Residential Location, Work Location, and Labor Market Outcomes of Immigrants in Israel*

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1 Introduction

Internal migration and immigration are two important mechanisms by which market economies adjust to changing economic conditions and achieve optimal allocation of resources. An influx of new workers to a particular region, be they new immigrants or internal migrants, can help equilibrate the labor market and improve the interregional allocation of resources. Perhaps due to friction that prevents the free flow of labor, national policies aimed at facilitating the arrival of new workers to different regions of a country are now widespread. Governments often subsidize the relocation expenses of internal migrants, subsidize mortgages, and help create employment exchanges that advertise job openings nationally. This was always the goal of the Israeli government. Specifically, the Israeli government has contemplated and implemented several policies that aimed at creating incentives for individuals to move to the northern and southern parts of Israel (the Galilee and the Negev, respectively). Most policies were not overly successful in achieving this stated goal, but it was argued that the reason for this general failure is the strong attachment that native Israelis have to their place of residence. By contrast, new immigrants are expected to be more responsive to such policies.

The purpose of this paper is to empirically examine the effect of a few alternative national migration policies on the regional location choices and labor market outcomes of migrant workers. We use data on a group of individuals who started arriving in Israel in large numbers from the former Soviet Union (USSR) toward the end of 1989. These new immigrants were allowed to freely choose their first locations of residence. Government housing policy presumably influenced these first location choices, as well as subsequent relocation choices, by substantially changing the regional housing cost structure.[1]

The Israeli government altered relative housing costs across regions of the country through both supply and demand interventions. On the housing demand side, the government provided direct grants to new immigrants to help cover rental costs and provided subsidized mortgages to encourage immigrants to purchase their own homes. The extent of benefits and subsidies depended on, among other things, the region of residence chosen by the immigrants. On the housing supply side, the government helped fund private firms that developed land for housing, and provided purchase guarantees. The government committed itself to purchasing new housing units that were built for new immigrants and remained unsold. These guarantees substantially reduced the risk of building new housing units outside the center of the country.

The government's intervention in the housing market, like many other types of migration policies, intended to improve upon the existing distribution of firms and workers across regions of the country. However, by altering the prior market balance between wages and housing costs, the government may have attracted immigrants to regions in which their lifetime earnings were, in

[1] Most new immigrants to Israel who arrived before the late 1980s were not free to choose their initial locations of residence but were rather placed, by the government, in absorption centers around the country and, later on, in specific towns where housing units were built for them.

fact, lower. While it may very well be the case that the artificially low housing prices may have benefitted immigrants, lower earnings in regions where housing prices were lower suggest that the government intervention may have distorted the allocation of labor resources. These distortions are above and beyond the usual distortions created by the need to finance government activities. It is therefore important to be able to assess the magnitude of the changes in lifetime utility for the purpose of calculating the overall social profitability of the program.

In order to infer the impact of the housing market intervention on regional location choices and labor market outcomes, we develop and estimate a dynamic programing (DP) discrete choice model of residential and work location decisions and labor market outcomes. We use longitudinal data on males who arrived in Israel during the period from 1989 to 1995. The model assumes that the immigrants make optimal choices, upon arrival and semi-annually thereafter, regarding: (a) the geographical region in which to live; (b) the geographical region in which to work; and (c) employment status. The choice set contains seven broadly defined regions, which cover all of Israel, namely: Tel Aviv, the Sharon, the Shfela, Haifa, the Galilee, the Negev and Jerusalem. The employment options in each location are non-employment, employment in a blue-collar occupation (or sector) and employment in a white-collar occupation.

The model of location choice developed here does not constrain work opportunities to be only in the regional labor market in which one resides. In fact, immigrants may choose to accept employment in one region while residing in another. However, when one resides in one location and works in another, a cost of commuting is incurred. The commuting cost is an additional key policy parameter, along with the cost of housing. To a certain degree, transportation policies that alter the cost of commuting provide alternative ways of affecting the distribution of workers over residential and employment locations. For example, the privatization of public transport could lead to decreased commuting costs in the long-run. Direct subsidies by the government could also affect the behavioral choices of the individuals. In addition, there are also non-pecuniary costs that may affect one's decisions.

The model accounts for several important factors that workers face in the labor market. First, the model takes into account the effects of regional amenities, differences in overall regional price levels and immigrant network effects. Second, the model incorporates stochastic job offers and job terminations. Third, the model allows the idiosyncratic shocks to wages in each region to be serially correlated. Finally, the model allows for the presence of permanent individual unobserved heterogeneity. The unobserved heterogeneity takes the form of discrete types, or nonparametric discrete individual random effects. That is, individuals are assumed to be of one of three possible types, where each type has, in general, a distinct set of behavioral parameters.

The rich error structure in the model necessitates estimation by simulation. We use a simulated maximum likelihood (SML) algorithm that incorporates classification error rates for discrete outcomes, as well as measurement error densities for continuous data. The estimation method builds on the method proposed in Keane and Sauer (2010) (see also Keane and Wolpin (2001)).

The continuous data includes accepted wages in the chosen work location and housing costs in the chosen residential location. In the estimation we include the regional housing cost function, which depends on individual and family characteristics. We also incorporate regional occupation-specific wage functions. Adding these elements is one of the novel features of the paper. The tight parameterization of decision rules and the nonparametric random effects allow us to correct the estimates of these latter functions for potential biases due to self-selection.

The results of the study indicate that the regions vary considerably in many dimensions, creating different incentives for different types of workers and for individuals who came from different republics in the former USSR. We find that the human capital accumulated before arriving in Israel, in the form of experience, has virtually no effect on the immigrants' wages. The only thing that matters for wages of the new immigrants is their labor history in Israel.

Having specified and estimated the DP model allows us to carefully examine four alternative policies, versions of which were considered by policymakers in the past. These include: (a) wage subsidy to all workers in the Galilee and the Negev of 22.5% of their wages; (b) transportation subsidy of 73.5% to all workers outside the major urban regions of Tel Aviv, Haifa, and Jerusalem; (c) rent subsidy of 100% to all workers residing in the Galilee and the Negev; and (d) lump-sum residential subsidy of 57,000 New Israeli Shekel (NIS) to all individuals who move after arrival in Israel to either the Galilee or the Negev. All simulations are carried out subject to the constraint that they all cost the same, namely 40 million NIS in 1995 prices.

We find that while some of the policy measures are of questionable utility, others are very effective in achieving the stated goals of the Israeli government. In particular, the lump-sum residential subsidy policy seems to be quite effective in creating the right incentives for individuals to fulfill the government goal, namely to move to the Negev and, even more so, to the Galilee. The rental subsidy policy also seems to be effective in achieving this goal, but it is harder to administer. The wage subsidy policy also seems to be providing the right incentives, but it is not as effective as the rental and the lump-sum subsidies. Furthermore, this is the most likely policy to be greatly affected by general equilibrium forces, and it is thus not clear how much of the benefits would go directly to the population of potential migrants. The transportation subsidy policy seems to be completely ineffective in achieving any meaningful goal.

The rest of the paper is organized as follows. In Section 2 we briefly review the relevant literature and put the current paper into context. Section 3 describes the data and provides some preliminary results. Section 4 presents the model, while Section 5 elaborates on the estimation procedures that are used in this study. Section 6 discusses and interprets the estimation results and provides evidence about the model fit. Section 7 is devoted to the examination of the four alternative policy measures discussed above and their effects on location choices and labor market outcomes. Section 8 provides a brief summary and some concluding remarks.

2 Previous Literature

There is a vast literature on the internal migration of native workers in developing and developed countries (see the surveys by Lucas (1998) and Greenwood (1997)). However, there are very few studies that evaluate the effect of government policy on location choices. Kennan and Walker (2011) is a notable exception. There is also very little formal research that studies the connection between immigrant location decisions and subsequent labor market outcomes. This paper, therefore, contributes to the general literature on both internal migration and immigration.

Two relatively recent papers that our study builds on are Ihlanfeldt (1993) and Borjas (2000).[2] Ihlanfeldt (1993) examines the location and labor market outcomes of young Hispanic immigrants in the U.S., finding that young Hispanic immigrants have a higher rate of unemployment than young whites. This is largely because a higher proportion of young Hispanic immigrants live in urban areas, while most low-skill jobs are located in non-urban areas. Specifically, he finds that there is a substantial mismatch between residential locations and job opportunities.

Borjas (2000) focuses on the role immigration plays in equilibrating labor markets across geographical locations. He argues that mobility among native workers may not be sufficient to eliminate wage differentials because native workers have relatively high migration costs that prevent them from moving quickly to areas that offer the best economic opportunities (see also Topel (1986) and Blanchard and Katz (1992)). Immigrants, on the other hand, do not incur substantial additional moving costs above and beyond the cost of immigrating to a new country. Therefore, it is easier for immigrants to initially locate in geographical areas that offer the highest wages. Using data from the Current Population Survey, Borjas finds that immigrants do, indeed, make different location decisions than natives and older immigrants. Hence, he finds that the location decisions of new immigrants are relatively more responsive to interstate wage differentials.

Our study is also related to several papers that have analyzed different aspects of the recent mass immigration from the former Soviet Union to Israel. This more specific literature has generally not addressed the importance of geographical location to immigrant and native outcomes (see, e.g., Friedberg (2001), Weiss, Sauer and Gotlibovski (2003) and Eckstein and Cohen-Goldner (2003, 2008)). An exception to this is Gotlibovski (1997) , which finds that the granting of housing subsidies outside of the major urban areas of the country induces highly skilled immigrants to move and leads to more unemployment and lower wages. We extend Gotlibovski's model in many ways. First Gotlibovski's model is static, and thus is unable to capture some of the key features observed in the data. The model developed here is dynamic. Second, the data used in his study provide information only about the first residential choices of the new immigrants, while our data provide information about the sequential decision-making of the immigrants. Finally, in Gotlibovski's model there is no distinction between the residential location and the work location because that study divided the country into only two general areas.

[2] For other aspects regarding immigrants, see also Borjas (2005 and 2006).

In the spirit of Kennan and Walker (2011), our model builds on Gotlibovski's previous research by: (a) disaggregating the choice set into more than two regions; (b) taking into account the influence of unobserved regional amenities; (c) taking into account unobserved individual effects; and (d) allowing inter-regional commuting. The current study also incorporates data on individual housing costs and subsequent location choices.

3 The Data and Preliminary Examination

The data used in this study are drawn from the population of immigrants that declared, upon arrival at the airport in Israel, that they trained and worked as engineers in the former Soviet Union. According to this self-definition of the source country profession, close to one out of every five immigrants who arrived from the Soviet Union between October 1989 and December 1993 was an engineer. The total number of Soviet engineers that arrived during this time period is $57,400$. This is a large number, especially relative to the existing number of native engineers in Israel immediately prior to October 1989, which was $30,200$.

A survey of engineers in Israel from the former Soviet Union was conducted by the Brookdale Institute of Jerusalem between the months of June and December of 1995. The interviews were face-to-face and in Russian. A total of $1,432$ male and female immigrants were interviewed. We restrict the analysis here to male engineers between the ages of 25 and 55 at the time of arrival, yielding a sample of 697 immigrants. Female immigrant engineers are excluded to avoid further expanding the model to take into account joint labor supply and fertility decisions. The age restriction avoids also having to model education and retirement decisions.

The survey of engineers is a retrospective survey. At the time of the survey the individuals supplied information about their occupational and educational background in the former Soviet Union, as well as a detailed history of their work experience in Israel since the time of arrival. The survey also supplies information on the immigrant's residential and work locations. Hence, a continuous history of the immigrant's residential location since the time of arrival can be constructed.

It is important to note that we do not make any direct use of the fact that the individuals declared themselves as engineers, but rather take this to mean that they were highly educated. The main goal of this paper is to examine the choice of the residential and work location of the individuals and the pattern of their migration within Israel thereafter. Moreover, we examine a few alternative policy measures that have been considered, and in part implemented, over the years by the Israeli government. It is therefore important for us to use a sample of individuals who are highly educated and therefore may need some governmental intervention for finding suitable jobs. Furthermore, these individuals are less attached to their place of residence and are therefore more likely to respond to policy incentives. For these reasons this sample of engineers is well suited to the goals of this study.

Table 1 displays selected descriptive statistics of the sample used in estimation. The mean monthly earnings at the time of the survey (excluding the non-employed) is $3,740$ NIS. All earnings observations are in 1995, at which time the exchange rate was approximately three NIS per U.S. dollar. The mean monthly housing costs at the time of the survey is about $1,000$ NIS. About 60% of the individuals reported monthly housing costs on their privately owned homes.[3] The mean age of the immigrants upon arrival is about 42 and the mean years of education in the former Soviet Union is 16. Nearly three quarters of the immigrants originate from the republics of Ukraine, Belarus and Russia. Note also that about 40% of the immigrants in the sample came in 1990, so we have about 10 six-month periods (semesters) of data for them.

Table 2a displays the region of residence choice distribution over the first 11 six-month periods since arrival.[4] The figures show that in the first period in Israel, there is considerable regional dispersion. Half of the new immigrants are initially located in Tel Aviv and the adjacent regions of the Sharon and the Shfela. The Shfela contains the largest proportion of new immigrants, while Jerusalem contains the smallest. The table indicates that there is a relatively sharp fall in the proportion of immigrants residing in Tel Aviv over time because the housing costs in Tel Aviv are larger than in other regions. In contrast, there is a moderate increase in the proportion residing in the Shfela (located south of Tel Aviv) and a more rapid increase in the proportion of individuals residing in the Galilee. The proportion in the other regions is roughly constant over time. By period 11, i.e., five and a half years since arrival in Israel, slightly more than half the sample resides outside of the three regions centered around Tel Aviv (i.e., Tel Aviv, the Sharon, and the Shfela).

Table 2b displays the employment status choice distribution over the first 11 periods since arrival.[5] Note that the non-employment rate drops sharply from 76.5% in the first period to 9% in period 11. Employment in blue-collar occupations rises from 21.1% in period 1 to 66.8% in period 3 and then declines steadily to about 54% by period 11. The proportion employed in white-collar occupations increases monotonically from 2.4% in period 1 to 36.7% in period 11. These patterns illustrate the main features of the labor market assimilation of the immigrants from the former USSR in Israel described in Weiss, Sauer and Gotlibovski (2003). Occupational downgrading, relative to that in the former Soviet Union, is followed by a gradual absorption of immigrants back into white-collar occupations.

Table 2c displays the distribution of employment status by region of residence averaged over all periods as well as for some selected periods. The table shows that the non-employment rate is

[3] The monthly housing costs were constructed as follows. For those who reported rent on their housing unit we take that rent as the housing costs. For all individuals who reported paying toward mortgage (which were obtained exclusively from the government), we take that payment to represent the housing costs. There were a few individuals who reported both mortgage payment and rent. For these we take the rent to be the housing costs, because in most cases this happens when the individual bought a housing unit but had not yet moved into it.

[4] The Sharon region contains Hertzeliya and Kfar Saba. The Shfela region contains Ashdod and part of the Gaza strip. The Galilee encompasses a large area stretching from Haifa to the northern border of Israel. The Negev includes Be'er Sheva, Dimona and Eilat. Jerusalem includes Bet Shemesh and the West Bank.

[5] Non-employment includes the unemployed, labor force dropouts and immigrants in training programs. White-collar employment includes immigrants employed as engineers or in other scientific/academic occupations, in addition to government officials. Blue-collar employment includes those employed as technical workers, teachers, nurses, artists and all others.

higher outside of the center of the country (Haifa, the Galilee, the Negev and Jerusalem), being the highest in Haifa. On the other hand, employment in white-collar occupations is most frequent in the Negev, primarily due to the presence of Ben Gurion University and the concentration of hi-tech plants in the desert region. This seems to create a trade-off between the quality of job one can get and the likelihood of losing one's job. Also, the table indicates that the distributions of employment status vary dramatically across time. For example, the non-employment rate in Haifa was close to 36% in the second semester, but declined to about 9% by semester 11. The decline in Jerusalem and the Negev was not as sharp, although the non-employment rates in these two regions were cut by more than half.

