. They indicated to us that the length of the program does not necessarily imply that a longer program covers more material, but rather that the same material is taught at a different pace.

25 To solve the dynamic model for periods subsequent to $t = 20$, it is internally consistent to assume that at retirement the terminal value is zero. This can be imposed by assuming that the $\delta$'s in (13) linearly decline to zero.

26 The smoothing function takes the standard logit form. For example, for the probability that the $x$ alternative, $x \in A$, was chosen from 4 possible alternatives ($a = 1, \ldots, 4$), we use the Kernel smoothing function: $\exp\left(\frac{(V_x(S(t),t)) - \max(V_a(S(t),t))}{\tau}\right) / \sum_{a=1}^{4}\exp\left(\frac{(Va(S(t),t)) - \max(V_a(S(t),t))}{\tau}\right)$. where $\tau$ is a parameter. This is a standard procedure in the literature.

moments can potentially identify the return to occupational experience, training and individual wage fixed effects. The fact that we have (relatively) few wage observations limits the precision (large standard errors) of the estimated parameters of the earning function and limit the possibility to estimate interaction terms between imported human capital (age at arrival and schooling) and local accumulated human capital indicators.

Given the wage parameters, the cross-section choices between the four states in each period can identify the utility and the cost of children parameters jointly, that is: $\gamma_{1m}, \gamma_{2m}, \gamma_{3m}, (-g_1 + \gamma_{1c}), (-g_2 + \gamma_{2c})$ and $(-g_3 + \gamma_{3c})$. This follows directly from a standard Heckman selection model. Thus, the cost of children ($g_a$) and the utility from children ($\gamma_{ac}$) cannot be identified separately for $a = 1, 2, 3$. In addition, lacking data on unemployment benefits and earnings during training, we cannot identify *TW* from $\gamma_{3l}$ nor *UB* from $\gamma_{4p}$. Therefore, we estimate the following utility parameters:

$$
\begin{aligned}
U_{1t} &= w_{1t} + \gamma_{1m}M + \theta_{1i}N \\
U_{2t} &= w_{2t} + \gamma_{1m}M + \theta_{1i}N \\
U_{3t} &= tw + \gamma_{2m}M + \theta_{2i}N + \varepsilon_{3t} \\
U_{at} &= b + \gamma_{3m}M + \theta_{3i}N + \varepsilon_{4t}
\end{aligned}
\tag{15}
$$

where $\theta_{1i} = -g_1 + \gamma_{1c}, \theta_{2i} = -g_2 + \gamma_{2c}, \theta_{3i} = -g_3 + \gamma_{3c}, tw = TW + \gamma_{3l}$ and $b = UB + \gamma_{4l}$. The parameters of the job and training offer rates ((8) and (9)) are identified from the transition rates (see Table 4). The terminal value parameters are identified by their joint restrictions on the transitions between states over time and the cross-section choice.

Do we need additional instruments to identify the causal effect of training on wages? The answer is no. If the dynamic programming model's implicit selection equation for the choice of training is correct, then we can consistently estimate the probability of participation in training for each individual using the predicted training choice probability as an "instrument" in the wage equation for her training status. The likelihood function (14) uses these moments and restrictions jointly in order to estimate the parameters of the model.

The rich transitions moments are the main source of the identification of the job and training offer probabilities as well as the utility parameters of training and unemployment outcomes. It also helped that the data includes many observations on the transitions between the four labor choices conditional on individual state variables (see Section 2). The likelihood function is built on the products of these conditional probabilities for each individual. The match of the simulated conditional probabilities that are generated by the offer rates above and the choices with the actual observed transitions identify jointly the impact of the state variables on these offer rates and the utility parameters given the parameters of the earning functions.[27]

## 4. Results

This section presents the SML estimates of the model's structural parameters. The solution of the dynamic programming problem serves as an input in the estimation procedure, as explained above. Hence, all the parameters of the model enter the likelihood function through their effect on the joint choice and wage probabilities.[28] In this section we first discuss the fit of the estimated model to the actual aggregate labor states, the transitions between these states and wages. We then review the estimated parameters and their interpretation. The policy implications are discussed Section 5.

### 4.1. Model fit

Given the estimated parameters of the model (to be discussed below) and the assumed random errors, we simulated the one quarter ahead predicted proportion of the initial 502 women in our sample for each of the four labor market states for each observation in the data.[29] In Table 6 we report the actual and predicted proportion of females in each labor market state in order to assess the fit of the estimated model to the aggregate data. Table 6 also presents a simple $\chi^2$ test of the fit for each quarter and for each choice for all periods.

The estimated model fits the aggregate proportions extremely well and succeeds in replicating the qualitative and quantitative patterns in the data. The $\chi^2$ goodness-of-fit test confirms this observation. The estimated model predicts that 9.4% (18.6%) of the immigrants will be employed in BC jobs during the first (third) quarter in Israel as compared to 6.4% (26.3%) in the data. The tests confirm that the predicted and observed choices are statistically different only in the first and third quarters. No significant differences are found in a simple $\chi^2$ goodness-of-fit test between actual and predicted choices for each alternative, both separately and for the whole model.

The predicted pattern of participation in training is consistent with the data. The model predicts the peak in training attendance during the fourth quarter although the predicted proportion is only 14.2% as compared to the observed participation rate of 16.9%. Furthermore, the estimated model predicts that 200 immigrants choose to attend training during the sample period as compared to the actual 218 immigrants who attended training in our sample.

It should be noted that the goodness-of-fit of the estimated model to the *aggregated* choices does not necessarily ensure that the model can accurately explain each individual's choices. On average, in each simulation, the model correctly predicts 5461 of the 7205 observed choices, which implies that the estimated model "explains" 76% of the immigrants' choices within the sample period.

Table 7 presents the actual and predicted quarter-to-quarter transitions between the four states of the model based on the same simulations as above.[30] The estimated model captures the dominance of the elements on the diagonal remarkably well. However, it produces too few transitions from the two employment states to training and too many transitions from unemployment to WC.

[27] If one set a multinomial probit model for the transitions conditional on the earning equation one could estimate $3 \times 20$ separate equations with different parameters for the controlled state variables. These multinomial equations generate more parameters than the parameters we set in the model for the job offer probabilities. Hence, identification is not due to functional forms but to the transition data.

[28] The program is written in FORTRAN90 code and iterates between the solution of the Dynamic Programming (DP) and the calculation of the likelihood function. For each of the 502 immigrants in our sample, we calculate the *Emax* at each point in the state space that may arise during the 20 period planning horizon. At each of these points, we use 150 simulated draws of the vector $\varepsilon$ to calculate the $E$ max. The state space increases linearly with the number of unobserved types. In this version of the model we assume there is no unobserved heterogeneity. As in an earlier version, we used 2 unobserved types and the proportion of type 1 converged to 0.98 which was not significantly different from 1. The attrition in the sample is treated in the estimation as random. Since the solution of the DP problem and the calculation of the likelihood function is done for each observation independently, we take advantage of the parallel processing features of super-computers. The program runs simultaneously on 8 or 16 or 32 processors on IBM and Silicon Graphics (Origin2000) super computers at Tel Aviv University and on a Silicon Graphics super-computer at Boston University.

[29] The predictions in this section are based on one step ahead predictions. As noted in Keane and Wolpin (1994), maximum-likelihood estimation of the model under the assumption of serial independence is based on one-step ahead forecasts of the conditional transition probabilities. The predictions in this section are based on 50 one-step ahead simulations of the choices of each of the 502 women in our sample.

[30] The total number of quarter-to-quarter transitions is $7205 - 502 = 6703$.

**Table 6**
Actual and predicted choice distributions.

| Quarter | Number of Obs. | White collar | | Blue collar | | Training | | Unemployment | | $\chi^2(3)$[a] |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Actual | Predicted | Actual | Predicted | Actual | Predicted | Actual | Predicted | |
| 1 | 502 | 0.010 | 0.016 | 0.064 | 0.094 | 0.002 | 0.010 | 0.924 | 0.881 | 6.99 |
| 2 | 502 | 0.026 | 0.026 | 0.149 | 0.159 | 0.016 | 0.016 | 0.809 | 0.799 | 0.38 |
| 3 | 495 | 0.044 | 0.063 | 0.263 | 0.186 | 0.121 | 0.101 | 0.572 | 0.651 | 25.01 |
| 4 | 479 | 0.069 | 0.071 | 0.299 | 0.319 | 0.169 | 0.142 | 0.463 | 0.468 | 3.18 |
| 5 | 466 | 0.082 | 0.099 | 0.333 | 0.367 | 0.150 | 0.135 | 0.436 | 0.399 | 5.22 |
| 6 | 457 | 0.103 | 0.116 | 0.372 | 0.374 | 0.116 | 0.090 | 0.409 | 0.420 | 4.33 |
| 7 | 446 | 0.132 | 0.155 | 0.399 | 0.415 | 0.085 | 0.081 | 0.383 | 0.350 | 3.27 |
| 8 | 430 | 0.147 | 0.167 | 0.449 | 0.437 | 0.072 | 0.063 | 0.333 | 0.333 | 1.85 |
| 9 | 422 | 0.168 | 0.168 | 0.472 | 0.483 | 0.059 | 0.062 | 0.301 | 0.287 | 0.46 |
| 10 | 417 | 0.194 | 0.185 | 0.496 | 0.487 | 0.046 | 0.048 | 0.264 | 0.281 | 0.76 |
| 11 | 412 | 0.194 | 0.228 | 0.517 | 0.505 | 0.032 | 0.041 | 0.257 | 0.226 | 4.98 |
| 12 | 408 | 0.213 | 0.221 | 0.525 | 0.515 | 0.020 | 0.029 | 0.243 | 0.235 | 1.60 |
| 13 | 386 | 0.233 | 0.244 | 0.536 | 0.534 | 0.013 | 0.018 | 0.218 | 0.205 | 1.05 |
| 14 | 354 | 0.251 | 0.266 | 0.537 | 0.540 | 0.025 | 0.025 | 0.186 | 0.170 | 0.87 |
| 15 | 321 | 0.252 | 0.259 | 0.533 | 0.539 | 0.034 | 0.019 | 0.181 | 0.184 | 4.25 |
| 16 | 281 | 0.256 | 0.267 | 0.562 | 0.545 | 0.021 | 0.032 | 0.160 | 0.157 | 1.30 |
| 17 | 207 | 0.295 | 0.271 | 0.541 | 0.560 | 0.005 | 0.015 | 0.159 | 0.155 | 0.62 |
| 18 | 127 | 0.323 | 0.299 | 0.528 | 0.528 | 0.008 | 0.008 | 0.142 | 0.165 | 0.67 |
| 19 | 63 | 0.397 | 0.397 | 0.444 | 0.444 | 0.000 | 0.000 | 0.159 | 0.159 | 0.00 |
| 20 | 30 | 0.433 | 0.433 | 0.400 | 0.367 | 0.000 | 0.000 | 0.167 | 0.200 | 0.26 |
| $\chi^2(19)$[a] | | 12.0742 | | 24.1496 | | 17.5661 | | 13.2383 | | |

[a] The relevant critical values are $\chi^2(3) = 7.81$ and $\chi^2(19) = 30.14$. In the training column, there are 14 d.f. since in some of the cells there are less than 5 immigrants. Therefore, the critical value for this column is 23.68. In the 1st and the 17th to 20th quarters, there are 2 d.f. and the relevant critical value is 5.99.

**Table 7**
Actual and predicted transitions.

| From | To | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | White collar | | Blue collar | | Training | | Unemployment | | |
| | Actual | Predicted | Actual | Predicted | Actual | Predicted | Actual | Predicted | |
| White collar | 918 | 929 | 7 | 0 | 12 | 3 | 23 | 28 | 960 |
| Blue collar | 14 | 13 | 2414 | 2434 | 51 | 31 | 120 | 121 | 2599 |
| Training | 33 | 44 | 71 | 66 | 222 | 208 | 105 | 113 | 431 |
| Unemployment | 101 | 142 | 330 | 310 | 154 | 161 | 2128 | 2100 | 2713 |
| Total | 1066 | 1128 | 2822 | 2810 | 439 | 403 | 2376 | 2362 | 6703 |

$\chi^2 = 59.619$. The critical value is $\chi^2(14) = 23.68$.

**Table 8**
Actual and predicted accepted wages by time since arrival, experience and participation in training.

| | WC | | BC | |
|---|---|---|---|---|
| | Actual | Predicted | Actual | Predicted |
| *Residency in Israel (quarters)* | | | | |
| 1–4 | 12.52 | 13.38 | 10.22 | 8.01 |
| 5–8 | 17.26 | 17.29 | 10.36 | 8.47 |
| 9–12 | 17.92 | 18.69 | 9.73 | 8.99 |
| 13–16 | 26.17 | 19.94 | 10.56 | 9.37 |
| *Experience (quarters)* | | | | |
| 0–4 | 19.88 | 16.63 | 10.63 | 8.38 |
| 5–8 | 18.70 | 18.85 | 9.81 | 9.09 |
| 9–12 | 25.85 | 23.33 | 10.21 | 9.42 |
| 13–16 | 25.13 | 24.59 | 11.54 | 9.77 |
| *Participation in training* | | | | |
| Before training | 18.10 | 17.49 | 10.07 | 8.60 |
| After training | 22.97 | 20.06 | 10.82 | 9.55 |

Hourly wage in July 1995 prices (NIS).

The fit of the model to the mean wage over time, occupation-specific experience and training is presented in Table 8. The estimated model accurately predicts the dynamic pattern and the level of wages by occupation. The substantial growth in wages, according to time since arrival, in WC occupations is somewhat underpredicted by the model but the flat pattern of wages in BC occupations is well-captured by the model. The same pattern by occupation-specific experience is also well captured by the model. The observed mean wage growth of 27% (8%) due to training in WC (BC) jobs is quite accurately predicted by the model (which predicts 14.7% (10%) wage growth for WC (BC)).[31]

Finally, in addition to the one-step ahead predictions, in which the state-space is updated according to the real choice of the immigrant in each period, Fig. 3 presents the 'unconditional' fit of the estimated model. This is based on simulations of the estimated model, assuming that all immigrants have zero experience in BC and WC jobs upon arrival in Israel and have not yet participated in training. Given these initial conditions and the exogenous values of the variables that make up the immigrant's state space (e.g. schooling, age on arrival, etc.) the immigrant chooses the alternative which gives her the highest value function during the first period in Israel and the state space is updated according to her simulated choices in each period. As the figure shows, the unconditional simulation also provides a very good fit to the observed patterns, with the exception of the last two periods in which it does not capture the turnaround in the proportions of immigrants working in WC and BC jobs.[32]

[31] It should be noted that there are very few wage observations. For example, there are only 6 observations for WC jobs during the first year in Israel and 41 for the 4th year. Therefore, we view the results as supportive for the model.

[32] It should be noted that the unconditional predictions are not used in the estimation and should be viewed as a better measure for the fit of the model.

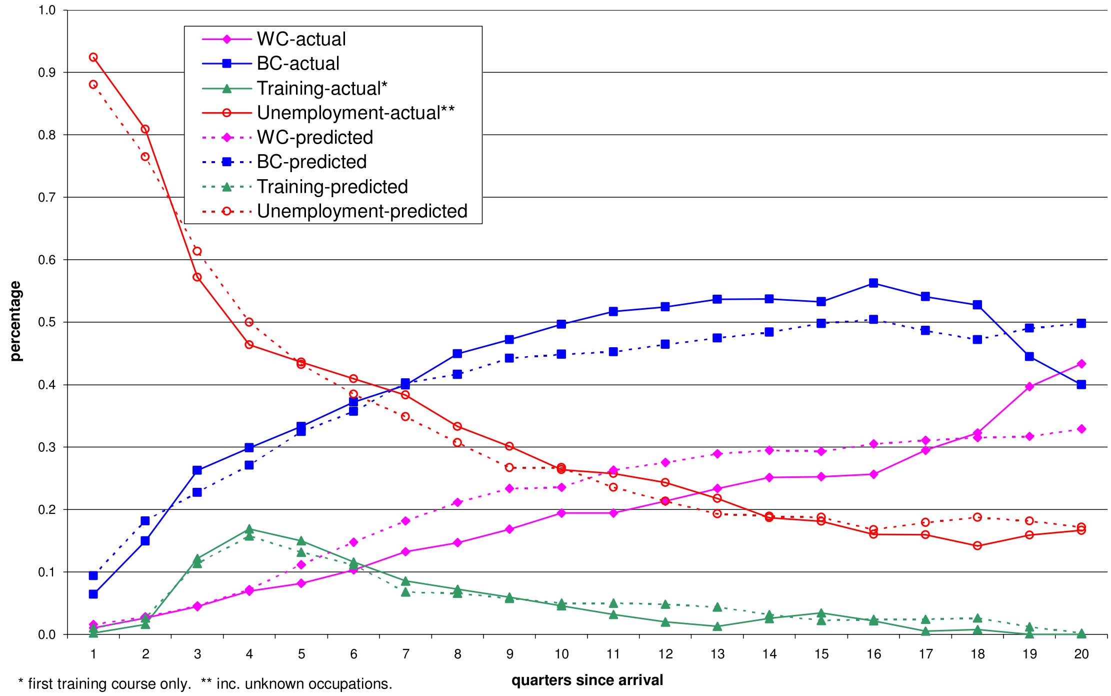


**Fig. 3.** Actual and predicted choices — unconditional.

*4.2. Estimated parameters*

*4.2.1. Wage parameters (Table 9)*

The occupation-specific wage functions were estimated according to Eq. (5). The estimated parameters are very close to the OLS parameters in Table 5. We find that immigrants from the former Soviet-Union (FSU) have an (almost) zero return to their imported human capital in the form of schooling and experience when conditioned on investment in local accumulated human capital. The return to schooling is 2.3% (0.025%) in WC (BC) occupations and is not significant at the 5% level. The impact of experience in the country of origin (using age on arrival as a proxy) is also statistically insignificant for both types of occupation. The finding that female immigrants do not receive a return to the human capital they brought from the FSU is consistent with findings on male immigrants from the FSU (Cohen and Eckstein, 2008; Eckstein and Weiss, 2004).