The survey records employment location for all individuals who work in the white-collar occupations.[6] Table 3 displays the extent of interregional commuting for these individuals. The information provided on commuting outcomes is conditional on employment status, residential location, and job location. This introduces another layer of sample selection that our model takes into account. We do so by modeling the simultaneous decisions made by the individuals regarding the employment status, the region of residence, and the region of work in each period. Not surprisingly, Table 3 reveals that the propensity to commute decreases with increasing average distance between regions. For example, individuals who live in the Sharon region are more likely to commute north to Haifa than are individuals who live in Tel Aviv or in the Shfela. By comparison, individuals who live in the Shfela region are more likely to commute to the Negev and Jerusalem. Immigrants who live in the major urban areas of Tel Aviv, Haifa, Jerusalem and the Negev (largely the city of Be'er Sheva) are less likely to commute out of their immediate region of residence.

Table 4 displays various aspects of the data on total monthly housing costs, which are reported at the time of the survey, using three simple housing costs regressions. The dependent variable in all regressions is the log of total monthly housing costs at the time of the survey. Column (1) of Table 4 indicates that married couples have 15.7% higher housing costs than unmarried individuals (the excluded group). Married couples with one child have 16.7% percent higher housing costs than unmarried individuals, while married couples with two children have 21% percent higher housing costs than the unmarried individuals. Renters, who account for about one-third of the sample, have significantly higher housing costs, by about 36.5%, than immigrants in owner-occupied dwellings. Column (2) of Table 4 adds other regressors to the basic specification: the immigrant's years of education in the former USSR, previous experience in the former USSR (and its square), and a dummy for being at least 40 years old upon arrival in Israel.[7] Note that the coefficient on marital status substantially increases after adding these additional regressors, because the coefficient on marital status in the previous specification was picking up the negative effect of age on housing

[6] Blue-collar workers, it is commonly known, largely work in the region in which they reside. The reason is mainly that wages in the blue-collar sector are generally too low to allow individuals to travel across distant regions.

[7] The added regressors whose coefficients are not reported, for the sake of brevity, include dummy variables for the length of time in the country (i.e., the number of semesters), dummy variables for the republic of origin (Ukraine, Belarus, Russia) and years of education of the spouse.

costs. In general, immigrants who are 40 or older upon arrival have lower housing costs. Also, older immigrants receive relatively generous housing subsidies. The coefficients on the family size and renter dummies are not substantially changed with the addition of other regressors. Surprisingly, there are no significant effects of education and experience on housing costs.

Column (3) of Table 4 adds the dummy variables for region of residence (the excluded region of residence is Tel Aviv). Note that the coefficients on the dummy variables for residing in Haifa, the Galilee and the Negev are all negative, and large in magnitude. The substantially lower housing costs in these regions could be due to amenity differences, greater distance from the cultural center of the country, and the greater extent of government intervention in the housing market in these regions.[8] Note also that the coefficient on the renter dummy variable is substantially reduced. The reason is that most renters are located in Tel Aviv, where renting is a more common phenomenon than in any other region in Israel.

Table 5 displays the results of employment and monthly earnings regressions. The dependent variable in Columns (1), (2) and (3) is a dummy variable for being employed at the time of the survey (in either a blue-collar or white-collar occupation). The results in Column (1) indicate that employment probabilities are not correlated with the level of education, are quadratic in previous experience and are lower for the older immigrants.

The regression whose results are reported in Column (2) adds the other regressors (as in Table 4) besides region of residence dummy variables. The addition of these regressors does not substantially change the results. Column (3) adds region of residence dummy variables. The results indicate that employment probabilities are generally lower outside of Tel Aviv. In particular, employment probabilities are lower in Jerusalem and the Galilee, and even more so in Haifa and the Negev. The coefficients on the regressors not reported reveal that immigrants from the Ukraine have significantly lower employment probabilities.

Columns (4), (5) and (6) of Table 5 report the results of log monthly earnings regressions. The dependent variable in all three columns is the log of monthly earnings reported at the time of the survey. The results in Column (4) reveal that monthly earnings are not strongly correlated with education in the former USSR nor are they correlated with previous experience. This is a common finding in the literature on Soviet immigrants in Israel. Older immigrants, however, do have significantly lower monthly earnings (by about 11 percent). Column (5) adds the other regressors without substantially changing the results except that the earnings penalty for older immigrants is weakened somewhat. Column (6) adds the region of residence dummy variables. The results indicate that overall there are no significant regional wage differentials.[9] The coefficients on the regressors not reported in the table indicate that time in Israel is a strong and significant

[8] The Israeli government has always had incentive for people to migrate into the Galilee and the Negev. To achieve this, the government subsidizes renting and gives enormous tax incentives for potential employers to relocate their businesses into these two regions.

[9] This might simply stem from the fact that the regressions include both white- and blue-collar workers. We therefore distinguish the two types of employment status in the model.

determinant of earnings.[10]

The regression results for the housing costs, employment and earnings functions suggest that region of residence is an important determinant of housing costs and employment probabilities. While housing costs are substantially lower outside the center of the country, so are the employment prospects. Also, region of residence is not a good predictor of the level of earnings, partially because the region of residence need not be the same as the region of employment. Thus, the raw data provide strong evidence of non-trivial interactions between the housing location and labor market outcomes, namely work location and earnings.[11]

Obviously the regression results reported above suffer from biases due to self-selection stemming from various sources, since housing costs, employment status, earnings, and region of residence are all determined simultaneously and are subject to correlated shocks. The model presented below addresses these self-selection problems and hence accounts for these potential biases. The model also facilitates the evaluation of the effect of potential government interventions on optimal location and employment decisions.

4 The Model

4.1 General Equilibrium versus Partial Equilibrium

The model described above is a partial equilibrium model in which housing prices and wages are taken to be exogenous. One may be concerned about the general equilibrium effects that such a large wave of immigration may have on prices, particularly those of housing and wages. The degree of the potential effects depends upon several factors. The most important factor is the size of the immigrant population, which is quite large over the period from 1990 to 1995 and amounts to about 12% of the native population.

As an empirical matter, there are numerous papers that have found little or no effect at all on any prices. To the degree that some effects were found, they were limited in scope to the two very first years: 1990 and 1991. The degree of substitution between natives and immigrants was very low in almost all occupations largely because of the inherent differences in the tasks required in Israel relative to those required in the former USSR. In essence, the Israeli labor market exhibits the structure of a two-tier system in which the labor force of natives was not affected by the large influx of immigrants. This applies especially to the group of highly educated immigrants considered in this study.

Friedberg (2001) documents this in a very convincing manner and finds no adverse impact of the immigrants on the native population outcomes. Research in this area is hardly supportive of

[10] In general, the time in Israel dummy variables can be thought of as instruments for actual work experience because year of arrival in the first few years of the immigration wave is generally thought to be exogenous to potential employment and earnings outcomes in Israel.

[11] Additional features of the raw data are related to transitions between states, i.e., geographical location of housing and work. The timing of transitions is considered in the discussion of the model fit below.

the common belief about the adverse impact that immigrants could have on wages and employment opportunities of the native-born population.[12] One important reason that might explain this fact is that Israel is largely an open economy with free and large movement of labor in and out of Israel, particularly for the new immigrants. This close to perfect integration of the labor market (and generally all product markets) in Israel with the rest of the world is likely to explain why local immigration has small insignificant effects.[13]

Even when there is a decline in wages, it is frequently short-lived since it leads to the accumulation of capital through increased domestic savings and, even more importantly, through international inflows of capital. Razin and Sadka (1995, 2004) argue that the flexible labor market in Israel and the massive influx of capital into Israel are largely responsible for the fact that there were no meaningful observed changes in the wage structure, or employment patterns, among the native Israelis.

Hercowitz and Yashiv (2002) develop a general equilibrium macro model that examines the impact of the mass migration to Israel. They find that there is some marginal effect on the Israeli economy through increased demand for goods, and very little, if any, negative employment effect on native workers.

The results of Eckstein and Weiss (2003) also indicate that the labor market for immigrants and native Israelis was completely segregated and the wage growth for the immigrants was very different from native Israelis. In fact, the wage growth of native Israelis hardly changed after the mass immigration from the former USSR.

As for the housing market, the Israeli government preempted the mass immigration by building numerous temporary housing structures that were able to accommodate the new immigrants. To the extent that there was any effect on the housing price level, it was very short lived.

The best account for the situation in the labor market in Israel during the period of the mass immigration to Israel is given by Weiss (2000), who states:

> Another important lesson is that even a large wave of immigration can be absorbed in the labor market without marked effects on wages or employment of natives. This is a consequence of two related trends, entry of additional capital and gradual entry into high skill occupations, that together kept the aggregate capital labor ratio constant, if labor is correctly measured. Specifically, the estimated individual wage profiles of natives and immigrants can be used to create a quality adjusted labor aggregate, that takes into account the different productivity of immigrants and natives and the changes in this gap as the immigrants are gradually matched. If one uses this quality adjusted number of workers, the capital labor ratio has remained roughly constant.

[12] See, for example, Borjas (1994), Friedberg and Hunt (1995), Kerr and Kerr (2008), and LaLonde and Topel (1997) for thorough reviews of the literature. For a review and some meta-analysis see also Longhi, Nijkamp and Poot (2008, 2010).

[13] Similar results have also been found for the U.S. by Altongi and Card (1991).

The current paper does not try to explain the Israeli economy's response to the mass immigration from the former USSR, but rather to examine the employment and residential patterns of a group of immigrants within Israel. To that extent, the situation in Israel during the sample period is perfectly suited to examine the economic phenomena regarding choices of residence and work and the implied costs associated with commuting to work across the various regions. For these reasons our goal in this paper is to model the individuals' behavior, taking into account the possible varying wage structures and housing prices across the various regions in Israel. Also, any differential changes in wages and housing prices across the various regions help us identify the features of the model that induce the observed behavioral responses of the individuals in the sample.[14]

4.2 The Model's Structure

The model of location and employment decisions assumes that upon arrival in the host country and in each period (semester) after arrival, immigrants choose a region of residence, a region of employment and employment status, in order to maximize the expected discounted present value of remaining lifetime utility. The total number of regions in the country is denoted by R. The regions are: Tel Aviv ($r = 1$), the Sharon ($r = 2$), the Shfela ($r = 3$), Haifa ($r = 4$), Galilee ($r = 5$), Negev ($r = 6$), and Jerusalem ($r = 7$). The total number of employment options is denoted by K. The employment options we consider are: non-employment ($k = 1$), white-collar employment ($k = 2$), and blue-collar employment ($k = 3$). The mutually exclusive choice set has dimension R^2 for those in the white-collar sector, and R for those who are not employed or in the blue-collar sector.

We assume that the residential locations are determined by the male in the family and they depend on his employment opportunities. Nevertheless, the residential choices are also affected by non-pecuniary attributes, which, among other things, reflect the preferences of all family members.

In order to control for unobserved heterogeneity, we assume that there are fixed discrete types of individuals J. Here we use three potential types, indexed by 1, 2, and 3. The proportions of the J types are parameters that are estimated along with the other parameters of the model.[15] In general, unless specifically stated, we allow all the model's parameters to vary by type.

For ease of the presentation, we let z_{it} denote the state vector for individual i at time t. The exact structure of z_{it} is provided below.

Value of Non-Employment:

The per period utility in the non-employment sector ($k = 1$) for individual i, of type j, at time t, in the region of residence r is given by

$$u^{j}_{i1rt}\left(z_{it}, t\right) = b_{1r}\left(\varepsilon_{i1rt}\right) + \tau_{r}\left(x_{it}, \mu_{ir}\right) - hc_{rj}\left(x_{it}\right) - \gamma_{j} I\left(r_{t} \neq r_{t-1}\right). \tag{1}$$

[14] We should also add that gathering the relevant data so that one can incorporate the analysis within a general equilibrium model is not a realistic enterprise within the current context. If anything, the assumptions that one would have to make to warrant the potential data usable would put any potential findings in serious doubt.

[15] Allowing for three types of individuals captures most of the variation due to unobserved heterogeneity. In fact, the first two types account for about 92% of the individuals in the sample.

The first term in (1), $b_{1r}(\varepsilon_{i1rt})$, represents the per period consumption and leisure value of non-employment in region r. It is allowed to vary with time since arrival in Israel according to the realization of the random variable ε_{i1rt}. The value of non-employment could be relatively high soon after arrival in the host country as assets are drawn down and investments are made in language acquisition and re-training. The shocks to the consumption and leisure value of non-employment capture unobserved changes in asset levels and available leisure time.[16]

The second term in (1), $\tau_r(x_{it}, \mu_{ir})$, represents the individual's per period preference for residing in region r. This preference is a function of the individual's characteristics, x_{it}, as well as a stochastic unobserved regional-specific characteristic, μ_{ir}. In general, the republic of origin shifts the preference for residing in a particular region in Israel depending on the concentration of immigrants from the same republic already living there. The republic of origin captures in part the immigrant's network effects.

The unobserved regional characteristic, μ_{ir}, represents the "match qualities," and captures the immigrant's valuation of regional amenities, e.g., proximity to a beach, landscape, climate, the size of housing per unit cost and the quantity and quality of local public services. It is assumed that each individual draws an initial value from the distribution of μ_{ir} that remains fixed over time. We further assume that: (i) all immigrants draw from the same distribution of μ_{ir} in any given region; (ii) the distributions of μ_{ir}, $r = 1, ..., R$ are independent across regions; and (iii) the distributions of μ_{ir}, $r = 1, ..., R$ need not be identical across regions.

The third term in (1), $hc_{rj}(x_{it})$, is the per period total cost of housing in region r. Note that the cost of housing is also a function of x_{it}. Among other characteristics, marital status and family size shift the cost of housing for immigrant i in region r.[17]

Finally the last term in (1), γ_j, is the individual type-specific moving costs from one region to another. An individual incurs this cost only if he chooses to change the location of residence between two adjacent periods.

Value of Working in the Blue- and White-Collar Occupations:

Below we specify the per period utilities for an individual who chooses to work in the blue-collar and white-collar sectors. There is one substantial difference between the two alternatives. Only individuals who works in the white-collar sector can choose to live in one region and work in a different region. An individual who works in the blue-collar sector is assumed to reside in the region where he works.[18]

[16] Immigrant re-training courses in Israel are widely believed to be ineffective in significantly improving labor market outcomes (see Cohen-Goldner and Eckstein (2003)). Thus, we ignore the role of training except for its effect on the duration of non-employment.

[17] Also, the size of the housing unit offered to the immigrants is fixed, conditional on the family characteristics, and is not chosen by the immigrants.

[18] The reason for imposing this restriction is that we do not have any information in the data set about the region in which the blue-collar workers are employed. However, this is not a major obstacle for accurately estimating the model, since it is well-known that very few blue-collar workers, if any, actually work out of their residential regions.

The per period utility in the white-collar sector (i.e., $k = 2$), for individual i, of type j, who works in region r' and resides in region r, is given by

$$u^j_{i2rt}\left(z_{it}, t\right) = 6 \cdot w_{kr't}(x_i, x_{ikt})e^{\varepsilon_{i2r't}} + \tau_r(x_{it}, \mu_{ir}) - hc_{rj}(x_i) - \gamma_j I\left(r_t \neq r_{t-1}\right) - tc(r', r), \qquad (2)$$

where the deterministic components of the wage offer function in region r', $w_{2r't}$, is assumed to be a function of the individual's time-invariant characteristics, x_i, and accumulated specific work experience, x_{ikt}. The return to experience is distinguished by employment sector, but not by region. Also, the initial condition for the experience since arrival in Israel is $x_{ikt} = 0$ for all immigrants. Previous work experience in the source country is part of the vector x_i. The stochastic component of the wage offer function in region r', $\varepsilon_{i2r't}$ is multiplicative, leading to standard Mincer-type wage functions. Note that the wage offer function is multiplied by 6, since the earnings are reported per month, while the period considered here, namely a semester, consists of six months.