The distinction between BC and WC occupation-specific experience is important for the analysis of the factors behind immigrants' wage growth. An addition of one quarter to WC experience significantly increases the WC wage (by 3.9%). WC work experience also has a large effect on the BC wage (2.7%), though this impact is statistically insignificant. The return to BC experience in both BC and WC occupations is small and not significant. This last finding implies that the wage of immigrants who were absorbed in BC jobs is not expected to grow as the immigrants accumulate experience in these low-skilled jobs. On the other hand, the wage in WC jobs grows rapidly in the short run with the accumulation of WC work experience. Hence, wage growth does not depend solely on previous employment, but also on occupation-specific experience. Studies that use age (or period of residence in the destination country) as a proxy for experience are ignoring the possibility that occupation-specific experience may have a substantially different impact on wage growth.

Knowledge of Hebrew has a positive and significant return in both WC and BC occupations. The Hebrew index variable ranges from 1 (no knowledge of Hebrew) to 4 (fluent in Hebrew), implying that the return to achieving fluency in Hebrew is 17% in WC jobs and 90% in BC jobs. The high return to Hebrew in BC jobs may reflect the fact that the usage of Hebrew in BC jobs is more extensive than in WC jobs (for example, gas stations attendants, cashiers, saleswomen, etc.).[33]

The return to training in terms of wage growth also depends on the immigrant's occupation. The wage-return to training in WC jobs ($\alpha_{41}$) is 19.5% and significantly differs from zero at the 5% level. The OLS estimator from a similar specification is 16.1% and is not significant. Thus, the OLS estimate is downward-biased due to the selection to training and due to occupational choice. The wage-return to training in BC jobs ($\alpha_{42}$) is not statistically different from zero.[34]

The finding that training has no impact on the wage in BC jobs is consistent with the prevalent finding in the US that the return to government-sponsored training is close to zero. One of the main explanations in the training literature for the small private gain from training is that government-sponsored training is usually targeted towards relatively unskilled and less able individuals who work in low-skilled jobs and are poorly paid. As Heckman et al. (1999) argue, evidence on the complementarity between the return to training and skill (education) in the private sector suggests that the return to training in the public sector should be relatively small. Our findings suggest that only immigrants who have succeeded in climbing up the occupational ladder will receive a high return to their investment in training. Our data on the training of high skilled workers provide a novel extension to the existing literature.

*4.2.2. Job offer parameters (Table 9)*

The estimated parameters imply that job-offer probabilities by occupation are sensitive to the current labor market state and

[33] Hebrew in the wage equation captures the direct wage return conditional on employment, where Hebrew in the job offer probability equation measures the reduction in job-offer friction.

[34] These results are not changed when we estimated the model with unobserved heterogeneity (2 types). Furthermore, these are consistent with the surprisingly high return to male training in WC jobs found by Cohen and Eckstein (2008).

to human capital stocks. The probability of job retention in the same occupation is close to one, though job-offer rates are much lower for both WC and BC occupations if the current state is different. Moreover, the probability of an unemployed immigrant receiving a job offer in either type of occupation is higher than from employment in the other occupation ($b_{12j} < b_{11j}$), $j = 1, 2$. These results are consistent with widely accepted assumptions concerning job-offer rates in models with on-the-job search.

Imported human capital, which had almost no effect on wages, turns out to have a significant and large impact on WC job opportunities. An additional year of schooling substantially increases the probability of receiving a WC job offer, but has no effect on job-offer probabilities in BC occupations. For example, an unemployed immigrant with 15 years of schooling faces a WC (BC) job-offer probability which is 16.1% (0.13%) higher than that of a similar immigrant with 14 years of schooling. However, age on arrival has zero impact on the job-offer probabilities in both types of occupation. Furthermore, an immigrant who worked in a WC job in the FSU receives a WC job-offer with a probability that is 135% higher than that for an immigrant who held a BC job in the FSU. Similarly, for an immigrant who worked in a BC job in the FSU the probability of receiving a BC job offer is 27% higher than that of an immigrant who worked in a WC job prior to immigrating.[35]

The impact of accumulated WC experience on WC job offer probability is greater than that of BC experience on BC job offer probability. Table 10 shows the impact of an immigrant's occupation-specific experience on the job-offer probabilities from a state of unemployment with and without training. We consider a female immigrant with 14 years of schooling, who was 38-years old on arrival, has a knowledge of Hebrew index of 3 and worked in a WC job prior to immigrating. As expected, the estimated model predicts a considerable difference between the availability of BC and WC job offers. On arrival, the immigrant described above receives a job offer in a WC (BC) occupation each quarter with a probability of 0.033 (0.1). This probability is not expected to change as long as the immigrant is unemployed and has not accumulated local skills, such as work experience, training and knowledge of Hebrew. An additional quarter of WC experience increases the WC job-offer probability for an unemployed immigrant by 8%–20.5%, while an additional quarter of BC work experience increases BC job-offer probability by only 3.5%–4%.[36] The large impact of WC experience on WC job-offer probability leads to a situation in which the probability of an unemployed immigrant who had already accumulated 9 quarters of WC experience to receive a WC job offer is higher than that for an immigrant who accumulated 9 quarters of BC experience to receive a BC job offer (see Table 10, columns (1) and (4)).

The effect of training on job-offer probabilities can be broken down into a permanent effect, $b_{4j}, j = 1, 2$, and a transitory effect, $b_{10j}$, in the quarter following graduation from the training program. Both coefficients indicate that training has a significant and positive impact on job-offer probabilities in both occupations, though to a much larger degree for WC jobs. The permanent effect of training on WC job-offer probabilities ranges from 179% for an unemployed immigrant without WC experience to 33% for an immigrant who has accumulated 20 quarters of WC experience. The permanent effect of training on BC job-offer probabilities is estimated at 76-96%. Since most of the female immigrants who participated in training had no prior experience of any kind in Israel (Table 2), the permanent effect of training on their job-offer probabilities is enormous.

In addition, training also has a large and significant transitory impact on the probabilities in the quarter following graduation from the training program. The probability for an unemployed immigrant with no work experience to receive a WC (BC) job offer in the quarter subsequent to training is 5.5 (3.4) times higher than that for an immigrant who has not attended training (Table 10). Given the negligible probability of receiving a WC job offer, participation in training appears to be an unavoidable step in the process of a WC job search. Moreover, in the absence of WC experience, the effect of training on the WC job-offer probability in the quarter following training is almost twice the permanent effect of training.

What is the source of the immediate and transitory impact of training on job-offer probabilities? According to our data source (the Brookdale Surveys), about 46% of the participants visited factories or institutions related to their area of study during the training program. These included meetings with potential employers, thus suggesting that training has an additional premium beyond the occupational skills it provides. In addition, about 55% of the trainees reported that the CT program also included explanations of the Israeli labor market and employment opportunities. Therefore, it is possible that the effect of training on job-offer probabilities reflects the acquisition not only of vocational skills, but also job-search skills. Although we are unable to distinguish between these two effects, we believe that the finding that training has a different impact on WC job-offer probability than on BC job-offer probability, indicates that the immigrants indeed obtained job-search skills in addition to occupational skills.

The estimated quarterly separation rate (Table 9) from WC (BC) jobs is 3.36% (5.15%). These rates are high and indicate a high rate of mobility among immigrants in the new labor market which is similar to the case of young workers.

*Comment:* The labor and immigration literature focuses on wage growth and the earning return to imported and locally accumulated human capital. The model presented here follows the dynamic labor supply literature (search and labor force participation models) with emphasis on job-offer probabilities as a source of friction in the labor market which may depend on the characteristics of the individual's human capital. In this framework, the wage data identifies earning growth conditional on the return to human capital that has been imported or locally accumulated. The labor market transitions to jobs and training participation identify the conditional impact of human capital on job-offer opportunities which may end up to be of greater value to the individual than the potential return if the job is not accepted. It turns out that the increase in job-offer opportunities due to training is a more important benefit of human capital investment than the impact of training participation on the potential wages. This is because the earning return to training is realized only if the immigrant works in a WC job, which is a very low-probability event.

Furthermore, an interesting point is that unemployment in this model can be either voluntary or involuntary. Using simulations we find that almost all of the unemployment is a result of no offers in both occupations and training, and therefore it can be interpreted as involuntary.

#### 4.2.3. *Training offer probability parameters*

The model predicts a substantial difference in the availability of training offer probabilities according to the immigrant's age on arrival (Table A.1). An immigrant who was 40-years old or younger on arrival, receives an offer to participate in training each quarter with a probability of 0.136. In contrast, an immigrant who was over 40-years old on arrival receives such an offer with a probability of only 0.058. This difference reflects the selection made by the government training administrators in providing training programs and the self-selection by immigrants of different ages.

[35] All the figures in this paragraph refer to job-offer probabilities for an unemployed immigrant who was 38 on arrival, has 14 years of schooling and has no experience or training in Israel.

[36] The contribution of an additional quarter of work experience on job-offer probabilities is not constant due to the logistical form of these probabilities. This impact decreases with accumulated experience, other things being equal.

**Table 9**
Estimated occupation-specific wage and job-offer probability parameters.

| | WC, $j = 1$ | BC, $j = 2$ |
|---|---|---|
| *Wage parameters* | | |
| $\alpha_{0j}$ — constant | 1.7615 (0.007) | 1.0696 (0.1429) |
| $\alpha_{1j}$ — years of schooling | 0.023 (0.0128) | 0.0025 (0.0071) |
| $\alpha_{2j}$ — WC experience | 0.0388 (0.012) | 0.0269 (0.0236) |
| $\alpha_{3j}$ — BC experience | 0.0006 (0.0234) | 0.0045 (0.0041) |
| $\alpha_{4j}$ — training | 0.1951 (0.0882) | −0.0149 (0.0334) |
| $\alpha_{5j}$ — age on arrival | 0.0054 (0.0045) | 0.0024 (0.0022) |
| $\alpha_{6j}$ — Hebrew | 0.0572 (0.0105) | 0.3033 (0.0423) |
| *Job-offer parameters* | | |
| $b_{10j}$ — attended training in $t-1$ | −5.856 (0.2124) | −1.4962 (0.3808) |
| $b_{11j}$ — unemployed in $t-1$ | −6.6306 (0.1834) | −2.2585 (0.3369) |
| $b_{121}$ — worked in BC in $t-1$ | −9.2383 (0.2916) | |
| $b_{122}$ — worked in WC in $t-1$ | | −4.3348 (0.5684) |
| $b_{2j}$ — years of schooling | 0.1551 (0.02) | 0.0015 (0.0201) |
| $b_{3j}$ — age on arrival | 0.0015 (0.0079) | 0.008 (0.0056) |
| $b_{4j}$ — training | 1.0797 (0.0048) | 0.7897 (0.1228) |
| $b_{5j}$ — WC in Soviet Union | 0.8719 (0.1035) | −0.2684 (0.1198) |
| $b_{6j}$ — experience in occupation $j$ | 0.1936 (0.0512) | 0.0434 (0.0229) |
| $b_{7j}$ — Hebrew | 0.0552 (0.0177) | 0 (0) |
| $s_j$ — separation rate from occupation $j$ | 0.0336 (0.0068) | 0.0515 (0.0039) |

Standard errors appear in parentheses (outer product of the numerical first derivatives of the SML).

### 4.2.4. Terminal value parameters

The terminal value expresses the expected future value of the immigrant's utility after five years in Israel. We assume that this value depends on the state space in the 20th quarter and specifically on the work experience accumulated by the immigrant in BC and WC jobs up to the 20th quarter and participation in training. Every quarter of WC(BC) experience increases the terminal value by 633 (520) NIS (see Table A.1). As expected, the terminal value decreases with age on arrival since the labor life cycle of the immigrant is shortened. Training increments the terminal value by 1400 NIS. This means that the value of training in terms of terminal value is larger than that of two quarters of WC work experience and slightly smaller than that of three quarters of BC work experience. Every unit of Hebrew knowledge (ranging from 1 to 4) contributes 35.98 NIS to the terminal value. WC employment during the 20th quarter increases the terminal value by 380 NIS. This premium for WC work reflects the fact that an immigrant in this sector is expected to remain there with a high probability and to earn a high wage.

### 4.2.5. Utility parameters

The utility estimates (see Table A.1) show that the immigrants do not enjoy training or unemployment. However, the disutility from attending training is much smaller than the disutility from being unemployed. This suggests that even if there is no gain associated with training, the immigrant will prefer it to being unemployed as long as training is available. In addition, we find a negative correlation between the preference shocks in unemployment and those in training (panel d in Table A.1). This may make training more appealing while unemployed.

## 5. The gain from training

The main motivation in estimating the model is to quantitatively evaluate the individual and social benefit from training, as well as to evaluate alternative economic policies to those which have actually been implemented in the past.[37] Through counterfactual simulations of the estimated model, we quantitatively evaluate the predicted outcomes of two training policies and two other types of Active Labor Market Policies (ALMP). Specifically, we study the effect of each of the four alternative policies on the following outcomes: employment by occupation; unemployment dynamics; participation in training programs; the expected present value of utility (individual benefit); and the expected present value of the annual earnings over the first five years after immigrating (gross social benefit). In addition, a cost-benefit analysis is conducted of the four policies using data on the costs of each policy.

Following are the four policy experiments to be considered:

**Policy A** — *No training*: In this experiment, there are no training programs offered to female immigrants. This policy is simulated by setting the quarterly probability to receive a training offer (Eq. (9)) to zero, regardless of age. This probability is then compared to the estimated offer rates (in the "benchmark economy") that are 0.136 for females younger than 40 on arrival and 0.056 for females older than 40 on arrival.

**Policy B** — *Free training*: Each immigrant has free access to training, which means the government offers a large number of courses on a continuing basis. This policy is simulated by setting the quarterly probability to receive a training offer Eq. (9) to one, regardless of age.[38]

**Policy C** — *Doubling WC offer probability*: White-collar job offer probability ($\lambda_{1t}$ in Eq. (8)) is doubled for non-employed immigrants who have no prior experience in WC jobs and remains the same for all others.[39] Implicitly we assume that the government subsidizes WC job offers to these immigrants. As a result, employers increase their efforts to offer WC vacancies to immigrants without prior experience in WC occupations.

**Policy D** — *Wage subsidization*: The government subsidizes the wage offered to workers in WC jobs during the first two years in Israel. Specifically, we assume that offered wages (Eq. (5)) are 6 NIS (1995 prices) higher than in the benchmark economy during the first year and 3 NIS higher during the second year.[40]

[37] This statement is based on the classic papers by Marschak (1953) and Lucas (1976) who emphasized the need for an estimated structural economic model in order to measure policy impact.

[38] This holds except for the first two quarters in Israel during which only immigrants with prior knowledge of Hebrew are permitted to enter the training programs, which is the standard prerequisite.

[39] For example, consider an unemployed immigrant with the following characteristics: no prior training, worked in a WC job in the FSU, age on arrival 38, 14 years of schooling and Hebrew index of 3. The probability of a WC job offer in Israel will increase from 3.3% to 6.6% in this case (see first row in Table 10).

[40] In fact, the offered wage during the first year for a WC job is $w_{1t} = \exp\{\alpha_{01} + \alpha_{11}SC + \alpha_{21}k_{1t-1} + \alpha_{31}k_{2t-1} + \alpha_{41}DT_t + \alpha_{51}AGE + \alpha_{61}Heb_t + \varepsilon_{1t}\} + 6$. During the second year, the 6 is replaced by a 3.

**Table 10**
Estimated job-offer probabilities in white-collar and blue-collar occupations.

| Experience in occupation *j* (in quarters) | WC job-offer probability | | | BC job-offer probability | | |
|---|---|---|---|---|---|---|
| | No training | One quarter after training | After training | No training | One quarter after training | After training |
| 0 | 0.033 | 0.181 | 0.092 | 0.100 | 0.343 | 0.196 |
| 4 | 0.070 | 0.323 | 0.181 | 0.116 | 0.383 | 0.225 |
| 8 | 0.140 | 0.509 | 0.323 | 0.136 | 0.425 | 0.257 |
| 12 | 0.260 | 0.692 | 0.509 | 0.157 | 0.468 | 0.291 |
| 16 | 0.433 | 0.830 | 0.692 | 0.182 | 0.512 | 0.328 |
| 20 | 0.624 | 0.914 | 0.830 | 0.209 | 0.555 | 0.368 |

The job-offer probabilities apply to an unemployed immigrant with 14 years of schooling, who worked in a WC job in the USSR, was 38-years old on arrival and has a Hebrew index of 3.

**Table 11**
The effect of policy experiments on labor market outcomes.

| | Benchmark[a] | Policy A: no training | Policy B: free training | Policy C: double WC probability | Policy D: wage subsidy |
|---|---|---|---|---|---|
| *In the 4th quarter* | | | | | |
| WC employment (%) | 7.2 | 7.4 | 9.0 | 14.7 | 7.2 |
| BC employment (%) | 27.1 | 29.5 | 28.1 | 24.5 | 27.1 |
| Training (%) | 15.7 | 0.0 | 36.9 | 15.5 | 15.7 |
| Unemployment (%) | 50.0 | 63.2 | 26.1 | 45.2 | 50.0 |
| *In the 20th quarter* | | | | | |
| WC employment (%) | 32.9 | 21.7 | 38.3 | 50.0 | 32.9 |
| BC employment (%) | 49.8 | 51.0 | 47.0 | 36.7 | 49.8 |
| Training (%) | 0.2 | 0.0 | 2.0 | 0.0 | 0.2 |
| Unemployment (%) | 17.1 | 27.3 | 12.8 | 13.4 | 17.1 |
| Accumulated no. of trained immigrants | 252 | 0 | 402 | 268 | 252 |

[a] The benchmark refers to the simulated choices of the 502 female immigrants over 20 quarters at the ML estimation point.