The next three terms in (2) are the same as the first three terms in (1), namely the valuation of the preference for residing in region r, the per period housing costs in region r, and the type-specific cost of moving from region r.

The fifth term, $tc(r', r)$, represents the commuting costs between the region of residence r, and the region of employment r'. In any given period the immigrant may decide to simultaneously move to a new residential region and a new region of employment. The commuting costs and moving costs change accordingly.

The per period utility in the blue-collar employment, $k = 3$, for individual i, of type j, in region r, is given by

$$u^j_{i3rt}\left(z_{it}, t\right) = 6 \cdot w_{3rt}(x_i, x_{i3t})e^{\varepsilon_{i3rt}} + \tau_r(x_{it}, \mu_{ir}) - hc_{rj}(x_i) - \gamma_j I\left(r_t \neq r_{t-1}\right). \qquad (3)$$

Note that the per period utilities in (2) and (3) have similar specifications, except that a worker in the blue-collar sector is constrained to work in the same sector in which he resides. Also, the parameters of the wage offer function $w_{kr't}(x_i, x_{ikt})$ and $w_{3rt}(x_i, x_{i3t})$ are allowed to vary.

The Value Functions and the State Vector:

The value functions of non-employment, working in the white-collar sector, and working in the blue-collar sector are given, respectively, by[19]

$$\begin{aligned}
V^1\left(z_{it}, t\right) &= u^j_{i1rt}\left(z_{it}, t\right) + \delta_d E\left[V\left(z_{i,t+1}, t+1\right) \middle| z_{it}, d^1_t = 1\right], \\
V^2\left(z_{it}, t\right) &= u^j_{i2rt}\left(z_{it}, t\right) + \delta_d E\left[V\left(z_{i,t+1}, t+1\right) \middle| z_{it}, d^2_t = 1\right], \quad \text{and} \\
V^3\left(z_{it}, t\right) &= u^j_{i3rt}\left(z_{it}, t\right) + \delta_d E\left[V\left(z_{i,t+1}, t+1\right) \middle| z_{it}, d^3_t = 1\right],
\end{aligned}$$

[19] Each of the value functions $V^1\left(z_{i,t+1}, t+1\right)$, $V^2\left(z_{i,t+1}, t+1\right)$, and $V^3\left(z_{i,t+1}, t+1\right)$ is by itself a maximization over 63 options. This is explained in greater detail below.

where the value function $V(z_{it}, t+1)$ is given simply by

$$V(z_{it}, t+1) = \max\left\{V^1(z_{i,t+1}, t+1), V^2(z_{i,t+1}, t+1), V^3(z_{i,t+1}, t+1)\right\}.$$

The state vector z_{it} consists of a number of predetermined fixed variables, variables that change deterministically, and the set of stochastic elements. That is,

$$z_{it} = \left(x_i', x_{it}', \varepsilon_{it}\right),$$

where $\varepsilon_{it} = (\varepsilon_{i1rt}, \varepsilon_{i2rt}, \varepsilon_{i3rt})$.

The vector x_i includes all the variables known upon arrival from the former USSR. In particular, it contains information regarding: age, education, experience, republic of residence, marital status, and number of children.

The vector x_{it} contains all the varying information, namely the current region of residence, the current region of work, experience accumulated since arrival in Israel in the white- and blue-collar sectors, marital status, the number of children under 18.

The Distribution of the Stochastic Terms:

The stochastic components ε_{ikrt}, for $k = 1, 2, 3$, are assumed to be independent and identically distributed across regions and employment sectors. However, we allow the ε_{ikrt}'s in the two employment sectors (i.e., $k = 2, 3$) to be serially correlated within the region of employment; that is, for $k = 2, 3$ we have

$$\varepsilon_{ikrt} = \rho_k \varepsilon_{ikrt-1} + \nu_{ikrt}, \tag{4}$$

conditional on sector k being chosen in period $t-1$, where the term ν_{ikrt} is white noise. The $AR(1)$ coefficient ρ_k is allowed to differ across employment sectors, but it is constrained to be identical across regions. For employment sectors that were not chosen in the previous period we simply have $\varepsilon_{ikrt} = \nu_{ikrt}$.

Job Offers and Job Termination:

Although the model does not impose any restrictions on the choice of residential region, there are natural restrictions placed on the choice of employment sector and region of employment. That is, a job in a blue-collar or white-collar occupations, in a particular region is in the individual's choice set only if an employment offer is received. We assume that each period an individual may receive offers in either of the two sectors and in any of the seven regions; that is, an individual may receive up to $2R = 14$ offers in each period. The probability of receiving an offer in sector k, in region r at time t, for an individual working in the same occupation and the same region in time $t-1$ is

$$P_{krt} = 1 - \lambda_{kr}, \quad \text{for } k = 2, 3, \tag{5}$$

where λ_{kr} is an involuntary dismissal probability. The probability λ_{kr} is assumed to be logistic so that dismissal probabilities lie in the unit interval. Moreover, it is assumed to depend on the sector and the individual's type, but does not depend on the region of employment, that is,

$$\lambda_{krj} = \lambda_{kj} = \frac{\exp\left\{\eta_{kj}\right\}}{1+\exp\left\{\eta_{kj}\right\}}, \quad \text{for } k = 2,3; \text{ and } j = 1,2,3.$$

In addition, an individual may receive offers in sector k' in any region r' with probability

$$P_{k'r'it} = \begin{cases} \psi_k \exp\left(A_{k'r'it}\right) / \left\{1+\exp\left(A_{k'r'it}\right)\right\} & \text{if } t = 1 \\ \exp\left(A_{k'r'it}\right) / \left\{1+\exp\left(A_{k'r'it}\right)\right\} & \text{otherwise,} \end{cases}$$

where

$$\begin{aligned} A_{k'rit} &= \lambda_{0k'r'} + \lambda_{1k} I\left(\text{unemployed at } t-1\right) + \lambda_{2k}\text{educ}_i + \lambda_{3k}\text{age}_i + \lambda_{4k}\text{age}_i^2 \\ &\quad + \lambda_{5k}\text{time}_i + \lambda_{6k}\text{time}_i^2 + \lambda_{7k} TP_{1i} + \lambda_{8k} TP_{2i}, \end{aligned}$$

age_i and educ_i denote the age and education of the immigrant upon arrival, time_i denotes the time since arrival, $TP_{ji} = 1$ if the individual is of type j, and $TP_{ji} = 0$, otherwise, for $j = 2, 3$. (The excluded type is type 1.) Note that we impose no restrictions on the number of outside offers that the individual may receive from different regions and employment sectors in period t.

4.3 Additional Parameterization

In order to carry out the estimation, one needs to introduce additional parameterization for some of the functions introduced above. Below we describe this additional parameterization.

The per period consumption and leisure value of non-employment in region r is further parameterized to be

$$b_{1rt}\left(\varepsilon_{i1rt}\right) = \alpha_r I\left(t=1\right) + \exp\left(\varepsilon_{i1rt}\right), \quad \text{for } t = 1, ..., T, \tag{7}$$

where $I\left(\cdot\right)$ is the usual indicator. Note that we allow the first (six-month) period in Israel to have differential consumption and leisure value. The reason is that in the first period the immigrants need to learn about the new environment either in the absorption centers provided by the government or privately. Consequently, the value of non-employment can be different from that in other periods by the amount α_r.

The per period preference for residing in region r is parameterized to be a simple linear function of the republic of origin and the individual specific valuation of region r, μ_{ir},

$$\tau_r(x_{it}, \mu_{ri}) = \tau_{0r} + \tau_{1r} R_{1i} + \tau_{2r} R_{2i} + \tau_{3r} R_{3i}, \tag{5}$$

where $R_{li} = 1$, $l = 1, 2, 3$, for each of the three republics of the Ukraine, Belarus and Russia, respectively, and $R_{li} = 0$, otherwise. The excluded category is all other republics in the former USSR.

The per period total cost of housing in region r is specified as a linear function of marital status, family size and the unobserved discrete type, that is,

$$hc_{rj}(x_{it}) = 6 * \exp\{\gamma_{0r} + \gamma_1 M_{it} + \gamma_2 NK_{it} + \gamma_3 TP_{1i} + \gamma_4 TP_{2i}\}, \tag{6}$$

where $M_{it} = 1$ if the immigrant is married, and $M_{it} = 0$, otherwise, NK_{it} is the number of children under 18 in the family. As before, $TP_{ji} = 1$, for $j = 2, 3$, if the individual is type j, and $TP_{ji} = 0$, otherwise. The excluded type is type 1. The three unobserved discrete individual types are specified a priori. The individual type probabilities are estimated as parameters along with the other parameters of the model. Including individual-specific effects in the housing cost functions helps control for unobserved assets that are also likely to be positively correlated with the immigrant's unobserved productivity.

The deterministic components of the wage offer functions in region r, w_{krt}, $k = 2, 3$, are specified as,

$$\begin{aligned} \ln w_{jkrit}(x_i, x_t) &= \beta_{0kr} + \beta_{1k} S_i + \beta_{2k} x_{0i} + \beta_{3k} x_{0i}^2 + \beta_{4k} x_{ikt} + \beta_{5k} x_{ikt}^2 \\ &\quad + \beta_{6k} I\left(\text{age}_i >= 40\right) + \beta_{7k} TP_{1i} + \beta_{8k} TP_{2i}, \end{aligned} \tag{7}$$

where S_i is the years of completed schooling in the former USSR. The term x_{0i} denotes the years of experience accumulated in the former USSR, while x_{ikt} denotes the number of years of experience after arriving in Israel. The individual types are the same as in (6). Note that the wage function in both sectors, as well as the housing costs, control for the specific type of unobserved heterogeneity. Since the correlations between these components are left unrestricted, this allows for possible correlation in the unobserved components of these functions.

It is important to note that all of the observed variables in the vector x_i are measured at the time of arrival of the immigrant in Israel. These variables are widely believed to be exogenous to potential outcomes in Israel among immigrants who arrived in the first few years of the immigration wave. Consequently, there is no initial conditions problem in this dynamic discrete choice model.

5 Estimation

5.1 The General Algorithm

Given the relatively long histories for many individuals and the computational complexity that arises from having serially correlated disturbances, the most computationally practical estimation technique is simulated maximum likelihood (SML). We augment this method allowing for classification errors in the discrete choices. We follow the method developed in Keane and Sauer (2009 and 2010) and in Keane and Wolpin (2001). Incorporating unbiased classification errors into the SML has two major advantages. First, it helps avoid the usual problem of zero probabilities that often arises when a pure frequency simulation method is employed. Second, the choice probabilities are computed from *unconditional* simulations of the model, rather than *conditional* on past reported choices and realizations of the relevant random variables. In other words, the SML solves the problem of missing endogenous state variables in dynamic discrete choice models. The classification error implies that each simulated choice history is the individual's true choice history with some positive probability.

The estimation procedure is based on matching multiple simulated choice histories with the observed choice history of each individual in the data. Every simulated choice history generates a particular product of classification error rates, depending on the corresponding observed choice history. The likelihood contribution for each individual is then an average over the generated classification error rate products. Observed continuous data are incorporated into the likelihood function via measurement error densities: that is, the density of measurement error necessary to reconcile the history of simulated outcomes (here wages and housing costs) with observed outcomes.

For ease of exposition, suppose the data consist of $\{D_i^*, w_i^*, hc_i^*, x_i\}_{i=1}^N$, where $D_i^* = \{d_{it}^*\}_{t=1}^T$ is the history of reported choices (i.e., sector, residential location, work location), $w_i^* = \{w_{it}^*\}_{t=1}^T$ is the history of reported wages in the chosen option, $hc_i^* = \{hc_{it}^*\}_{t=1}^T$ is the history of reported housing costs in the chosen option, x_i is a vector of initial conditions for individual i, and N denotes the sample size.

Since there may be missing choices and wages (because only accepted wages are observed), we also define three additional variables $I(d_{it}^*) \equiv I(d_{it}^* \text{ is observed})$, $I(w_{it}^*) \equiv I(w_{it}^* \text{ is observed})$, and $I(hc_{it}^*) \equiv I(hc_{it}^* \text{ is observed})$. These are simply indicator functions that equal one if the condition in brackets is true, and zero otherwise.

Estimation of the model proceeds as follows:

Step 1: Given x_i and a particular unobserved type j, draw M times from the distribution of wage offers in each sector and each region in every period t to form the sequences $\left\{\{w_{ijtm}\}_{t=1}^T\right\}_{m=1}^M$. In addition, draw M times from the job termination distribution, for each sector and region.

Step 2: Given x_i, the individual's unobserved type, $\left\{\{w_{itm}\}_{t=1}^T\right\}_{m=1}^M$ and the simulated job termination probability, construct M simulated choice histories in every period t, to form the sequence $\left\{\{d_{tm}\}_{t=1}^T\right\}_{m=1}^M$.

Step 3: Compute classification error rates π_{jkt} that allow the probability of reporting a particular choice to differ from the true choice and that allow for persistence in mis-reporting. That is, compute $\widehat{\pi}_{jlt} = \Pr(\text{reported } d_i = j | \text{actual } d_i = l)$, for $j, l = 0, 1$.

Step 4: Form the type-specific likelihood contribution for each individual i as:

$$\widehat{P}\left(D_i^*, w_i^*, x_i|\theta\right) = \frac{1}{M}\sum_{m=1}^{M}\prod_{t=1}^{T}\left(\sum_{j=0}^{1}\sum_{l=0}^{1}\widehat{\pi}_{jlt} I\left[d_{it}^m = j, d_{it}^* = l\right]\right)^{I\left(d_{it}^*\right)} f_W\left(u\right)^{I\left(w_{it}^*\right)} f_{HC}\left(v\right)^{I\left(hc_{it}^*\right)}, \quad (13)$$

where θ is the vector containing all the model parameters, $f_W(u)$ is the measurement error density in reported wages and $f_{HC}(v)$ is the measurement error density in reported housing costs.

Step 5: Repeat steps (1) through (4) for each unobserved type in the population, in our case, for $j = 0, 1, 2$.

Step 6: Average the type-specific likelihood contributions for each individual i using the unobserved type probabilities as weights.

Step 7: Use the unconditional (on the type) likelihood contributions to build the log-likelihood function.

Step 8: Maximize the log-likelihood.

5.2 Computation of the Individual Likelihood

The estimation takes the sequential steps described below. Each step is repeated for each individual in the sample. For simplicity we omit the subscript i from all quantities below.

1. Let the current estimated probabilities for an offer in region r and sector k be denoted by $\widehat{p}_{rk}$, for $r = 1, ..., 7$, and $k = 2, 3$. Draw ζ_{rk}, for $r = 1, ..., 7$; $k = 2, 3$, from a uniform distribution $U(0, 1)$. If $\zeta_{rk} > \widehat{p}_{rk}$ then assume that the individual was offered a job in sector k at region r.

2. Each individual has $N_p = 7 \cdot 7 + 7 + 7 = 63$ potential choices, because of the residential and work location decision for white-collar workers, work location for blue-collar workers, and residential location for the non-employed. Compute the value function for all N_p alternative possibilities. Let, $V_1, ..., V_{N_p}$ denote these values and let $V_{\max} = \max\left\{V_1, ..., V_{N_p}\right\}$.

   Compute also
   $$V_l^d = V_l - V_{\max} \quad \text{and } e_l^d = \exp\left\{V_l^d/\tau\right\},$$
   for $l = 1, ..., N_p$, where τ is some constant (in our case $\tau = 10000$).

3. Compute the probabilities for all possible combinations as $\widetilde{p}_l^d = e_l^d \Big/ \sum_{m=1}^{N_p} e_m^d$, for $l = 1, ..., N_p$.

4. Repeat Step 1 through Step 4 for M simulations and form $\overline{p}_l = \sum_{j=1}^{M} \widetilde{p}_{lj}^{d} \Big/ M$, for $l = 1, ..., N_p$.
5. We also take into account possible classification errors in the choice probabilities as follows:
   (a) If the probability p_l of a particular possible choice is also the observed choice in the data we let
   $$p_l = c + (1 - c)\,\overline{p}_l, \tag{8}$$
   for some constant $0 < c < 1$.
   (b) If this is not the case then we set
   $$p_l = (1 - c)\,\overline{p}_l.$$
   The constant c, which is a parameter to be estimated, indicates the degree of accurate classification for the smallest probabilities.
6. To take into account possible measurement errors in reported (log) wages and (log) housing costs we now form the density functions in reported wages and housing costs. We define here the density function for wages; the density function for housing costs is defined analogously.
   (a) If the wage is observed for some choice made by the individual, then
   $$f_W\left(w_{it}^{*}, w_{itjm}; \sigma_w\right) = \phi\left(\log\left(w_{it}^{*}/w_{itjm}\right)/\sigma_w\right), \tag{9}$$
   where $\phi(\cdot)$ denotes the density function of a standard normal variable and σ_w, a parameter to be estimated, is the standard error of the measurement error.
   (b) If the wage is not observed, then we set $f_W\left(w_{it}^{*}, w_{itjm}; \sigma_w\right) = 1$.
7. Repeat Step 1 through Step 6 as part of the maximization of the (log) likelihood with respect to the model's parameters until convergence is achieved.

5.3 Computation of the Value Function

In computing the value function we use no approximations at all beyond the approximation implied by using a discrete distribution for the continuous variables. We discretize the distributions of ε_{i2rt} and ε_{i3rt} to have ten equally spaced points of support. Given the discretization of these distributions we compute the "exact" value function for each value of the state vector described above. This puts an enormous burden on the computational complexity of the model and the corresponding likelihood function. However, it allows us to avoid an additional source of approximation error that stems from having to impute the value functions for a relatively large fraction of the possible values for the state vector, as is typically the case in applications that use dynamic programing models.[20]

6 Estimation Results

6.1 Parameter Estimates

The resulting parameters are provided in Tables 6 through 11. In Tables 6, 7, and 8 we present the parameter estimates associated with the three value functions of: (a) non-employment; (b) working in the white-collar sector; and (c) working in the blue-collar sector, respectively. In Tables 9 and 10 we present the parameter estimates associated with the probabilities of job termination and the wage offer probability, respectively. Finally, in Table 11 we present estimates of additional common parameters of the model.[21]

Value of non-employment:

Table 6 indicates that the consumption and leisure values of non-employment vary considerably across the different regions. In particular, the least valuable places of residence seem to be Tel Aviv and the Sharon, and to a lesser degree the Negev. By contrast, Jerusalem and the Galilee seem to be the most desirable. Recall that the α parameters only represent the value in the very first period after arriving in Israel, when most of the immigrants do not work. The results support the idea that the immigrants self-select into the region they are most comfortable with in the first period, although new work opportunities in later periods may lead them to change their place of residence.

For the preference of residing in a region (see lines 8-14 of Table 6), the results indicate that, all else constant, immigrants from the three republics of the Ukraine, Belarus, and Russia prefer (relative to the smaller group of all other immigrants) to live in the Shfela and the Sharon regions (see the column labeled τ_0), while the Negev, which is largely desert area with a hot climate and few amenities, is the least desirable region. However, the coefficients τ_1, τ_2, and τ_3 indicate that individuals from different republics seem to have distinct preferences.

The results for the cost of housing (at the bottom of Table 6) indicate, as expected, that the cost of housing tends to be higher in areas that are largely urban areas, especially in Tel Aviv, but also in the Sharon, the Shfela, Haifa, and Jerusalem. It is significantly lower in the more rural areas of the Galilee and the Negev. Being married and the number of children in the household have significant effects on the overall housing costs. The cost of housing also varies significantly across the three different types of individuals; that is, relative to type 1 (the omitted category), type 2 and type 3 have higher housing costs of 17.4% and 38.8%, respectively.

[20] To do that we used state-of-the-art programing routines in C, that involve delicate dynamic allocation of memory. We thank Yuval Lifshitz for his great assistance in implementing these procedures.

[21] We present here only the final estimation results, after imposing some additional restrictions on the parameter estimates, incorporating the results from our initial analyses not reported here for brevity.

Value of employment in white-collar and blue-collar occupations:

Table 7 reports the results for the utility from working in the white-collar occupations. Note that two components of the utility, the preference for residing in a region and the housing costs in the that region, are common to all utilities. The results regarding these two components were discussed above. The key element of the utility is the wage earned in the white-collar sector. The results show clear wage differentials between regions. The wage premium for those in the most southern region of the Negev is, not surprisingly, the lowest among all regions. Note that both schooling and experience in the home country have a negative effect, though economically very small. This is likely to stem from the fact that engineers with higher levels of education are more specialized in areas that are less transportable from the former USSR to Israel. In comparison, the effect of experience accumulated since arrival in Israel is relatively large, positive, and significant, with almost no curvature in the earning profile. This may be due to two important facts. First, the sample is composed of relatively older individuals with an average age of over 42 years, much higher than the age in the population at large. Second, we observe the immigrants for a relatively short calendar time of only 13 semesters.

Contrary to the results of the reduced-form estimation, here we see that there is a substantial premium for being over 40 years of age. Relative to individuals of type 1, a group that accounts for about 8% of the population (see the results in Table 11), there is a significant wage premium for the type 2 individuals, a group that accounts for approximately 61% of the population, but negative for type 3 individuals, a group that accounts for approximately 31% of the population.

Finally, in line 10 of Table 7 we report the estimates for the travelling costs. Recall that these costs are relevant only for the white-collar workers. The estimated costs represent the monetary value (in NIS) for the six-month period, which includes the direct costs as well as the indirect non-pecuniary costs. In the data there are regions that are too far for any individual to be able to live in one and work in the other. For this reason we impose constraints on these coefficients and allow for only three levels of costs, $tc_1 = 8,087$, $tc_2 = 80,821$, and $tc_3 = 19,930$. This represents that there are substantial costs associated with travelling to a job from one region to another, even for travelling between regions that are relatively close. An expense of about 8,000 NIS (as in tc_1) per period amounts is equivalent to close to 20% of the earnings of an average worker. An estimate of about 20,000 NIS (as in tc_3) implies that there will be little travelling between regions.

In Table 8 we report the results for the wage function in the blue-collar sector. For limitation of data and based on preliminary estimation, the coefficients on initial experience and the dummy variable for being over the age of 40 are constrained to be the same as those for the white collar occupations (see Table 7). Note that the coefficients for the region-specific dummy variables are generally smaller than those obtained for the white-collar sector. Overall, there is smaller variation in the region-specific coefficients across regions for the blue-collar workers than for the white-collar workers, partially because of the effectiveness of the minimum wage policy in Israel. This implies that the blue-collar workers prefer to locate themselves outside of the major urban areas because of lower housing costs, as is shown below.

In complete contrast to the result for the white-collar sector, relative to individuals of type 1, type 2 individuals have a substantial negative premium of 38.1%, while type 3 individuals have a substantial positive premium of 40.6%. This indicates that the type corresponds to the ability of the individuals in the two sectors. While type 2 individuals have a comparative advantage in the white-collar occupations, type 3 individuals have the comparative advantage in the blue-collar occupations. This highlights the need for one to control for unobserved heterogeneity, through having three alternative types.

Note the similarity in the results for the AR coefficients for the wage functions in the white- and blue-collar sectors (see line 11 in Table 7 and line 10 in Table 8). Both are estimated to be .55, indicating a relatively high degree of persistence in the wage shocks in both sectors.

Probabilities of losing and obtaining jobs:

Table 9 presents the results for the parameters associated with the probability of losing a job, by individual type. The results indicate that the probability of losing a job is rather small for most of the population. That is, for the individuals of type 1 there is only .3% chance of losing a job in the white-collar sector. For type 2 individuals this probability is even smaller. Even for type 3 individuals, for whom the probability of losing is the largest, it is only 1.4% per semester.

In Table 10 we report the parameters associated with the probabilities of getting wage offers, by region, as well as by individual type. These probabilities apply to individuals who either worked outside of the specified region in the period preceding the current period, or to individuals who did not work at all. Several results stand out. First, note that while all the regional coefficients for the white-collar sector (i.e., $\lambda_{10}(r)$) are negative, those for the blue-collar sector (i.e., $\lambda_{20}(r)$) are all positive. This implies that one is much more likely to obtain a wage offer in the blue-collar sector than in the white-collar sector, regardless of the region. Moreover, the order of the implied probabilities for the blue- versus white-collar sectors are almost completely reversed. For example, holding everything else constant, the probability of obtaining a wage offer in the white-collar sector is much higher in the Negev than in Tel Aviv. In contrast, the probability of obtaining a wage offer in the blue-collar sector is much higher in Tel Aviv. That is, while there seems to be a greater demand for blue-collar workers in Tel Aviv, there is a clear shortage of white-collar workers in the Negev relative to the major urban areas of the country. The estimates also indicate that being non-employed in a given period increases the probability of obtaining a wage offer in subsequent periods (see λ_2 in lines 8-9). Moreover, the more time elapsed since one's arrival in Israel the more likely one is to obtain a wage offer in either sector (see λ_4 and λ_5 in lines 10-11), especially for individuals who were older upon arrival (see λ_3 in lines 8-9).

The last two estimates (i.e., for λ_6 and λ_7) indicate that in the white-collar occupations it is much more likely for an individual of type 2 to obtain a job offer relative to individuals of type 3, and even more so relative to individuals of type 1 (the excluded group). In the blue-collar occupations the order changes. While it is more likely for an individual of type 3 to obtain an offer relative to type 1 individuals, it is much less likely for type 2 individuals to obtain an offer. This again speaks to the role of the comparative advantage of the various group types.

As the estimates for the ψ parameters for the white- and blue-collar occupations indicate, the probability of obtaining a job offer in the very first semester after arrival in Israel is very small. Nevertheless, the probability of obtaining an offer in the blue-collar sector is somewhat larger than in the white collar-sector.

Finally, Table 11 provides estimates of some additional parameters of the model. First, the table provides estimates of the probability of being of a particular type (see line 1). Note that the estimates imply that the population of immigrants is composed mostly of type 2 individuals (61%) and type 3 individuals (31%). Type 1 individuals account for only 8% of the population. The latter is the type for whom the outcome variables are the worst, while type 2 individuals are associated largely with being successful in the white-collar occupations.

The moving cost estimates for each of the types of individuals are presented in line 2 of Table 11. Note that the moving costs for type 1 individuals are about 15% larger than those for type 2 individuals, and are three times larger than those for type 3 individuals. Even for type 2 individuals, the moving costs are estimated to be quite substantial relative to their earnings.

The estimated parameters reported in lines 3 and 4 of Table 11 are for the standard errors of the measurement error for the unconditional log wage and unconditional log housing costs, respectively.

Finally, the parameter estimate associated with the classification error rate simply implies that the base classification error for all discrete outcomes in the model, namely the sectorial, residential location, and work location choices is $c = .682$, where c, defined in (8). In other words, it indicates that the degree of accurate classification for the smallest probabilities of the model is almost 70%. This is very much in line with the results obtained by Keane and Sauer (2009).

6.2 Model Fit

To examine the fitness of the model we compare some of the model's predictions with their observed counterparts. In Figures 1a–1c we report the density estimates for the observed and predicted monthly wages for the whole population and then for the two sub-populations of white-collar and blue-collar workers, respectively. Table 12a provides key summary statistics of the actual and predicted wage distributions, corresponding to the densities presented in Figure 1. The predictions of the model are extremely good for the distributions in both the blue- and white-collar occupations. Table 12a indicates that we match all the moments of the distributions, except maybe the standard deviation of the two distributions. That is, the predicted distribution does not fully capture the very end of the right-hand-tail on the wage distributions.

To further examine the model's ability to predict wages and the choices of residential and work locations we perform the following experiment. We randomly "assign" each individual to: (i) a region of residence; (ii) a particular employment status (i.e., unemployed, blue-collar or white-collar); and (iii) a work location if the individual realization of employment status is in the white-collar sector. For those individuals who were randomly assigned to the white-collar sector we then calculate the average wage in each work location using the type probabilities estimated in the model (presented below in Table 11). We do the same for those individuals who were assigned to the blue-collar sector. The results of this experiment are presented in Table 12b, by region of employment. Note that the realized wages based on these random assignments are systematically lower than those predicted by the model for both the blue-collar workers and, especially, for the white-collar workers. Moreover, the model's predictions of the average regional wages are extremely close to the actual ones.

These results clearly indicate that individuals self-select into the regions and occupations in which they maximize their wages. It is important to note that these location choices are far from being random, and thus need to be modeled as simultaneous choices. More importantly, the model does an extremely good job in predicting these choices and their corresponding outcomes, namely wages.

In Table 13 through Table 17 we examine various aspects of the model's predictions. All these tables are organized in similar fashion. In Panel A of the tables we present the observed data, while in Panel B we report the prediction of the model. In each of the five tables we also provide four additional panels, Panel C through Panel F, in which we report the results from a set of policy simulations described in detail below.

In Table 13 we report the predicted and actual distribution of employment status by semester. Overall, the model is able to capture the patterns of employment in both sectors. This is true even for the very first period, which is an introductory period in a new country with a new language, new occupational requirements, etc. More specifically, the model predicts faster transition from the non-employment state into the blue-collar and white-collar occupations. Moreover, the model accurately predicts the transition from the blue-collar sector into the white-collar sector in the later periods of the sample.

Tables 14a and 14b report the results for work location for the white-collar workers (Table 14a) and blue-collar workers (Table 14b). Note from Table 14a that the model accurately captures the overall distribution of white-collar workers across the various regions.[22] More importantly, it accurately captures the transitions between regions over time. For example, it captures very well the increase in the percentage of individuals in the white-collar sector working in the Shfela and Haifa, as well as the decline in the fraction of white-collar workers in the Negev and Jerusalem. Recall that the blue-collar workers do not report their work location, so we assume that they work and reside in the same region of the country. Thus, in Table 14b we only report the prediction of the model regarding the work location of the blue collar workers.

The results for the residential location are provided in Table 15. The data and the predictions

[22] It is important to note that the fraction of individuals working in the white-collar sector is very small (only 2.5% of the sample). It is therefore very hard to predict their distribution across the various regions.

are provided for all individuals, including those who do not work. The overall predictions of the model are very good. There are some relatively small deviations of the model's predictions from the actual data, mostly for Tel Aviv and the Galilee. Nevertheless, the model captures the overall distribution of residential areas as well as the transition of the immigrants across the regions over time.

Next we examine the simultaneous choices of work and residential locations. Again, because residential location is the same as the work location for a blue-collar worker, in Table 16a we restrict attention to the white-collar workers and present the joint distribution of residential-work location over the entire sample period. In Table 16b we provide the results for the distribution of residential location (which is also the work location) for the group of blue-collar workers. Note from Table 16a that for the most part the model predicts the location-residential choice combinations extremely well. The marginal distributions of work location in the data and as predicted by the model (presented at the last rows of Panels A and B, respectively) show very small deviation, as is the case for the marginal distribution of place of residence in the data and as predicted by the model (presented at the last columns of Panels A and B, respectively).

While in Table 16 we report the joint work-residential location, Table 17 provides a different angle of the distribution of work location. Here we present the conditional distribution of work location, conditional on the place of residence. Again, while some small deviations do exist, the overall predictions of the model are very accurate. In particular, the model correctly predicts that individuals tend to travel only to close regions. Moreover, it predicts that all individuals from Jerusalem and the Negev will avoid travelling across regions. That is, individuals residing in these regions also work in these regions.