**Table 12**
The effect of policy intervention on mean accepted wages.

| | Benchmark | | Policy A: no training | | Policy B: free training | | Policy C: double wc probability | | Policy D: wage subsidy | |
|---|---|---|---|---|---|---|---|---|---|---|
| | WC | BC | WC | BC | WC | BC | WC | BC | WC | BC |
| *Time since arrival* | | | | | | | | | | |
| 4th quarter | 14.53 | 8.00 | 15.42 | 7.99 | 16.89 | 8.11 | 14.61 | 8.02 | 20.53 | 8.00 |
| 20th quarter | 24.32 | 9.45 | 22.62 | 9.55 | 27.61 | 9.65 | 25.92 | 9.51 | 24.32 | 9.45 |
| *By training* | | | | | | | | | | |
| Before training | 18.87 | 8.84 | 18.63 | 8.88 | 19.13 | 8.67 | 19.36 | 8.54 | 19.82 | 8.84 |
| After training | 22.45 | 8.80 | | | 22.70 | 9.00 | 22.10 | 8.99 | 22.82 | 8.80 |

Hourly wages in July 1995 prices (NIS).

Each of these policies emphasizes a different channel through which the government can influence the employment outcomes and welfare of female immigrants. To evaluate the effect of each policy, we simulate each "economy" using the random sample of 502 female immigrants, assuming that they all remained in the sample for 20 continuous quarters.[41] The "benchmark economy" is based on the simulation using the estimated parameters of the model reported in the previous section. Table 11 reports the predicted policy effect on labor market outcomes; Table 12 reports the predicted effects on mean accepted wages and training; and Table 13 presents results of the cost-benefit analysis and the individual and social benefit.

Particular attention should be paid to the calculation of the individual and social benefits calculated for each case. The individual benefit for each policy is measured by the change in average expected present value of utility on arrival over the sample of 502 immigrants due to the policy relative to the benchmark. Due to its linear form, utility is measured in NIS per hour according to 1995 prices. The social benefit is meant to measure the increase in output less the cost of the policy for the sample. We use the present value of earnings of each immigrant as the measure for output. The present value of earnings is presented in NIS in annual terms (in 1995 prices) per immigrant assuming that in each of the 20 quarters in Israel the immigrant works 500 hours.[42]

The cost of each policy is determined by a number of factors, both directly and indirectly. First, each policy affects the number of unemployed and since unemployed immigrants receive government benefits, government expenditure is also directly affected.[43] Second, the cost of training consists of the direct cost of the program per participant, as well as the stipend the participant receives during the program. In calculating the cost of training, we assume that the quarterly training allowance is equal to the unemployment benefit, which is in fact the case for most immigrants. The cost of policy A and B can therefore be calculated as the sum of the direct and indirect costs of training and the government expenditure on unemployment benefits.

As for policy C, we have no direct method of calculating the cost of a policy that doubles the rate of white-collar job offers. Nonetheless, in order to evaluate this policy, we assume that employers would offer more WC jobs if they were offered an

41 This assumption is necessary in order to avoid sample selection based on the time between arrival in Israel and the interview.

42 The present value of annual earnings is calculated as: $\frac{4}{502x5}\sum_{i=1}^{502}\sum_{t=1}^{20}\beta^t(w_{i1t}+w_{i2t})500$ and is reported in Table 12.

43 The cost of unemployment benefits provides an upper bound since our definition of an unemployed immigrant is closer to non-employment and not all of these non-employed are eligible for unemployment benefits.

**Table 13**
Cost benefit analysis of the policy experiments.

| | Benchmark | | | Policy A: no training | Policy B: free training | | | Policy C: double WC probability | | | Policy D: wage subsidy | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Transfer payments – trainees[a] | Transfer payments – unemployed[b] | Direct training cost[c] | Transfer payments – unemployed[b] | Transfer payments – trainees[a] | Transfer payments – unemployed[b] | Direct training cost[c] | Transfer payments – trainees[a] | Transfer payments – unemployed[b] | direct training cost[c] | Transfer payments – trainees[a] | Transfer payments – unemployed[b] | direct training cost[c] |
| Years since arrival[d] | | | | | | | | | | | | | |
| 1 | 670 | 6024 | 296 | 6594 | 1953 | 4667 | 778 | 687 | 5759 | 296 | 670 | 6024 | 296 |
| 2 | 822 | 3214 | 212 | 4358 | 605 | 2740 | 81 | 852 | 2718 | 233 | 822 | 3214 | 212 |
| 3 | 448 | 2144 | 129 | 3340 | 222 | 1766 | 78 | 553 | 1692 | 150 | 448 | 2144 | 129 |
| 4 | 265 | 1609 | 72 | 2740 | 270 | 1179 | 84 | 265 | 1331 | 75 | 265 | 1609 | 72 |
| 5 | 139 | 1570 | 45 | 2536 | 544 | 979 | 183 | 135 | 1274 | 48 | 139 | 1570 | 45 |
| PV of costs for 5-year period[d] | 2141 | 13,320 | 693 | 17,741 | 3307 | 10,390 | 1112 | 2275 | 11,726 | 736 | 2141 | 13,320 | 693 |
| PV of annual costs per immigrant[e] | 853 | 5307 | 276 | 7068 (33) | 1318 (55) | 4139 (−22) | 443 (61) | 906 (6) | 4672 (−12) | 293 (6) | 853 (0) | 5307 (0) | 276 (0) |
| PV of total annual costs per immigrant[f] | | 6436 | | 7068 (10) | | 5900 (−8) | | | 5871 (−9) | | | 6436 (0) | |
| PV of annual earnings per immigrant[g] | | 13,889 | | 11,300 (−19) | | 15,923 (15) | | | 16,859 (21) | | | 13,889 (0) | |
| Benefit net of cost[h] | | 7453 | | 4232 | | 10,023 | | | 10,988 | | | 5986 | |
| Change in benefit net of cost[i] | | | | −3221 (−43) | | 2570 (34) | | | 3535 (47) | | | −1467 (−20) | |
| Expected present value | | 5121 | | 3047 (−40) | | 7638 (49) | | | 6340 (24) | | | 5124 (0) | |

Costs and wages are in July 1995 prices (NIS).
[a] No. of trainees during 4 quarters * transfer payments per individual per quarter. Zero for the No Training policy.
[b] No. of unemployed during 4 quarters * transfer payments per individual per quarter.
[c] No. of new trainees during 4 quarters * direct cost per trainee. Zero for the No Training policy.
Transfer payments per individual is 1450 NIS per month or 4350 NIS per quarter, assuming that each trainee receives payment for 6 months. Direct training cost per trainee is 2992 NIS for the entire training course. Costs are based on Yonatan Eyal, "The Effect of Vocational Training on Unemployment Duration" (see footnote a).
[d] Thousands.
[e] Cost for 5 years/no. of immigrants (502)/no. of years (5).
[f] Transfer payments to trainees and unemployed + direct training cost.
[g] Present value over 20 quarters of (no. of workers * hourly wage)/no. of immigrants (502)/no. of years (5) * no. of hours per quarter (500). The hourly wage in the wage subsidy policy does not include the subsidy.
[h] PV of annual earnings per immigrant − PV of total annual costs per immigrant − cost of subsidy (for the wage subsidy policy only).
[i] Relative to the benchmark. In policy D, the cost is of the subsidy.
Percentage change relative to the benchmark appears in parentheses.

appropriate subsidy for each WC worker hired.[44] Specifically, we look for a "fixed-wage subsidy per hour" for all immigrants in white-collar jobs for five years that equates the present value of potential benefits due to policy C to the present value of the costs (including the subsidy). The present value of the benefit is equal to the present value of additional wages relative to the benchmark. Since these benefits are uncertain, we discount the figures by 15% (annually) in order to capture the risk involved with it. The present value of the cost of this policy includes the change in training and unemployment costs, as discussed above, as well as the present value of the cost of the subsidy calculated for a period of five years. The costs of policy D include the cost of training and unemployment benefits plus the expenditure on the employee' subsidy during the first 2 years.

The impact of policy A, according to which no training is offered, on unemployment and employment among female immigrants in WC jobs after five years in Israel is substantial (Table 11). Policy B, which makes training available with a probability of one, would increase participation in training by 60% (from 252 to 402 females), with most of the increase during the first year. Since training increases job-offer probabilities in both types of occupations, this type of intervention has a positive effect on employment in general and on employment in WC jobs in particular. After five years in Israel, unemployment would decline from 17.1% (in the benchmark economy) to 12.8% and the share of those employed in WC jobs would increase by 5.4%. Meanwhile, the proportion of those employed in BC jobs would decrease by almost 3%.