7 Policy Implications

Having estimated the DP model we turn to the main goal of this study, namely to examine and evaluate four alternative policy measures. All policies we examine here have been proposed in one form or another by the Israeli government. Here we provide a comprehensive evaluation of each policy simulation, devoting attention to the resulting changes in the key choice variables, namely work and residential location and the choice of employment status. All simulations are performed under the restriction that they cost the same amount. The cost of each policy is about 39-40 million NIS, assuming that they are carried out by the government for the first ten years (i.e., 20 semesters) after the immigrant's arrival in Israel. We determine this constraint by first applying the rental subsidy described below and calculating the cost implied by that subsidy. All other policies have been altered accordingly, so that the cost would be the same as that of the rental subsidy.[23]

For various reasons, one of the most important goals of all governments in Israel over the

[23] The exact costs are: 39.2 million NIS for the wage subsidy; 39.9 million NIS for transportation subsidy; 39.4 million NIS for rent subsidy; and 39.5 million NIS lump-sum transfer subsidy.

years was to enlarge the Jewish population in the Galilee and the Negev. These two regions, and especially the Negev, were, according to policymakers, "underpopulated." We offer no explanation regarding the goals of the Israeli government. Obviously, there is a strong political element that underlies and motivates the stated goals. Our goal is merely to examine the effectiveness of the economic incentives on the individuals' choices. As noted above, the results for the four alternative simulations are presented in Panels C through F of Tables 13 through 17. The results are compared with the predictions of the base model that are provided in Panel B of these tables.[24]

7.1 Wage Subsidy

One of the policies that the Israeli government has been contemplating is to provide direct wage subsidies to those working in the Negev and the Galilee. The subsidy we consider here comes as a 22.5% increase in one's wage. Naturally this type of a policy is relatively hard to implement and it can lead to an incentive structure of potential employers that would undermine the intent of the policy. It is clear that any potential general equilibrium effects would mitigate the impact measured under the scenario considered here. Nevertheless, it is important to examine such a policy under the assumption that there will be no such effects, since the results provide us with an upper bound on the possible effects. The wage increase considered here is for both the blue- and white-collar workers, and it is determined solely by the chosen place of work, which, for the white-collar workers may not be the same as the place of residence.

The results from this simulation are reported in Panel C of Table 13 through Table 17. The results in Table 13 indicate that the policy somewhat lowers the fraction of non-employed individuals, especially in the first few periods. The increased fraction of employed individuals comes largely in the blue-collar sector, because the wage subsidy simply makes the offers that come mainly in the blue-collar sector more attractive. Nevertheless, the policy has an effect only in the short-run. By period 10 the distribution of workers across employment statuses are almost the same as before (see Panel B of Table 13).

In Panel C of Table 14a we provide the results for the work location choices of the white-collar workers. The policy seems to have a significant effect on the fraction of individuals in the white-collar occupations working in the Negev and the Galilee. The more attractive work opportunities along with the comparatively low cost of housing in the Negev and the Galilee relative to the major urban areas draws workers into these two regions.

By period 10 the fraction of white-collar workers in the Negev increased from less than 11% under the base model to over 20% as a result of the policy. The fraction of workers in the Galilee increased from about 14% under the base scenario to almost 22% as a result of the policy. This represents an increase of almost 8 percentage points in the fraction of white-collar workers who choose to work in the Negev. The increase in the fraction of white-collar workers in these two

[24] The exception is Table 16b, which provides the results for the blue-collar workers. Due to the fact that the blue-collar workers reside where they work, all the predictions are provided in only 5 lines.

regions comes from a decrease in the percentage of individuals working in all other regions, but especially from reduction in Haifa and the Shfela, and to a lesser degree in Tel Aviv.

The main impact of the policy is on the blue-collar workers. The fraction of workers choosing to work (and reside) in the Negev and the Galilee increases dramatically from 18.1% and 11.0% under the base model, for the Galilee and Negev, respectively, to 37.6% in the Galilee and 21.9% in Negev by the 10th period.

The success of the stated goal of the Israeli government policy, i.e., to induce people to reside in the Negev and the Galilee, can be seen in Panel C of Table 15 in comparison with Panel B of the table. As one might expect, a significant number of individuals changed not only their work location, but also their residential location, largely because the commuting costs are relatively large (see Table 7). Consequently there is an increase of over 14 percentage points (from less than 16% to 30%) in the fraction of individuals choosing to live in the Galilee. The effect in the Negev is also substantial. The fraction of individuals choosing to live in the Negev increases by almost 10 percentage points, from 10.9% to 20.6%.

In Table 16a we provide the results for the residential-work location choice of the white-collar workers. Note that for this group there is an increase of more than 5 percentage points in the fraction of individuals residing and working in the Negev. A much larger increase is observed for the Galilee, from 10.4% to 27%. The main reason for the apparent difference between the two regions is the regional amenities, which clearly favor the Galilee over the Negev.

Effects of an even larger magnitude are also observed for blue-collar workers (see line 2 of Table 16b in comparison with line 1 of the table). The fraction of blue-collar workers who work and reside in the Galilee increases under the policy from about 15.8% to almost 36%, while for the Negev the increase is more moderate, from about 13% to about 22%. The reason for these results is that the blue-collar workers have to reside where they work. Note that the increases in the fraction of individuals residing and working in the Negev and the Galilee come largely from a significant reduction in the number of workers who work and reside in the Shfela and Haifa regions.

Finally, Table 17 provides the results for the distribution of work locations, conditional on the region of residence, for the group of white-collar workers. We can clearly see that because of the substantial commuting costs, individuals find it infeasible to work in the Negev and live elsewhere. Thus, conditional on living outside the Negev region there is hardly any change in the fraction of individuals in the white-collar occupations who work in the Negev. For the Galilee the story is somewhat different, specifically because it is feasible to live in the Haifa region and commute to work in the Galilee. Hence, we see an increase of about 6 percentage points in the fraction of individuals living in Haifa while working in the Galilee. This is in addition to an increase of about 9 percentage points in the fraction of individuals living in the Galilee who also choose to work in that region.

Overall, we see that the 22.5% wage subsidy does achieve the ultimate goal of shifting individuals into working and residing in greater numbers in the two regions that were targeted by the various governments in Israel. Nevertheless, one should be a bit cautious in jumping to the conclusion that it is worthwhile implementing such a policy. First, it is quite an expensive policy that costs almost 40 million NIS over a period of ten years for a group of about 700 individuals. To implement this policy for the entire population can cost billions of NIS. Moreover, the policy is likely to be significantly less effective for native Israelis. Second, the estimated impacts of the policy considered here are the upper bound of the possible effects. In reality, general equilibrium considerations would necessarily imply significantly more moderate effects.

7.2 Transportation Subsidy

Another primary goal of most governments in Israel's history was to shift employment from the urban areas of Tel Aviv, Haifa, and Jerusalem into the periphery. Since it is believed that Israelis have a strong tendency to live in the major urban areas, we consider a policy contemplated by Israeli lawmakers that is designed to achieve this goal without forcing individuals to change their places of residence. Under this policy an individual obtains a transportation subsidy that amounts to 73.5% of his transportation costs in the event that he commutes across regions, but not into the metropolitan areas of Tel Aviv, Haifa, or Jerusalem.[25] While on its face it seems that this policy provides a substantial incentive for individuals, it may not be sufficiently large to induce individuals to commute across regions that are geographically far apart. The results of this policy simulation are provided in Panel D of Tables 13 through 17.

As is expected, the transportation subsidy has little effect on the employment status of the immigrants (see Table 13), and only in the short-run. By period 10 the distribution of workers across the employment status has changed very little. What this policy does is make it possible for individuals to accept less lucrative offers in the white-collar occupations outside the region in which they reside without having to incur the moving costs associated with acceptance of such offers. Nevertheless, the effect is quite small, raising the fraction of individuals employed in the white-collar occupations from 33.5% to 37.9% by the end of the 10th period.

This generous transportation subsidy seems to have the right effect, but the effect is quite small for the white-collar workers (see Panel D of Tables 14a), and only in the short-run. Particularly, it has no impact on the two regions that the Israeli governments were traditionally interested in, namely the Galilee and the Negev. While for the Galilee there is a small long-run increase of less than 3 percentage points, there is virtually no effect on the fraction of white-collar workers employed in the Negev.

The effects on the residential location, while quite small, go in the "wrong" direction, as is illustrated in Table 15. Now that travelling becomes cheaper, the white-collar workers can afford to live in the more desirable residential areas of Tel Aviv, the Sharon and Haifa and commute to work

[25] The choice of having a subsidy of 73.5% of the transportation costs is made so that the total costs of this subsidy would be similar to those of the other policy alternatives. Recall also that this policy applies only to the white-collar workers who can work and reside in different regions.

in adjacent regions. This essentially undermines the purpose of the policy of moving individuals out of the major urban areas altogether. The overall effect can be seen in Panel D of Table 16a for the white-collar workers, where the fraction of the white-collar workers actually declines in both the Galilee and the Negev. Also, there is no effect on the group of blue-collar workers who are not expected to benefit from the transportation subsidy (see line 3 of Table 16b).

Finally, Table 17 indeed confirms that there are more individuals in the white-collar occupations who now commute to the Negev and the Galilee. Overall, the employment in these two areas increases for the white-collar workers. However, they are not residing in these areas, but commuting from the urban areas. If anything, this would increase congestion due to increased traffic in and out of the major urban areas, especially Tel Aviv and Haifa.

Overall, this policy seems to be ineffective. It has a very small impact, which is mainly not in the desired direction. Hence, it makes no sense to try and implement it given the large costs of almost 40 million NIS per 700 individuals over the period of ten years.

7.3 Rent Subsidy

Here we consider a policy that would give free rent to all immigrants who reside in the Negev or the Galilee. The rent subsidy was determined according to the initial average rent that was paid in the two regions.[26] Versions of this policy have been considered in Israel in the past. This policy seems to have the "right" effects, in the sense that the government's stated goals are achieved. As in the wage simulation, we do not consider the general equilibrium effects that the policy might have on regional housing prices. Hence, the results obtained here should be viewed as the upper bound on the potential effects. The results of this policy's simulations are provided in Panel E of Tables 13 through 17.

Panel E of Table 13 indicates that there is only a slight change in the employment status, largely due to the shift of some individuals from the white-collar to the blue-collar sector. That is, with the rent subsidy individuals can afford to accept lower offers in the blue-collar sector in the two target areas of the Galilee and the Negev. But, these two areas also attract a significant fraction of the white-collar workers. As can be seen from Panel E of Table 14a, by the 10th period almost 51% of the white-collar workers are working in the Negev (23.4%) and the Galilee (27.4%). Note also that there is a relatively large decrease of over 23 percentage points in the fraction of white-collar workers in the Shfela region. All other regions also experience a decline in the number of white-collar workers, but the decrease is not as steep. Note that especially in Haifa the decrease is much smaller. This is because it is feasible for the white-collar workers to live in the Galilee, enjoying the rent subsidy, while working in Haifa, which, in general, is more favorable for white-collar workers.

The effects for the blue-collar workers is even larger, at least for the Galilee (see Panel E of

[26] We do so because otherwise an individual would always have the incentive to rent the most expensive housing in the Galilee and the Negev, conditional on deciding that he wanted to live in either of these two regions. The exact total cost for the government of implementing this policy is 39.4 million NIS in 1994 prices.

Table 14b). While 23.4% reside in the Negev as a result of this policy, almost 32% reside in the Galilee. The transition of blue-collar workers into the Negev and the Galilee comes largely from the Sharon and the Shfela regions.

A sizeable impact of this policy can be seen on the place of residence (Panel E of Table 15). This policy does contribute to a significant reduction in the percentage of immigrants living in the big cities of Tel Aviv and Haifa, but most of the reduction comes from the Shfela and Haifa regions. Nevertheless, the individuals relocate themselves disproportionately to the Galilee, increasing the fraction of individuals living there from about 16% to almost 42%, while a more modest increase of less than 9 percentage points is observed for the Negev.

The large shift in the residential-work location is also seen in Panel E of Table 16a. A very large fraction of the white-collar workers who live in the Galilee also work there, with some taking advantage of the rental subsidy and living in the Galilee while working in the adjacent region of Haifa. Because of the relatively large commuting cost, all the individuals who move to the Negev region also work there, but the increase is much smaller than in the Galilee. This policy causes significant shifts in other regions as well, most prominently in the Shfela region. Even a larger effect between the Galilee and the Negev is also observed for the blue-collar workers (see line 4 of Table 16b). A huge fraction of almost 48% is now residing and working in the Galilee. While there is a significant effect on the Negev, the magnitude is much smaller (only a 5.6 percentage point increase).

Overall, we see moderate changes in the conditional distributions of work location, conditional on the residential location, for the white-collar workers, as is indicated by the results reported in Panel E of Table 17. Recall that white-collar workers can live and work in separate regions. Nevertheless, due to the relatively large commuting costs, individuals who relocate themselves to the Galilee and the Negev also tend to work in these two regions.

Overall, the rental subsidy policy seems to be quite effective in causing individuals to relocate themselves into the Galilee and the Negev. It is important to note though the vastly different implication for the Negev and the Galilee, largely because these two regions are very different in nature. What we see is that what may work for the Galilee is not as effective for the Negev. If the government's goal is to draw individuals to live in the Negev, it should provide them with a different set of incentives from those it provides individuals choosing to live in the Galilee.

7.4 Residential Location Lump-Sum Subsidy

The Israeli government has tried a number of policies of various housing subsidies over the years. For the earlier immigration waves from the USSR during the early 1970s the government simply allocated housing units in certain geographical areas according to some criteria based on family size, etc. For recent immigration waves the government simply allocated a lump-sum of money that the immigrants could use as they deemed appropriate. Both policies raised great deal of criticism from various political groups. In any case, both policies had only limited success in achieving the ultimate goal of relocating new immigrants to the Negev and the Galilee. The policy we consider here is a variation on the two policies described above. Under this policy an individual gets, upon arrival in Israel, a lump-sum subsidy of 57,000 NIS, provided that he chooses to reside in either the Negev or the Galilee. If at some point the immigrant relocates himself to a different region of the country within the first 10 years after arrival in Israel, he has to return 61,000 NIS to the government.[27] This is one of the most direct policies one can imagine, so one might expect it to be the most effective. The results of this simulation are provided in Panel F of Tables 13 through 17.

First note from Panel F of Table 13 that this policy has a significant effect on the distribution of employment status across years. First, more individuals are drawn into the non-employment status shortly after their arrival in Israel. Specifically, this policy raises the value of residing and thus draws more individuals who decide to live in the Negev and the Galilee. It also makes it possible for the individuals to be more selective in choosing among the jobs they are offered. By period 10 the distribution of employment status is similar to that under the base model, except that now the fraction of individuals in the blue-collar occupations is somewhat higher, while the fraction in the white-collar occupations is somewhat lower, compared with the base model.

Panel F in Tables 14a and 14b shows a dramatic effect on the work location in both the white-collar sector (Table 14a) and the blue-collar sector (Table 14b). For the white-collar workers the fraction of individuals increases by 31 percentage points, from 13.7% to almost 45% in the Galilee, and from about 11% to 35% in the Negev. For the blue-collar workers the increase in the Galilee is even more dramatic, from 18% to 54%, while in the Negev it is essentially the same as for the white-collar workers. The reason for these phenomena is that in the Galilee the labor market is more attractive, in terms of wage offers and dismissal probabilities, and the regional amenities dominate those of the Negev.

This policy is aimed at having people reside in the Negev and the Galilee. And Panel F of Table 15 indicates that indeed there are large increases in both the Galilee and the Negev, similar to the increases in work location, largely because all of those who reside in the Negev work in the Negev, and most of those who live in the Galilee work there as well. Consequently, in all other regions the fraction of immigrants declines, most notably in the Shfela and Haifa regions.

The overall effect is captured in Panel F of Table 16a for the white-collar workers. We see that the fraction of individuals who reside and work in the Galilee increases from 10.4% under the base model to almost 47% under the lump-sum policy experiment. The increase in the Negev is also quite large, from about 13% under the base scenario to over 33% under this policy. The effect for the blue-collar workers is enormous for the Galilee, raising the fraction of blue-collar workers from about 16% to over 70%. In the Negev the effect is more modest, where there is an increase from about 13% to almost 25%.

Finally, Panel F of Table 17 shows that the vast changes in the residential choices across regions

[27] The exact total cost for the government of implementing this policy is 39.5 million NIS in 1994 prices for 697 individuals.

have very little effect on the distribution of work location, conditional on the residential location, for workers in all regions.

Overall, it seems that a lump-sum subsidy is most effective in achieving the goals stated by the Israel government over the years. This is because it gives individuals huge incentives to live in the Galilee and the Negev, while allowing them to have the time needed to obtain a job by making the value of non-employment significantly higher than in other regions.

8 Conclusions

In this study we develop a dynamic model and empirically examine the regional location choices and labor market outcomes of migrant workers. We focus here on the group of immigrants who came to Israel from the former USSR during the period 1989 to 1995. While the role of the government in relocating this massive wave of immigrants is indeed an important issue, the focus on the group of immigrants is not because they are immigrants per se. Rather, this group of individuals is significantly more likely to migrate across regions of the country than are native Israelis. Thus, any potential policy that does not work for this group of individuals is unlikely to work for native Israelis. Specifically, we focus here on measuring and examining the consequences of the Israeli government intervention in the housing market on the labor market outcomes of these new immigrants. These immigrants were allowed to freely choose their first residential location anywhere in the country. However, the government had established a number of policies in the housing market to influence these first location choices and, consequently, all subsequent relocation choices. The Israeli government altered building costs of housing, as well as prices, across all regions of the country. The government did that by providing economic incentives for builders on one side and by offering differential mortgage subsidies across the different regions for potential buyers.

In order to examine the impact of the housing market intervention on regional location choices and labor market outcomes, we develop and estimate a dynamic programing discrete choice model of employment and location choices, using longitudinal data on male immigrants from the USSR (who declared themselves engineers upon arrival in Israel) who arrived in Israel between 1989 and 1995. The model developed addresses several important features that were found in a few other studies to be vital in understanding and explaining the migration behavior of these immigrants across regions of the country. We explicitly account for the housing costs, the traveling costs from the region of residence to the region of employment, and the effect of changes in the underlying economic variables on the reallocation decisions of these individuals. We include a number of new features. Specifically, we include the regional housing cost function, which depends on individual and family characteristics. We also specify region- and occupation-specific wage functions for two general occupation categories: white- and blue-collar occupations.

The results shed new and important light on several issues regarding the large immigration wave from the former USSR from 1989 to 1995. The results also shed light on several issues that have been debated among policymakers in Israel regarding residential location, work location, and, most importantly, work-residential location combinations. We find that the job market experience accumulated by workers before coming to Israel has no effect on any labor market outcome in Israel. It has no effect on the job offer probability or on the wage in either the white-collar or blue-collar sectors. We also find significant differences in the wage offer functions for the white-collar workers across the regions. The regional differences for the blue-collar workers are not as pronounced.

We find that there are enormous traveling costs associated with commuting for work from one region to another. Consequently, individuals tend to live close to where they work. Most commuters who travel across regions do so to regions adjacent to their residence. In far away regions, such as the Negev, individuals almost exclusively work and reside in the same region.

The model performs very well in terms of its predictions. For virtually all key variables the model's predictions are quite close to the observed data. This includes the predictions of the various wage functions, as well as the residential, work patterns, and the joint distribution of work-residence location. This gives us confidence in the usefulness of the policy simulations that are carried out.

We examine a number of policies that are designed to give citizens incentives to reside and work outside of the main urban areas, and specifically to move into the northern region of the Galilee and southern region of the Negev. The four simulations that we conduct include: (a) wage subsidy to all workers in the Galilee and Negev of 22.5% of their wages; (b) transportation subsidy of 73.5% to all workers who commute outside the regions of Tel Aviv, Haifa, and Jerusalem; (c) rent subsidy of 100% to all workers residing in the Galilee and the Negev; and (d) lump-sum residential subsidy of 57,000 NIS to all individuals who choose to settle in either the Galilee or the Negev. Versions of all policies have been seriously discussed, and implemented, by policymakers over the years. To make the comparison among the various policies meaningful, we constrain the costs for each of the four alternatives to be about 40 million NIS, per a group of 700 individuals.

We find that while some of the policy measures have significant effects in the desired directions, others are questionable at best. The usefulness of the transportation subsidy is particularly questionable because it does not achieve the goal of moving individuals from the main urban areas into the periphery. Given its small effect, it seems extremely expensive to implement. Moreover, if anything, it will induce more traffic in already congested areas. In complete contrast, we find the lump-sum subsidy the most effective in achieving the goal of moving individuals to the Galilee and the Negev regions. Given the large transportation costs from these two regions, we find that most individuals who choose to live in these two regions prefer to work in them as well. However, this policy seems to be significantly more effective in moving individuals into the Galilee than into the Negev. The Israeli government has always had very similar policies regarding the Negev and the Galilee, largely for political reasons, ignoring the differential economic incentives that individuals in the two regions face. Our results clearly indicate that considerably more resources would be required to induce migration into the Negev of similar magnitude to that into the Galilee. We find the rental policy also to be quite effective in creating incentives for individuals to move to the

Negev and Galilee, although it is not as effective, requiring more administrative oversight. Finally, we find the wage subsidy to be the least effective. While it does seem to create incentives that propel individuals to work and reside in the Negev and the Galilee, it is not as effective as the lump-sum subsidy. Moreover, the estimates obtained here only provide the upper bound on the potential effects, because they do not take into account general equilibrium effects that are likely to take place. Like the rental subsidy, it is also administratively difficult to maintain.

A key lesson that we learn from our study is that the policies can be effective only within a particular framework. It is therefore important to model in detail the different features—particularly wage, housing market, and local labor market conditions—in order to properly evaluate possible policy measures. While more work, using more detailed data, is certainly required, the study reported in this paper makes a few important steps in the right direction.

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Table 1: Descriptive Statistics

Variable	Mean	St. Dev.	Obs.
General Variables:			
Employed	.87	—	655
Monthly Earnings	3,740	(1,738)	571
Monthly Housing Costs	1000	(604)	677
Months In Israel	46.68	(16.45)	697
Age	42.01	(8.65)	697
Years of Education	16.45	(1.60)	697
Previous Experience	16.11	(8.54)	697
Married	.89	—	697
Children under 21 Living at Home	1.11	(.86)	
Years of Education of Spouse	14.98	(2.07)	624
From Ukraine	.31	—	697
From Belorussia	.11	—	697
From Russia	.32	—	697
Year of Arrival			697
1989	.01	—	
1990	.40	—	
1991	.19	—	
1992	.15	—	
1993	.16	—	
1994	.09	—	
Monthly Earnings:			
Semester 1	NA	NA	—
Semester 2	2,599	579	15
Semester 5	2,909	835	33
Semester 8	3,446	1,478	34
Semester 11	4,190	2,065	121
Monthly Housing Costs:			
Semester 1	NA	NA	—
Semester 2	1,398	1,459	18
Semester 5	1,058	421	46
Semester 8	940	409	40
Semester 11	918	433	141

Note: The first four variables, the monthly housing costs and the monthly earnings are measured at the time of the survey in 1995. The remaining variables are measured at the time of arrival.

Table 2a: Residential Locations, by Period (row percentage)

Semester	Tel Aviv	Sharon	Shfela	Haifa	Galilee	Negev	Jerus.	Obs
1.	10.6	9.6	29.8	16.3	13.8	11.4	8.4	667
2.	10.9	10.0	29.6	15.3	13.8	12.5	8.1	682
3.	10.5	10.5	28.2	14.6	14.5	13.6	8.1	664
4.	10.6	10.1	28.8	14.5	14.3	13.5	8.2	635
5.	9.7	10.7	29.6	14.4	14.9	12.9	8.0	599
6.	8.8	10.1	29.6	14.4	16.0	13.5	7.6	555
7.	8.7	9.8	29.7	14.4	16.7	12.8	7.9	492
8.	8.4	8.9	30.3	14.0	17.3	14.0	7.2	429
9.	7.2	9.0	30.8	14.6	18.0	13.6	6.9	390
10.	6.7	8.9	31.4	16.5	16.5	12.4	7.6	315
11.	4.5	7.9	31.1	18.6	18.6	10.2	9.0	177

Table 2b: Distribution of Employment Status, by Period (row percentage)

Semester	Non-Empl.	White-Collar	Blue-Collar
1.	76.5	2.4	21.1
2.	27.8	12.3	59.8
3.	18.0	15.2	66.8
4.	16.3	18.5	65.2
5.	13.4	21.5	65.2
6.	12.2	24.2	63.7
7.	9.9	28.1	62.0
8.	11.1	30.2	58.7
9.	10.5	31.5	58.1
10.	10.5	33.3	56.2
11.	9.0	36.7	54.2

Table 2c: Employment Status by Region of Residence (column percentage)

	Tel Aviv	Sharon	Shfela	Haifa	Galilee	Negev	Jerus.
Whole Sample:							
Non-employment	20.7	19.2	18.0	31.2	23.6	24.1	22.0
Blue-Collar	66.3	61.8	57.4	50.8	56.8	50.6	62.9
White-Collar	12.9	19.0	24.6	18.0	19.7	25.3	15.1
Obs. (total $= 5,640$)	526	552	1,679	850	865	723	445
Semester 1:							
Non-employment	70.4	82.8	65.8	88.1	82.6	75.0	82.1
Blue-Collar	28.2	15.6	31.7	11.0	16.3	17.1	14.3
White-Collar	1.4	1.6	2.5	0.9	1.1	7.9	3.6
Obs. (total $= 667$)	71	64	199	109	92	76	56
Semester 2:							
Non-employment	29.7	25.0	23.3	35.6	26.6	29.4	30.9
Blue-Collar	64.9	61.8	64.3	51.9	62.8	52.9	54.5
White-Collar	5.4	13.2	12.4	12.5	10.6	17.7	14.6
Obs. (total $= 682$)	74	68	202	104	94	85	55
Semester 5:							
Non-employment	13.8	9.4	8.5	24.4	15.7	15.6	8.3
Blue-Collar	74.1	70.3	66.1	57.0	67.4	53.2	72.9
White-Collar	12.1	20.3	25.4	18.6	16.9	31.2	18.8
Obs. (total $= 599$)	58	64	177	86	89	77	48
Semester 8:							
Non-employment	2.8	10.5	8.5	16.6	10.8	16.7	9.7
Blue-Collar	75.0	63.2	53.8	56.7	59.5	48.3	77.4
White-Collar	22.2	26.3	37.7	26.7	29.7	35.0	12.9
Obs. (total $= 429$)	36	38	130	60	74	60	31
Semester 11:							
Non-employment	25.0	7.2	5.4	9.1	6.1	16.7	12.5
Blue-Collar	50.0	71.4	47.3	57.6	51.5	50.0	68.7
White-Collar	25.0	21.4	47.3	33.3	42.4	33.3	18.8
Obs. (total $= 177$)	8	14	55	33	33	18	16

Table 3: Percentage of Residential-Work Locations for White-Collar Workers

Residential Location	Employment Location							
	Tel Aviv	Sharon	Shfela	Haifa	Galilee	Negev	Jerus.	Obs
Tel Aviv	57.6	3.4	39.0	—	—	—	—	95
Sharon	47.5	30.3	14.1	8.1	—	—	—	123
Shfela	26.0	5.1	58.1	4.1	3.3	0.5	2.8	474
Haifa	—	—	—	90.6	9.4	—	—	166
Galilee	—	1.3	3.3	32.0	63.4	—	—	178
Negev	1.9	—	7.4	—	—	88.7	—	203
Jerusalem	—	—	—	—	—	—	100.0	83

Table 4: OLS Log Monthly Housing Costs Regressions

Variable	(1)	(2)	(3)
Married	.157	.537	.465
	(.086)	(.234)	(.221)
One Child	.166	.119	.110
	(.059)	(.058)	(.055)
Two Children	.208	.132	.142
	(.063)	(.068)	(.064)
More than 2 Children	.056	-.045	-.059
	(.166)	(.173)	(.160)
Renting	.365	.374	.233
	(.053)	(.066)	(.066)
Education	—	.013	.010
		(.015)	(.014)
Previous Exp.	—	.021	.016
		(.014)	(.012)
Previous Exp. Sq.	—	-.0005	-.0004
		(.0003)	(.0003)
Age >= 40	—	-.141	-.139
		(.075)	(.071)
Sharon	—	—	-.026
			(.079)
Shfela	—	—	-.062
			(.059)
Haifa	—	—	-.304
			(.071)
Galilee	—	—	-.532
			(.085)
Negev	—	—	-.661
			(.108)
Jerusalem	—	—	-.048
			(.099)
Other Regressors	No	Yes	Yes
RMSE	.5924	.5887	.5406
R Sq.	.0873	.1221	.2667
N	677	674	674

Note: Other regressors include dummies for length of time in the country (six month periods), dummies for republic of origin (Ukraine, Belarus, Russia) and years of education of the spouse. Approximately one-third of the individuals in the sample are renting. Robust standard errors are in parentheses. Each column in the table represents a different regression with the same dependent variable, but different explanatory variables.

Table 5: OLS Employment and Log Monthly Earnings Regressions

	Employment			Log Monthly Earnings		
Variable	(1)	(2)	(3)	(4)	(5)	(6)
Education	.0049	.0062	.0060	-.0130	-.0131	-.0133
	(.0091)	(.0092)	(.0090)	(.0097)	(.0096)	(.0097)
Previous Exp.	.0235	.0232	.0234	.0044	-.0022	-.0031
	(.0079)	(.0080)	(.0078)	(.0083)	(.0080)	(.0080)
Previous Exp. Sq.	-.0006	-.0006	-.0006	-0.0003	-0.0002	-0.0001
	(.0002)	(.0002)	(.0002)	(.0002)	(.0002)	(.0002)
Age $\geq$ 40	-.0752	-.0852	-.0925	-.1130	-.0875	-.0835
	(.0422)	(.0435)	(.0426)	(.0581)	(.0545)	(.0552)
Sharon	—	—	.0127	—	—	.0297
			(.0476)			(.0700)
Shfela	—	—	-.0401	—	—	.1030
			(.0403)			(.0558)
Haifa	—	—	-.1756	—	—	.0762
			(.0583)			(.0737)
Galilee	—	—	-.0723	—	—	-.0709
			(.0474)			(.0635)
Negev	—	—	-.1585	—	—	.0406
			(.0527)			(.0644)
Jerusalem	—	—	-.0920	—	—	-.0278
			(.0619)			(.0742)
Other Regressors	No	Yes	Yes	No	Yes	Yes
RMSE	.3346	.3333	.3290	.3867	.3587	.3583
R^2	.0353	.0690	.1013	.1198	.2411	.2510
Observations	655	652	652	568	565	565

Note: See note in Table 4.