The effect of policy C one year after its adoption would be a substantial increase in white-collar employment, and a decrease in unemployment. However, this policy also lowers blue-collar employment (Table 11). After a period of five years, the share of female immigrants employed in WC jobs increases to 50%, while unemployment declines to 13.4% and employment in BC jobs declines to 36.7%. Participation in training increases only slightly by less than one percent (16 immigrants). Note that policy C has almost the same effect as policy B on unemployment, but has a much larger effect on the proportion of female immigrants working in WC jobs. Policy D has no effect on the choice distribution of the immigrants and therefore has no effect on employment in WC jobs. The reason this policy is ineffective in this regard is that immigrants prefer WC jobs even in the absence of a wage subsidy and the main reason they are not employed in WC jobs is the low offer probability (low availability) of these jobs.

Policy A has a small negative effect on wages in WC jobs after 20 quarters, but has no effect on wages in BC jobs (Table 12), while policy B has a large positive effect on accepted wages in white-collar jobs and almost no effect on accepted wages in blue-collar jobs. There are two sources for the increase in WC wages: First, immigrants who participated in training and find a WC job earn more due to the high wage-return to training in WC jobs. Second, immigrants who work in WC jobs accumulate more experience in WC jobs and enjoy the high return to this specific type of experience. The wage increase is about 2.3–3.3 NIS which represents an increase of 13.5% to 16.3% relative to the benchmark economy, depending on time since arrival. Since the return to training and to BC experience in BC jobs is almost zero, this intervention has no significant effect on accepted wages in BC jobs.

Policy C has no effect on the mean accepted wage in either BC or WC jobs. This policy accelerates the accumulation of WC experience, which has a positive effect on wages in WC jobs. However, more immigrants with less skills (education) will then be employed in WC jobs. This selection process implies a negative effect that offsets most of the positive effect of increased WC experience on wages in WC jobs. Policy D has no effect on labor market outcomes or wages (Table 12). As such, this policy consists of a pure transfer of income to immigrants in WC jobs during the first two years in Israel, without having any real impact on the economy.

The individual and social benefit from the various policies are reported in the lower part of Table 13. The elimination of training programs (policy A) is predicted to reduce annual output per immigrant by 19% due to the reduction in WC employment and the increase in unemployment. Free access to training (policy B) increases average yearly earnings per immigrant by about 15%. This is about double the estimated return to a year of schooling for native Israelis (see Eckstein and Weiss, 2004). The average duration of training is about six months and the cost is lower than standard schooling. Hence, it appears that the model predicts a very high social return to training programs, assuming that the increase in earnings reflects an increase in marginal product and therefore is proportional to the increase in output.[45] Overall, the gain from free access to training in comparison to no training implies an annual earnings growth of 34 (=15 + 19)%.

The large reduction (40%) in the welfare of female immigrants as a result of canceling training programs (policy A) and the large increase (49%) in welfare from free training (policy B) demonstrate the substantial average gain from training (Table 13). However, this gain varies widely within the sample. The largest gain is obtained among older and less-educated females who moved from unemployment to employment due to their participation in training. The fact that the older females in the benchmark economy had a very low rate of training offers created a large potential gain as a result of training becoming available with a probability of one. This result suggests that interventionist policies have a larger impact on extensive margins (unemployment to employment), than on intensive margins (an increased rate of WC jobs).

Policy C implies a predicted annual increase in earnings per female immigrant of about 21%, which constitutes a high social return for this policy, though it is lower than that for the case of free training. The private gain from policy C (24%) is also lower than that obtained from free training and is very close to the increase in earnings. The main advantage of training expansion (policy B), relative to policy C, is that training directly affects both employment and wages (productivity), while policy C affects only employment in WC jobs, and its effect on wages is only secondary through the accumulation of WC experience. Policy D results in neither social nor private gain and even though money has been transferred, only a small fraction of the female immigrants are recipients.

Based on figures from Eyal (2005), the per immigrant present value of total annual cost of transfers to trainees, unemployment benefits and direct training costs in the benchmark economy is 6436 NIS in 1995 prices. Policy A (no training) increases these costs by 10%; Policy B (free training) lowers them by 8%; and Policy C (doubling WC job offers) lowers them by 9%. The subsidization of WC employees (policy D) has no effect on participation in training

[44] We assume that this policy would not affect native Israeli workers in WC jobs. In other words, employers would not substitute natives with immigrants, but rather would increase the total number of employees in WC jobs. This assumption is consistent with a CRS production function, the existence of which is supported by various papers on recent immigration to Israel (such as Cohen and Hsieh, 2001; Eckstein and Weiss, 2002, 2004; Cohen-Goldner and Paserman, 2006).

[45] When calculating the annual present value of earnings of only employed immigrants, free access to training (policy B) leads to a 3.9% increase in annual earnings while no training (policy A) leads to a 4.2% decrease in annual earnings. Hence, the gain from the implementation of free access to training in comparison to no training is only 8.1% (as compared to 34% in Table 13). This implies that the main source for the large social gain we report above is the effect of training on unemployment (Table 11) and not,as conventionally assumed, through its effect on wages.

and unemployment and therefore does not affect these costs. As discussed above, the benefit from each policy is measured by the average increase in annual wages while the change in net benefit relative to the benchmark economy is equal to the change in benefit minus the change in costs. The net benefit of the no training policy is negative while the return to training provided in the benchmark economy is 43% under our assumptions. Free training is estimated to increase net benefit by 34%. The policy in which the WC job offer rate is doubled increases the benefit by 47% if one ignores the subsidy that employers receive in order to offer more WC jobs. We calculate the upper bound of the this subsidy by solving for the value that equates the additional benefit to the additional cost, including the subsidy. The result is a subsidy of 5.37 NIS per hour where the hourly wage (see Table 12) in white-collar jobs starts at 15 NIS and increases to about 25 NIS after 20 quarters. Hence, it appears that a subsidy of 5.37 NIS might substantially increase the potential number of job offers for immigrants and that this policy is potentially feasible with a positive social rate of return.

## 6. Verification of the model: Out-of-sample predictions

We attempt to verify the model using data from four additional sources (see Table A.2)[46]: (i) the full employment survey that is used for the above estimation of the model (502 immigrants); (ii) the partial employment survey that includes 235 females from the full employment survey for whom the sample period was extended to ten years based on a third interview (during 2001–2002); (iii) the 'Engineers Survey' that includes 304 female immigrants from the FSU who arrived during the period 1989–1994 and reported that they held an engineering diploma from the FSU (These immigrants were first interviewed in 1995 and then again in 2001–2002, such that a retrospective ten-year panel was created); and (iv) the national Labor Force Survey (LFS) which contains annual cross-sectional data on female immigrants who arrived in Israel from the FSU during the period 1989–1992. The summary statistics in Table A.2 show that the various samples share similar demographic (age on arrival, years in Israel, number of children, etc.) and human capital (schooling and Hebrew knowledge) characteristics. Immigrant engineers are the only exception due to the fact that they are older on arrival and have more years of schooling.

### 6.1. Continuation predictions

The model was estimated using a sample of 502 immigrants who were tracked for up to five years (20 quarters) in Israel. The partial employment survey of 2001–2 provides an exceptional opportunity to study the dynamics of immigrant assimilation and transition in the labor market over a period of ten years on a quarterly basis and to compare those patterns to the predictions of the estimated model.[47] In order to provide predictions of labor market states from the 6th to the 10th years following arrival, we first must solve the model for 10 years, and therefore modify the estimated terminal value at the 21st quarter (Eq. (13)) in order to produce the terminal value at the 41st quarter in Israel. In other words, we seek an approximation for the terminal value after ten years in Israel that is consistent with the requirement that the terminal value decrease to zero as the individual approaches retirement at age 65. Our approximation adjusts the estimated coefficients of the linear estimated terminal value at the 21st quarter, such that each coefficient reaches a value of zero at the age of retirement.[48]

Fig. 4 presents the actual and predicted labor market states for the ten-year period based on the partial employment sample of 235 immigrants. The predicted states are the result of a conditional one-step ahead forecast based on the estimated parameters and the approximated terminal value at the 41st quarter. The model accurately reproduces both the trends and levels of actual employment by type of occupation, unemployment and training for the entire ten-year period. The fit for the first five years in Israel is as good as that of the estimated model within the sample period, as can be seen from Table 6. The most striking result is that the continuation predictions accurately recreate the dramatic stability in occupational employment and unemployment that characterizes the data starting from the 21st quarter in Israel.

The data shows that the transition to a new labor market takes about five years of adjustment and following that immigrants on average reach a relatively stable distribution across labor market states. These transitions are accurately predicted by our estimated dynamic model based only on the first 5 years since arrival. Thus, the out-of-sample prediction result provides strong verification for our framework of analysis and for the estimated parameters.

### 6.2. Aggregate trends

Table 14 compares the annual aggregate data from the LFS to the unconditional prediction of the estimated model for a ten-year period, using all 502 observations of the employment sample.[49] The model accurately predicts both the level and trend of white-collar employment up to the 5th year following arrival. The trend in unemployment is accurately predicted for the entire ten-year period. Furthermore, the model predicts the reduction in blue-collar employment after 7 years in Israel. However, there are some significant deviations from the actual levels of WC and BC employment during the second five-year period in Israel.

It should be noted that the model abstracts from aggregate macro changes in the Israeli economy that affect individuals in the nationally-based LFS sample. However, the model does capture the trends due to the individual's transitions in the new labor market as they are reflected in the aggregate data.[50] The good out-of-sample fit of the model to the trends in the cross-sectional data provides additional verification of the empirical model as a good approximation of the immigrant's dynamic choice problem.

46 Todd and Wolpin (2006) proposed the idea of model verification in studies that attempt to evaluate social policies. They estimated the model using only the data from a control group and treatment group for the period before treatment. They verified the model by using the predictions of the estimated model for the treated sample after treatment was implemented. Their method provides a direct verification of the interventionist policy.

47 Studies of labor market performance and mobility for the case of immigrants in the US usually use two (or more) consecutive censuses. Using this type of data, one can observe the labor market choices of a certain cohort after ten years in the new country, but it is not possible to study the transitions between these two points in time, nor can any conclusions be drawn regarding the assimilation path between these points.

48 Specifically, if the estimated coefficient of a certain attribute (see Table A.1) is $\nu$ for the effect of a particular state variable after 21 quarters (5 years) in the terminal value equation, this coefficient 'depreciates' over time and therefore its value for individual $i$ after 10 years in Israel is given by $\nu - (\nu/(65 - (AGE_i + 5))) \times 5$, where $AGE_i$ is age on arrival for immigrant $i$. For example, in the estimated model, training incremented the terminal value by 1400 NIS ($\delta_4 = 1400$; see Table A.1). Consider an immigrant who was 40-years old on arrival, after spending 21 quarters (5 years) in Israel. The estimated $\delta_4$ reflects the contribution of her participation in training over the next 20 years, from age 45 until retirement (age 65). Assuming this contribution depreciates in a linear manner, this contribution decreases by 70 *NIS* ($=1400/(65 - (40 + 5))$) for every year closer to retirement. Therefore, the (future) contribution of training after 41 quarters (10 years) in Israel, when the immigrant is 15 years prior to retirement, is 1050 *NIS* ($=1400 - 70 \times 5$).

49 The unconditional prediction is based only on the state variables at the time of arrival in Israel.

50 In 1995, the LFS changed its definitions of unemployment and participation which might also affect our comparison.

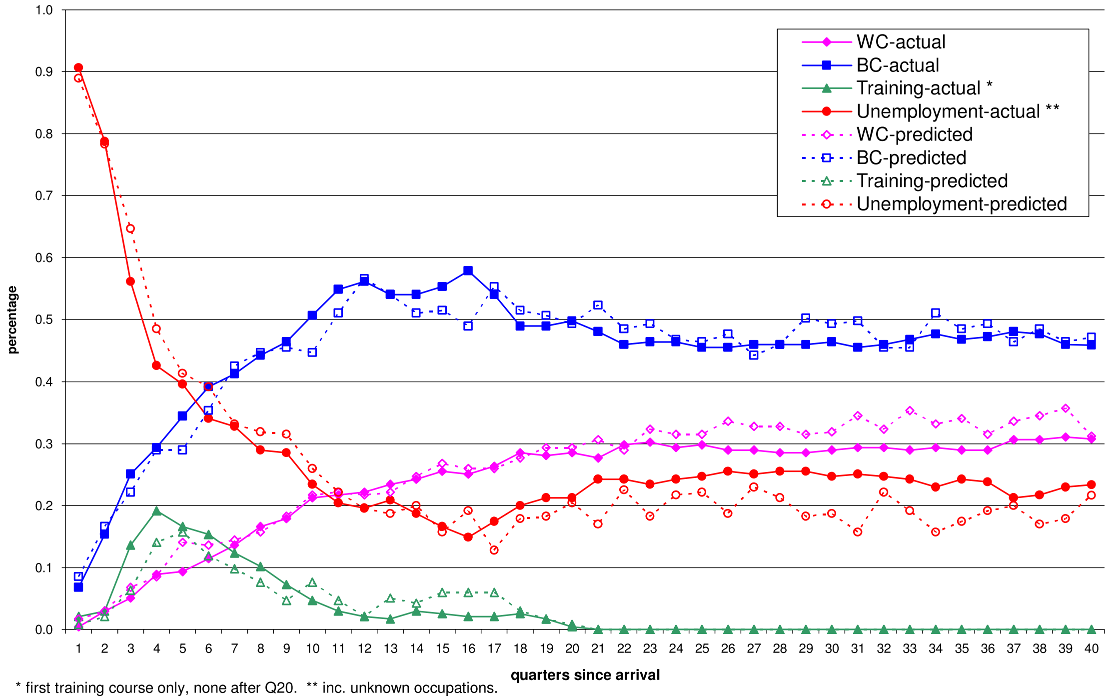


**Fig. 4.** Actual and predicted labor market outcomes during the ten-year period since arrival (by quarter) — partial employment survey (235 obs.).

**Table 14**
Actual and predicted labor market outcomes during the ten-year period since arrival — Comparison between the labor force survey[51] and the unconditional prediction of the Model[52].

| Years since arrival | Number of observations | WC LFS | WC predicted | BC LFS | BC predicted | UE LFS[a] | UE predicted[b] |
|---|---|---|---|---|---|---|---|
| 1 | 283 | 0.0459 | 0.0438 | 0.3180 | 0.2082 | 0.6360 | 0.7480 |
| 2 | 1567 | 0.1072 | 0.1445 | 0.4352 | 0.3476 | 0.4576 | 0.5080 |
| 3 | 1666 | 0.1885 | 0.2206 | 0.5384 | 0.4358 | 0.2731 | 0.3437 |
| 4 | 1797 | 0.2454 | 0.2749 | 0.5799 | 0.4801 | 0.1747 | 0.2450 |
| 5 | 1761 | 0.2873 | 0.3292 | 0.5980 | 0.4711 | 0.1147 | 0.1997 |
| 6 | 1837 | 0.2629 | 0.3615 | 0.6570 | 0.4935 | 0.0800 | 0.1449 |
| 7 | 1897 | 0.2683 | 0.3860 | 0.6447 | 0.4995 | 0.0870 | 0.1146 |
| 8 | 1827 | 0.3060 | 0.4109 | 0.6185 | 0.4836 | 0.0755 | 0.1056 |
| 9 | 1704 | 0.3322 | 0.4427 | 0.5951 | 0.4438 | 0.0728 | 0.1136 |
| 10 | 1717 | 0.3279 | 0.4736 | 0.5807 | 0.4447 | 0.0914 | 0.0817 |

[a] Including unknown occupations.
[b] Including training.

### 6.3. *Highly-skilled immigrants*

The Engineers Survey provides an additional opportunity to verify the model's predictions using a ten-year quarterly panel of highly-skilled immigrants. Engineers have an average of 16 years of schooling (and almost all have more than 14 years of schooling; see Table A.2). This survey of 304 female immigrant engineers was not used in the estimation and contains almost all the data (on a quarterly basis) required in order to produce unconditional predictions for each individual in the sample for a ten-year period.

Table 15 summarizes the data and the unconditional simulated prediction of the model for the sample on an annual basis (the annual figures are obtained by averaging over 4 quarters). The model predicts with relative accuracy the observed patterns of WC and BC employment, as well as none-employment (including training). The fit for the first five years is much better that that of the second five years in terms of the level and trends in the data. The model underpredicts unemployment and BC employment and overpredicts WC employment from the 5th to the 10th year in Israel, though it accurately predicts the observed decrease in BC employment after the 5th year in Israel.

The model predicts that 171 female immigrant engineers will participate in training as compared to only 116 who actually reported participating in training.[53] Overall, the sample of 304 immigrants in the Engineers Survey contains lower quality labor state outcomes than those predicted. One plausible explanation is that this particular sample represents a sub-sample with a high reservation wage for BC employment. The main observation that supports this claim is the very high rate of un(non)employment of more than 20% from the 4'th to the 10'th years in Israel. In addition, the actual number of trainees is lower than predicted and is also lower than that in the full employment sample. In addition,

51 Based on annual cross-sectional data from the national Labor Force Survey during the period 1989–2002. Females were chosen according to the following criteria: migrated from the former USSR, aged 24–60, arrived in Israel during 1989–1992 and participant in the labor force.

52 Based on the initial conditions of the full Employment Survey (502 observations).

53 The data on training participation in the Engineers Survey was only collected in the 2001–2 survey. Thus, we suspect that the participation in training is underreported due to the 10-year lag in collecting the data. This could be one important reason for the overprediction of participation in training.