Table 6: Utility of Non-Employment

No.	Variable	Coeff. Est.	St. Err.	Coeff. Est.	St. Err.	Coeff. Est.	St. Err.	Coeff. Est.	St. Err.
Value of Non-Employment, $b_{1rt}\,(\varepsilon_{i1rt})$:									
		α (for $t=1$)							
1.	Tel Aviv	1,098	21.8						
2.	Sharon	1,314	376.4						
3.	Shfela	4,583	7.1						
4.	Haifa	3,429	2.1						
5.	Galilee	5,768	4.8						
6.	Negev	2,034	7.8						
7.	Jerusalem	6,575	5.9						
Preference for Residential Location, $\tau_r\,(x_{it}, \mu_{ir})$:									
		τ_0		τ_1 (Ukraine)		τ_2 (Belarus)		τ_3 (Russia)	
8.	Tel Aviv	0	—	0	—	0	—	0	—
9.	Sharon	7,810	3.0	-3,397	4.0	-3,301	8.5	-5,361	7.8
10.	Shfela	8,114	1.9	-5,127	3.8	2,246	113.1	-4,811	2.4
11.	Haifa	-687	1.0	2,616	2.6	7,430	23.0	2,320	2.7
12.	Galilee	1,313	3.0	-1,177	2.5	6,135	9.9	-1,952	3.4
13.	Negev	-7,097	4.0	4,980	4.7	12,130	83.0	9,187	8.4
14.	Jerusalem	0	—	0	—	0	—	0	—
Housing Cost, $hc_{rj}\,(x_{it})$:									
		γ_0							
15.	Tel Aviv	7.04	0.002						
16.	Sharon	6.90	0.002						
17.	Shfela	6.84	0.001						
18.	Haifa	6.69	0.001						
19.	Galilee	6.45	0.001						
20.	Negev	6.19	0.002						
21.	Jerusalem	6.86	0.002						
		γ_1 (Married)		γ_2 (Children)		γ_3 (Type 2)		γ_4 (Type 3)	
22.	All regions	0.0038	0.00005	0.0225	0.00001	0.1736	0.00005	0.3882	0.0003
		$\sigma^2_{\varepsilon_1}$							
23.	All regions	7.15	0.001						

$$
\begin{aligned}
u_{i1rt}(z_{it}, t) &= b_{1rt}(\varepsilon_{i1rt}) + \tau_r(x_{it}, \mu_{ir}) - hc_{rj}(x_{it}) - \gamma_j I\,(r_t \neq r_{t-1})\,, \\
b_{1rt}\,(\varepsilon_{i1rt}) &= \alpha_r I\,(t=1) + \exp\,(\varepsilon_{i1rt})\,, \\
\tau_r\,(x_{it}, \mu_{ir}) &= \tau_r(x_i, \mu_{ri}) = \tau_{0r} + \tau_{1r} R_{1i} + \tau_{2r} R_{2i} + \tau_{3r} R_{3i}, \\
hc_{rj}\,(x_{it}) &= 6 * \exp\left\{\gamma_{0r} + \gamma_1 M_{it} + \gamma_2 NK_{it} + \gamma_3 Type_{2i} + \gamma_4 Type_{3i}\right\}
\end{aligned}
$$

Table 7: Utility from Employment in White-Collar Occupations

No.	Variable	Coeff. Est.	St. Err.	Coeff. Est.	St. Err.	Coeff. Est.	St. Err.	Coeff. Est.	St. Err.
Log wage, $\ln w_{jkrit}(x_i, x_t)$:									
		β_{02r}							
1.	Tel Aviv	8.779	0.002						
2.	Sharon	8.500	0.003						
3.	Shfela	8.719	0.001						
4.	Haifa	8.782	0.001						
5.	Galilee	8.820	0.001						
6.	Negev	8.470	0.003						
7.	Jerusalem	8.583	0.001						
		β_{21}		β_{22}		β_{23}		β_{24}	
8.	All regions	-0.0351	0.000007	-0.0054	0.000002	0.0000	–	0.0363	0.00001
		β_{25}		β_{26}		β_{27}		β_{28}	
9.	All regions	-0.0001	0.00000008	0.1152	0.0095	0 .1284	0.00006	-0.1811	0.0003
Travelling Costs $tc(r, r')$:									
		tc_1		tc_2		tc_3			
10.	All regions	8,087	1.6	80,821	123.8	19,930	8.0		
Error Structure:									
		ρ_2		$\sigma^2_{v_2}$					
11.	All regions	0.5500	0.0002	0.351	0.00008				

$\tau_r(x_{it}, \mu_{ir})$: As in Table 6

$hc_{rj}(x_{it})$: As in Table 6

$$u_{i2rt}(z_{it}, t) = 6 \cdot w_{2rt}(x_i, x_{2t})e^{\varepsilon_{2rt}} + \tau_r(x_i, \mu_{ir}) - hc_r(x_i) - \gamma_j I(r_t \neq r_{t-1}) - tc(r, r'),$$

$$\ln w_{2rit}(x_i, x_t) = \beta_{02r} + \beta_{21}S_i + \beta_{22}x_{0i} + \beta_{23}x_{0i}^2 + \beta_{24}x_{kt} + \beta_{25}x_{kt}^2$$
$$+\beta_{26}I(\text{age}_i >= 40) + \beta_{27}Type_{1i} + \beta_{28}Type_{2i} + \rho_2\varepsilon_{i2rt},$$

$$\varepsilon_{i2rt} = \rho_2\varepsilon_{i2rt-1} + \nu_{i2rt},$$

$$tc_1 = tc_{1,2}, tc_{1,3}$$

$$tc_2 = tc_{1,4}, tc_{1,5}, tc_{1,6}, tc_{1,7}, tc_{2,5}, tc_{2,6}, tc_{2,7}, tc_{3,5}tc_{3,6}tc_{3,7}, tc_{4,6}tc_{4,7}, tc_{5,6}, tc_{5,7}, tc_{6,7}$$

$$tc_3 = tc_{2,3}, tc_{2,4}, tc_{3,4}, tc_{4,5}$$

Table 8: Utility from Employment in Blue-Collar Occupations

No.	Variable	Coeff. Est.	St. Err.	Coeff. Est.	St. Err.	Coeff. Est.	St. Err.	Coeff. Est.	St. Err.
Log Wage, $\ln w_{jkrit}(x_i, x_t)$:									
		β_{03r}							
1.	Tel Aviv	8.410	0.002						
2.	Sharon	8.322	0.002						
3.	Shfela	8.389	0.001						
4.	Haifa	8.383	0.002						
5.	Galilee	8.380	0.002						
6.	Negev	8.340	0.001						
7.	Jerusalem	8.419	0.002						
8.	All regions	β_{31}		β_{32}		β_{33}		β_{34}	
		-0.0350	0.00001	Same as β_{22}		0.0000	—	0.0355	0.00002
9.	All regions	β_{35}		β_{36}		β_{37}		β_{38}	
		-0.0001	0.0000002	Same as β_{26}		-0.3807	0.0004	0.4064	0.0003
Error Structure:									
10.	All regions	ρ_3		$\sigma^2_{\varepsilon_3}$					
		0.5500	0.0005	0.299	0.0001				

$hc_{rj}(x_{it})$: As in Table 6

$\tau_r(x_{it}, \mu_{ir})$: As in Table 6

$$\ln w_{3rit}(x_i, x_t) = \beta_{03r} + \beta_{31} S_i + \beta_{32} x_{0i} + \beta_{33} x_{0i}^2 + \beta_{34} x_{kt} + \beta_{35} x_{kt}^2$$
$$+ \beta_{36} I(\text{age}_i >= 40) + \beta_{37} Type_{1i} + \beta_{38} Type_{2i} + \varepsilon_{i3rt},$$

$$\varepsilon_{i3rt} = \rho_3 \varepsilon_{i3rt-1} + \nu_{i3rt},$$

Table 9: Probability of Losing Job, by Type, Λ_{kj}

No.	Occupation	Coeff. Est.	St. Err.	Coeff. Est.	St. Err.	Coeff. Est.	St. Err.
		η_k of Type 1		η_k of Type 2		η_k of Type 3	
1.	White-collar	-5.860	0 .205	-9.282	0.155	-4.255	0.005
	Implied prob.	0.0028		0.00009		0.0140	
2.	Blue-collar	-5.229	0.007	Same as above		Same as above	
	Implied prob.	0.0053					

$$\Lambda_{kj} = \exp\left(\eta_{kj}\right) / \left(1 + \exp\left(\eta_{kj}\right)\right) \text{ for } k = 1, 2;\ j = 0, 1, 2.$$

Table 10: Probability of Job Arrival, by Type

No.	Variable	Coeff. Est.	St. Err.	Coeff. Est.	St. Err.	Coeff. Est.	St. Err.
		White-Collar, $\lambda_{10}(r)$		Blue-Collar, $\lambda_{20}(r)$			
1.	Tel Aviv	-2.586	0.0009	2.602	0.0066		
2.	Sharon	-3.270	0.0008	1.780	0 .0016		
3.	Shfela	-2.330	0.0007	1.732	0.0009		
4.	Haifa	-2.395	0.0016	2.270	0.0041		
5.	Galilee	-2.649	0.0010	1.980	0.0016		
6.	Negev	-1.682	0.0015	2.010	0.0031		
7.	Jerusalem	-2.169	0.0010	2.660	0.0029		
		λ_1		λ_2		λ_3	
8.	White-collar	-0.150	0.00003	1.000	0.0003	0.037	0.000007
9.	Blue-collar	Same as above		Same as above		Same as above	
		λ_4		λ_5		λ_6	
10.	White-collar	0.140	0.00004	-.0006	0.0000005	2.820	0.0005
11.	Blue-collar	0.142	0.0001	-0.0005	0.0000006	-1.804	0.0009
		λ_7					
12.	White-collar	1.070	0.0005				
13.	Blue-collar	0.680	0.0013				
		white-ψ		blue-ψ			
14.	P_{krit} for $t=1$	0.076	0.00005	0.071	0.00019		

$$
\begin{aligned}
P_{krit} &= \psi_k \exp(A_{krit}) / (1+\exp(A_{krit})), \quad \text{if } t=0 \\
&= \exp(A_{krit}) / (1+\exp(A_{krit})), \quad \text{otherwise,} \\
A_{krit} &= \lambda_{0r} + \lambda_{k1} S + \lambda_{k2} I\,(\text{Occ. } 0 \text{ at } t-1) + \lambda_{k3} \cdot \text{age at arrival} \\
&+\lambda_{k4} \cdot t + \lambda_{k5} \cdot t^2 + \lambda_{k6} Type_{2i} + \lambda_{k7} Type_{3i}, \\
t &= \text{time since arrival in Israel.}
\end{aligned}
$$

Table 11: Other Parameters

	Coeff. Estimate	Standard Error	Coeff. Estimate	Standard Error	Coeff. Estimate	Standard Error
Type-specific parameter:						
	Type 1		Type 2		Type 3	
1. Prob. param, φ	—	—	1.967	0.105	1.296	0.118
Implied probabilities	0.084		0.606		0.310	
2. Moving costs	118,184	49	104,820	22	40,134	15
Standard deviation of measurement errors						
3. Wages	0.363	0.012				
4. Cost of housing exp (κ)	0.6114	0.023				
Base classification error rate:						
5. Parameter, ϑ	0.762	0.014				
Implied probability	0.682					

$\pi_j = \Pr(Type\ j) = \exp(\varphi_j) / (1 + \exp(\varphi_1) + \exp(\varphi_2))\,,\ j = 2, 3.$

$\pi_0 = \Pr(Type\ 1) = 1 - \pi_1 - \pi_2.$

$c = \exp(\vartheta)/ (1 + \exp(\vartheta)) = 0.682 = 1 - \text{Classification error}.$

Table 12a: Summary Statistics for Actual and Predicted Monthly Wage Distributions (in 1994 New Israeli Shekel)

Statistic	Actual			Predicted		
	All	White	Blue	All	White	Blue
Mean	3,756	4,955	3,298	3,740	4,850	3,300
Median	3,348	4,560	3,037	3,346	4,560	3,037
St. deviation	1,734	2,172	1,266	1,661	1,951	1,259
Inter-quartile range	1,671	2,353	1,319	1,670	2,352	1,322

Table 12b: Wages Under Random Allocation and Model Prediction

	Work Location						
	Tel Aviv	Sharon	Shfela	Haifa	Galilee	Negev	Jerusalem
White-Collar Wages:							
Actual	5,500	4,246	5,072	5,524	5,767	3,959	4,414
Predicted	5,335	4,150	5,000	5,467	5,694	3,827	4,387
Random Allocation	4,790	3,658	4,512	4,811	4,950	3,509	3,962
Blue-Collar Wages:							
Actual	3,027	3,281	3,330	3,298	3,412	3,378	3,171
Predicted	3,099	3,128	3,453	3,118	3,472	3,349	2,975
Random Allocation	3,003	2,764	2,953	2,947	2,955	2,804	3,041

Table 13: Employment Status, by Semester

A. Actual Data

Employment Status	Semester 1	2	3	4	5	6	7	8	9	10	11
Non-employed	.765	.278	.180	.163	.134	.122	.099	.111	.105	.105	.090
White-collar	.024	.123	.152	.185	.215	.242	.281	.302	.315	.333	.367
Blue-collar	.211	.598	.668	.652	.652	.637	.620	.587	.581	.562	.542

B. Basic Model

Employment Status	Semester 1	2	3	4	5	6	7	8	9	10	11
Non-employed	.753	.297	.195	.156	.139	.126	.115	.111	.105	.097	.098
White-collar	.023	.112	.154	.183	.207	.235	.261	.285	.311	.335	.387
Blue-collar	.224	.591	.651	.661	.654	.639	.624	.604	.584	.568	.515

C. Wage Subsidy Simulation

Employment Status	Semester 1	2	3	4	5	6	7	8	9	10	11
Non-employed	.750	. 283	.188	.146	.129	.120	.111	.107	.103	.100	.095
White-collar	.024	.119	.162	.192	.217	.242	.266	.290	.315	.339	.363
Blue-collar	.226	.598	.650	.662	.654	.638	.623	.603	.582	.561	.542

D. Transportation Subsidy Simulation

Employment Status	Semester 1	2	3	4	5	6	7	8	9	10	11
Non-employed	.753	.273	.177	.143	.126	.119	.111	.106	.101	.098	.096
White-collar	.023	.147	.195	.224	.249	.274	.300	.326	.353	.379	.403
Blue-collar	.224	.580	.628	.633	.625	.607	.589	.568	.546	.523	.501

E. Rent Subsidy Simulation

Employment Status	Semester 1	2	3	4	5	6	7	8	9	10	11
Non-employed	.754	.303	.202	.159	.138	.127	.118	.113	.108	.102	.099
White-collar	.023	.106	.145	.173	.197	.220	.244	.267	.292	.316	.340
Blue-collar	.223	.591	.653	.668	.665	.653	.638	.620	.600	.582	.561

F. Residential Location Lump-Sum Subsidy

Employment Status	Semester 1	2	3	4	5	6	7	8	9	10	11
Non-employed	.843	.349	.228	.176	.148	.135	.127	.120	.116	.110	.107
White-collar	.022	.091	.126	.152	.175	.197	.219	.241	.264	.289	.312
Blue-collar	.135	.560	.646	.672	.677	.668	.654	.639	.620	.601	.581

Table 14a: Work Location, by Semester, for White-Collar Workers

A. Actual Data

Region	Semester 1	2	3	4	5	6	7	8	9	10	11
Tel Aviv	.214	.224	.208	.209	.192	.189	.168	.170	.171	.144	.070
Sharon	.000	.066	.073	.046	.050	.047	.031	.051	.054	.056	.053
Shfela	.143	.158	.208	.255	.267	.268	.298	.280	.279	.322	.351
Haifa	.071	.211	.188	.164	.167	.173	.191	.195	.189	.189	.246
Galilee	.071	.105	.094	.109	.108	.118	.107	.119	.126	.144	.175
Negev	.357	.145	.135	.136	.142	.142	.145	.144	.135	.111	.070
Jerusalem	.143	.092	.094	.082	.075	.063	.061	.042	.045	.033	.035

B. Basic Model

Region	Semester 1	2	3	4	5	6	7	8	9	10	11
Tel Aviv	.115	.173	.185	.190	.194	.197	.196	.197	.197	.190	.190
Sharon	.060	.068	.060	.054	.048	.044	.040	.039	.037	.036	.038
Shfela	.148	.226	.240	.250	.256	.260	.260	.263	.267	.257	.256
Haifa	.141	.171	.171	.168	.165	.165	.170	.175	.180	.190	.189
Galilee	.118	.128	.125	.123	.120	.120	.123	.128	.128	.137	.133
Negev	.251	.149	.141	.140	.141	.136	.133	.120	.114	.107	.108
Jerusalem	.167	.085	.078	.075	.076	.078	.078	.078	.077	.083	.086