**Table 15**
Actual and predicted[54] labor market outcomes during the ten-year period since arrival — Engineers survey.

| Years since arrival | Number of observations | WC data | WC predicted | BC data | BC predicted | UE data[a] | UE predicted[b] |
|---|---|---|---|---|---|---|---|
| 1 | 304 | 0.0436 | 0.0650 | 0.2294 | 0.2122 | 0.7270 | 0.7229 |
| 2 | 304 | 0.1637 | 0.1941 | 0.4679 | 0.3701 | 0.3684 | 0.4359 |
| 3 | 304 | 0.2237 | 0.2887 | 0.5079 | 0.4310 | 0.2684 | 0.2804 |
| 4 | 304 | 0.2569 | 0.3470 | 0.5047 | 0.4112 | 0.2385 | 0.2418 |
| 5 | 304 | 0.2851 | 0.4219 | 0.5049 | 0.4013 | 0.2100 | 0.1768 |
| 6 | 304 | 0.3007 | 0.4770 | 0.4729 | 0.4054 | 0.2264 | 0.1176 |
| 7 | 304 | 0.3273 | 0.5008 | 0.4633 | 0.3627 | 0.2094 | 0.1365 |
| 8 | 286 | 0.3517 | 0.5444 | 0.4252 | 0.3545 | 0.2231 | 0.1012 |
| 9 | 249 | 0.3631 | 0.5880 | 0.4074 | 0.3281 | 0.2294 | 0.0839 |
| 10 | 209 | 0.3789 | 0.5864 | 0.4063 | 0.3100 | 0.2148 | 0.1036 |

[a] Including unknown occupations and training.
[b] Including training.

it should be noted that the model abstracts from macro effects, such as the slowdown in the growth of the Israeli labor market during the relevant period (1996–2000) relative to 1990–95 and the aggregate increase in unemployment.

## 7. Conclusions

The dynamic choice model presented here extends previous models in several directions: (i) It enables training to be modeled not only as a conventional human capital investment decision, but also as a form of job search since it affects the arrival rate of job offers. (ii) It allows training to also affect non-participants since their labor supply decision takes into account the *option* to participate in training. (iii) Models that evaluate training tend to value labor supply in the non-market sector at a zero wage. Individuals, on the other hand, view their labor supply in the non-market sector as their reservation wage. The dynamic choice model presented here evaluates training from the individual's perspective. (iv) As indicated in Heckman et al. (1999), most previous models did not include employment history variables as explanatory variables in the participation decision. However, several studies suggest that previous labor force status, and the changes in that status, affect participation in training.[55] In our model, the decisions to work and participate in training are made simultaneously. Hence, the decision to participate in training is affected by the immigrant's past activities and by current and expected future employment opportunities. Previous activity is, therefore, endogenous rather than exogenous in our model. (v) While the estimation of the return to various types of human capital in a Mincerian wage regression treats human capital as exogenous, estimation of the offered wage as part of a dynamic choice model allows it to be endogenously determined by the individual and to affect her wage growth. The dynamic selectivity is, therefore, embedded in the model and wage growth in this framework can be viewed as an outcome of the individual's choices.

Both the qualitative and quantitative results of this paper are similar to those obtained by Cohen and Eckstein (2008) for male immigrants. They used a similar model and method of estimation, though a different specification. The similarity of the findings regarding the rates of return to training is an indication of the robustness of the findings and of their importance. The main conclusion of these studies is that training is valuable for all immigrants but is more so for older and less-skilled workers since it provides them with the option to leave unemployment for a potentially better job. This result holds despite the fact that training has no impact on wages in blue-collar jobs and despite the high rental value in white-collar jobs. Hence, the job search aspects of training programs should receive more emphasis.

The study of the individual and social benefit from government-provided training assumes that it affects the mean accepted wage through offered wages and employment probability. However, as in the case of investment in schooling, training may serve as a signal to employers. The possibility that a part of the gain from training is in the form of a signal of worker quality has not yet been studied and awaits empirical investigation.

**Table A.1**
Estimated parameters.

| | |
|---|---|
| *Training Offer Probability parameters* | |
| $pt_1$ (if age on arrival $< 40$) | 0.1361 (0.0105) |
| $pt_2$ (if age on arrival $\geq 40$) | 0.0575 (0.0072) |
| *Terminal value parameters* | |
| $\delta_1$ — accumulated WC experience | 633.335 (3.149) |
| $\delta_2$ — accumulated BC experience | 520.462 (3.14) |
| $\delta_3$ — age on arrival | −65.138 (3.152) |
| $\delta_4$ — training | 1399.968 (3.162) |
| $\delta_5$ — constant | 1426.68 (3.162) |
| $\delta_6$ — worked in WC during the previous period | 379.179 (3.163) |
| $\delta_7$ — worked in BC during the previous period | −0.093 (3.154) |
| $\delta_8$ — years of schooling | 150 (3.132) |
| $\delta_9$ — number of children | 100.064 (3.162) |
| $\delta_{10}$ — married | 99.979 (3.162) |
| $\delta_{11}$ — worked in WC in USSR | 99.362 (3.164) |
| $\delta_{12}$ — Hebrew | 35.982 (3.162) |
| *Utility parameters* | |
| Children — employment | −29.512 (0.0898) |
| Marriage — employment | 124.96 (3.1551) |
| Constant — training | −15.955 (3.161) |
| Children — training | −2.762 (3.155) |
| Marriage — training | −12.62 (3.1591) |
| Constant — unemployment | −591.648 (3.162) |
| Children — unemployment | −1.361 (3.1594) |
| Marriage — unemployment | 40.462 (3.1613) |
| *Cholesky decomposition parameters* | |
| $\sigma_{11}$ | 0.286 |
| $\sigma_{22}$ | 0.150 |
| $\sigma_{33}$ | 0.051 |
| $\sigma_{44}$ | 9.883 |
| $\mathrm{Cov}_{34}$ | −0.476 |

Standard errors appear in parentheses.

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54 Unconditional prediction based on the initial conditions of the Engineers Survey (304 observations.).

55 For example, Card and Sullivan (1988) observe that trainees employment rates decline prior to entering training. Heckman and Smith (1999) found that unemployment is a powerful predictor of participation and that people who recently changed their labor force status have the highest probability of participating.

**Table A.2**
Summary statistics for the four samples (Section 6).[f]

| Variables | Full employment survey[a] | | | Partial employment survey[b] | | | Engineers survey[c] | | | LFS[d] |
|---|---|---|---|---|---|---|---|---|---|---|
| | All | Trained | Not trained | All | Trained | Not trained | All | Trained | Not trained | All |
| Number of observations | 502 | 263 | 239 | 235 | 141 | 94 | 304 | 116 | 188 | 17,772 |
| Age on arrival | 37.21 | 35.59 | 38.99 | 38.09 | 36.11 | 41.07 | 41.3 | 39.77 | 42.24 | 34.14 |
| | (8.5) | (7.7) | (8.9) | (8.1) | (8) | (7.3) | (8.6) | (8) | (8.8) | (9.2) |
| Years of Schooling | 14.47 | 15.16 | 13.72 | 14.69 | 15.23 | 13.89 | 16.04 | 15.93 | 16.11 | 14.3 |
| | (2.4) | (2.1) | (2.4) | (2.4) | (2.1) | (2.5) | (1.4) | (1.4) | (1.4) | (2.6) |
| Number of children | 1.05 | 1.11 | 0.99 | 1.08 | 1.11 | 1.03 | | | | |
| | (0.8) | (0.8) | (0.9) | (0.8) | (0.8) | (0.9) | | | | |
| Knew Hebrew before immigrating | 15.7% | 20.2% | 10.9% | 17.4% | 21.3% | 11.7% | | | | |
| Employed in WC in the FSU | 75.7% | 84.0% | 66.5% | 78.3% | 87.2% | 64.9% | 98.7% | 99.1% | 98.4% | |
| Married | 76.5% | 76.8% | 76.2% | 79.6% | 78.7% | 80.9% | 75.7% | 77.6% | 74.5% | 76.8% |
| Hebrew fluency index — first survey[e] | 2.99 | 3.29 | 2.66 | 2.99 | 3.22 | 2.64 | | | | |
| | (0.8) | (0.6) | (0.8) | (0.7) | (0.7) | (0.7) | | | | |
| Hebrew fluency index — second survey | 3.3 | 3.56 | 2.95 | 3.25 | 3.5 | 2.88 | 3.24 | 3.44 | 3.12 | |
| | (0.8) | (0.5) | (0.9) | (0.7) | (0.6) | (0.8) | (0.7) | (0.6) | (0.8) | |

[a] The sample used for estimation (see Section 2).
[b] Includes 235 females from the full employment survey who were re-sampled in 2001–2002.
[c] Includes 304 females who were sampled in 1995 and re-sampled in 2001–2002 (see Section 6).
[d] Based on annual cross-sectional data from the national Labor Force Survey during the period 1989–2002. 17,772 females were chosen according to the following criteria: immigrated from the former USSR, aged 24–60, arrived in Israel during 1989–1992, participated in the labor force and resided in Israel for up to 11 years.
[e] 1 — lowest, 4 — highest.
[f] Standard deviations appear in parentheses.

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## Appendix

See Tables A.1 and A.2.

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