C. Wage Subsidy Simulation

Region	Semester 1	2	3	4	5	6	7	8	9	10	11
Tel Aviv	.111	.135	.144	.148	.150	.152	.152	.152	.151	.149	.147
Sharon	.061	.054	.048	.043	.039	.036	.034	.032	.030	.030	.029
Shfela	.153	.187	.193	.197	.200	.201	.201	.201	.200	.199	.198
Haifa	.137	.158	.153	.146	.141	.138	.138	.137	.138	.138	.138
Galilee	.120	.171	.180	.186	.191	.195	.201	.206	.212	.219	.226
Negev	.260	.225	.219	.219	.218	.217	.213	.211	.208	.205	.202
Jerusalem	.158	.070	.063	.061	.061	.061	.061	.061	.061	.060	.060

D. Transportation Subsidy Simulation

Region	Semester 1	2	3	4	5	6	7	8	9	10	11
Tel Aviv	.112	.123	.137	.145	.152	.156	.159	.160	.160	.159	.158
Sharon	.062	.087	.093	.095	.095	.094	.091	.087	.083	.079	.075
Shfela	.156	.216	.232	.246	.256	.264	.269	.275	.280	.283	.287
Haifa	.139	.136	.139	.143	.145	.148	.150	.152	.153	.155	.156
Galilee	.118	.150	.153	.156	.157	.157	.159	.159	.161	.163	.165
Negev	.254	.238	.200	.169	.147	.132	.121	.115	.110	.107	.104
Jerusalem	.159	.050	.046	.046	.048	.049	.051	.052	.053	.054	.055

Table 14a: (Continued)

E. Rent Subsidy Simulation

	Semester										
Region	1	2	3	4	5	6	7	8	9	10	11
Tel Aviv	.111	.117	.122	.124	.126	.128	.129	.129	.129	.128	.127
Sharon	.061	.045	.040	.035	.033	.031	.029	.028	.027	.026	.025
Shfela	.153	.166	.168	.170	.171	.171	.172	.171	.171	.169	.169
Haifa	.138	.174	.164	.152	.141	.134	.131	.129	.128	.128	.128
Galilee	.120	.204	.221	.232	.242	.248	.254	.261	.267	.274	.280
Negev	.260	.239	.240	.244	.245	.246	.243	.240	.237	.234	.230
Jerusalem	.157	.055	.045	.043	.042	.042	.042	.042	.041	.041	.041

F. Residential Location Lump-Sum Subsidy

	Semester										
Region	1	2	3	4	5	6	7	8	9	10	11
Tel Aviv	.104	.042	.035	.032	.032	.033	.032	.032	.032	.031	.030
Sharon	.055	.017	.013	.011	.010	.010	.009	.009	.008	.008	.007
Shfela	.148	.058	.046	.042	.040	.039	.038	.037	.035	.034	.033
Haifa	.142	.206	.190	.167	.148	.135	.126	.121	.118	.116	.114
Galilee	.129	.295	.338	.366	.386	.401	.416	.426	.437	.447	.457
Negev	.287	.326	.344	.356	.362	.363	.361	.358	.355	.350	.346
Jerusalem	.135	.056	.034	.026	.022	.019	.018	.017	.015	.014	.013

Table 14b: Predicted Work Location, by Semester, for Blue-Collar Workers

B. Basic Model

	Semester										
Region	1	2	3	4	5	6	7	8	9	10	11
Tel Aviv	.148	.076	.071	.068	.067	.063	.063	.061	.060	.058	.063
Sharon	.133	.106	.103	.102	.101	.099	.097	.101	.102	.093	.091
Shfela	.138	.271	.281	.288	.290	.295	.293	.300	.307	.296	.293
Haifa	.152	.162	.165	.163	.160	.160	.165	.163	.164	.175	.169
Galilee	.141	.149	.148	.150	.154	.159	.163	.169	.170	.181	.184
Negev	.133	.137	.134	.135	.135	.133	.131	.119	.114	.110	.114
Jerusalem	.155	.099	.098	.094	.093	.091	.088	.087	.083	.087	.086

C. Wage Subsidy Simulation

	Semester										
Region	1	2	3	4	5	6	7	8	9	10	11
Tel Aviv	.148	.066	.057	.054	.051	.048	.046	.045	.043	.042	.040
Sharon	.129	.088	.083	.079	.077	.075	.075	.072	.070	.066	.064
Shfela	.132	.177	.184	.186	.185	.184	.180	.175	.171	.167	.161
Haifa	.148	.112	.112	.110	.108	.105	.101	.098	.093	.089	085
Galilee	.150	.282	.289	.296	.305	.316	.326	.338	.351	.362	.376
Negev	.142	.194	.198	.201	.202	.204	.205	.208	.212	.216	.219
Jerusalem	.151	.081	.077	.074	.072	.068	.067	.064	.060	.058	.055

D. Transportation Subsidy Simulation

	Semester										
Region	1	2	3	4	5	6	7	8	9	10	11
Tel Aviv	.150	.075	.070	.065	.066	.064	.065	.065	.065	.063	.061
Sharon	.135	.121	.121	.120	.119	.119	.116	.115	.113	.112	.112
Shfela	.138	.266	.274	.280	.282	.285	.288	.290	.292	.293	.296
Haifa	.154	.170	.174	.174	.172	.169	.165	.162	.160	.156	.154
Galilee	.139	.149	.147	.147	.149	.153	.155	.159	.161	.164	.167
Negev	.131	.129	.126	.126	.125	.126	.127	.127	.128	.130	.131
Jerusalem	.153	.090	.088	.088	.087	.084	.084	.082	.081	.082	.080

E. Rent Subsidy Simulation

	Semester										
Region	1	2.	3	4	5	6	7	8	9	10	11
Tel Aviv	.065	.046	.046	.048	.050	.051	.052	.054	.055	.056	.057
Sharon	.076	.064	.067	.066	.065	.064	.066	.064	.064	.063	.063
Shfela	.187	.225	.225	.224	.223	.221	.219	.217	.214	.210	.207
Haifa	.136	.089	.081	.078	.076	.076	.076	.077	.077	.078	.077
Galilee	.120	.288	.297	.299	.299	.300	.302	.307	.312	.319	.325
Negev	.259	.238	.240	.244	.245	.246	.243	.240	.237	.234	.230
Jerusalem	.157	.050	.044	.042	.042	.042	.042	.041	.041	.041	.041

Table 14b: (Continued)

F. Residential Location Lump-Sum Subsidy											
	Semester										
Region	1	2	3	4	5	6	7	8	9	10	11
Tel Aviv	.058	.022	.020	.020	.020	.020	.020	.019	.019	.018	.018
Sharon	.069	.021	.020	.020	.019	.020	.019	.019	.018	.018	.017
Shfela	.181	.059	.049	.046	.044	.042	.041	.040	.039	.038	.036
Haifa	.091	.029	.024	.023	.023	.023	.023	.023	.022	.021	.020
Galilee	.180	.501	.515	.513	.412	.513	.519	.524	.532	.541	.550
Negev	.287	.335	.347	.357	.362	.364	.361	.359	.355	.350	.346
Jerusalem	.134	.033	.025	.021	.020	.018	.017	.016	.015	.014	.013

Table 15: Place of Residence, by Semester

A. Actual Data

Region	Semester 1	2	3	4	5	6	7	8	9	10	11
Tel Aviv	.106	.109	.105	.106	.097	.088	.087	.084	.072	.067	.045
Sharon	.096	.100	.105	.101	.107	.101	.098	.089	.090	.089	.079
Shfela	.298	.296	.282	.288	.296	.296	.297	.303	.308	.314	.311
Haifa	.163	.153	.146	.145	.144	.144	.144	.140	.146	.165	.186
Galilee	.138	.138	.145	.143	.149	.160	.167	.173	.180	.165	.186
Negev	.114	.125	.136	.135	.129	.135	.128	.140	.136	.124	.102
Jerusalem	.084	.081	.081	.082	.080	.076	.079	.072	.069	.076	.090

B. Basic Model

Region	Semester 1	2	3	4	5	6	7	8	9	10	11
Tel Aviv	.112	.105	.103	.102	.102	.094	.090	.087	.085	.083	.080
Sharon	.097	.099	.098	.098	.098	.097	.096	.100	.098	.092	.094
Shfela	.294	.290	.120	.293	.293	.300	.299	.306	.312	.300	.299
Haifa	.152	.157	.158	.155	.152	.154	.160	.160	.166	.177	.174
Galilee	.129	.134	.136	.137	.140	.142	.145	.149	.149	.159	.159
Negev	.128	.127	.127	.129	.129	.128	.127	.115	.110	.106	.109
Jerusalem	.088	.088	.088	.086	.086	.085	.083	.083	.080	.083	.085

C. Wage Subsidy Simulation

Region	Semester 1	2	3	4	5	6	7	8	9	10	11
Tel Aviv	.102	.092	.088	.084	.081	.077	.075	.074	.071	.070	.067
Sharon	.086	.085	.083	.080	.078	.077	.077	.074	.073	.071	.070
Shfela	.207	.204	.203	.202	.202	.201	.200	.199	.197	.195	.193
Haifa	.112	.115	.115	.114	.113	.113	.112	.111	.110	.109	.108
Galilee	.237	.243	.250	.257	.262	.268	.273	.280	.287	.293	.300
Negev	.182	.188	.191	.194	.196	.198	.199	.200	.203	.204	.206
Jerusalem	.074	.073	.070	.069	.068	.066	.064	.062	.059	.058	.056

D. Transportation Subsidy Simulation

Region	Semester 1	2	3	4	5	6	7	8	9	10	11
Tel Aviv	.106	.100	.098	.096	.094	.091	.090	.090	.088	.086	.084
Sharon	.130	.134	.134	.133	.132	.133	.133	.132	.130	.131	.131
Shfela	.280	.277	.278	.279	.181	.282	.284	.285	.287	.287	.288
Haifa	.174	.179	.181	.182	.183	.183	.184	.185	.186	.187	.188
Galilee	.122	.122	.122	.121	.122	.122	.122	.122	.123	.123	.123
Negev	.114	.112	.112	.112	.112	.113	.113	.113	.113	.113	.113
Jerusalem	.074	.076	.085	.077	.076	.076	.074	.073	.073	.073	.073

Table 15: (Continued)

E. Rent Subsidy Simulation

Region	Semester 1	2	3	4	5	6	7	8	9	10	11
Tel Aviv	.101	.092	.087	.085	.082	.078	.076	.075	.073	.071	.069
Sharon	.071	.072	.072	.068	.067	.067	.066	.065	.064	.062	.061
Shfela	.134	.141	.142	.143	.144	.145	.146	.146	.147	.147	.147
Haifa	.066	.070	.070	.071	.071	.070	.069	.069	.068	.068	.067
Galilee	.395	.390	.394	.398	.401	.404	.407	.410	.414	.417	.421
Negev	.183	.186	.188	.189	.190	.192	.193	.193	.194	.194	.195
Jerusalem	.040	.049	.047	.046	.045	.044	.043	.042	.040	.041	.040

F. Residential Location Lump-Sum Subsidy

Region	Semester 1	2	3	4	5	6	7	8	9	10	11
Tel Aviv	.050	.044	.042	.038	.037	.037	.035	.035	.033	.032	.031
Sharon	.019	.014	.014	.014	.013	.012	.012	.011	.012	.011	.011
Shfela	.029	.022	.022	.021	.021	.020	.020	.020	.019	.019	.019
Haifa	.020	.015	.014	.014	.014	.014	.014	.014	.014	.013	.013
Galilee	.644	.645	.645	.645	.645	.645	.646	.646	.647	.647	.648
Negev	.224	.249	.253	.258	.260	.262	.264	.265	.267	.270	.271
Jerusalem	.014	.011	.010	.010	.010	.090	.009	.009	.008	.008	.007

Table 16a: Residence-Work Locations, for White-Collar Workers

A. Actual Data

Place of Residence	Work Location: Tel Aviv	Sharon	Shfela	Haifa	Galilee	Negev	Jerus.	Sum of row
Tel Aviv	3.23	0.19	2.18	0.00	0.00	0.00	0.00	5.60
Sharon	4.46	2.85	1.33	0.76	0.00	0.00	0.00	9.40
Shfela	9.59	1.90	21.46	1.52	1.23	0.19	1.04	36.94
Haifa	0.00	0.00	0.00	11.87	1.23	0.00	0.00	13.11
Galilee	0.00	0.19	0.47	4.65	9.21	0.00	0.00	14.53
Negev	0.28	0.00	1.42	0.00	0.00	13.49	0.00	15.19
Jerusalem	0.00	0.00	0.00	0.00	0.00	0.00	5.22	5.22
Sum of column	17.57	5.13	26.88	18.80	11.68	13.68	6.27	100.00

B. Basic Model

Place of Residence	Work Location: Tel Aviv	Sharon	Shfela	Haifa	Galilee	Negev	Jerus.	Sum of row
Tel Aviv	3.94	0.48	2.15	0.01	0.01	0.01	0.01	6.61
Sharon	4.30	2.74	1.10	1.28	0.01	0.01	0.01	9.44
Shfela	10.87	0.98	22.09	0.01	0.00	0.03	0.03	34.00
Haifa	0.01	0.39	0.00	14.19	2.14	0.01	0.01	16.74
Galilee	0.01	0.00	0.00	1.81	10.41	0.00	0.00	12.24
Negev	0.01	0.00	0.00	0.00	0.00	12.96	0.01	12.98
Jerusalem	0.00	0.00	0.00	0.00	0.00	0.00	7.97	7.98
Sum of column	19.12	4.60	25.35	17.30	12.57	13.03	8.04	100.00

C. Wage Subsidy Simulation

Place of Residence	Work Location: Tel Aviv	Sharon	Shfela	Haifa	Galilee	Negev	Jerus.	Sum of row
Tel Aviv	3.29	0.26	1.31	0.00	0.00	0.00	0.00	4.87
Sharon	3.36	1.88	0.62	0.83	0.00	0.01	0.00	6.69
Shfela	6.75	0.32	16.14	0.01	0.00	0.01	0.01	23.24
Haifa	0.00	0.15	0.00	10.60	2.50	0.00	0.00	13.27
Galilee	0.01	0.00	0.01	1.74	26.96	0.01	0.01	28.74
Negev	0.01	0.00	0.00	0.00	0.00	18.09	0.01	18.11
Jerusalem	0.00	0.00	0.00	0.00	0.00	0.00	5.08	5.08
Sum of column	13.41	2.62	18.08	13.18	29.46	18.13	5.11	100.00

Table 16a: (Continued)

D. Transportation Subsidy Simulation

Place of Residence	Work Location: Tel Aviv	Sharon	Shfela	Haifa	Galilee	Negev	Jerus.	Sum of row
Tel Aviv	3.49	0.53	2.34	0.00	0.25	0.12	0.00	6.73
Sharon	4.56	2.23	5.95	1.01	0.77	0.45	0.00	14.98
Shfela	7.64	2.11	17.71	0.00	1.47	1.01	0.01	29.95
Haifa	0.00	1.54	0.83	14.02	6.99	0.54	0.01	23.92
Galilee	0.00	0.10	0.58	0.94	7.15	0.35	0.00	9.12
Negev	0.00	0.09	0.55	0.00	0.71	7.70	0.00	9.07
Jerusalem	0.00	0.06	0.38	0.00	0.47	0.19	5.11	6.22
Sum of column	15.70	6.65	28.36	15.98	17.81	10.37	5.14	100.00

E. Rent Subsidy Simulation

Place of Residence	Work Location: Tel Aviv	Sharon	Shfela	Haifa	Galilee	Negev	Jerus.	Sum of row
Tel Aviv	3.65	0.29	1.46	0.00	0.00	0.00	0.00	5.41
Sharon	3.03	1.71	0.52	0.70	0.00	0.00	0.00	5.97
Shfela	5.70	0.26	14.17	0.01	0.00	0.01	0.01	20.15
Haifa	0.00	0.09	0.00	7.23	0.63	0.00	0.00	7.96
Galilee	0.01	0.00	0.01	4.89	31.22	0.01	0.01	36.15
Negev	0.01	0.00	0.00	0.00	0.00	20.67	0.01	20.69
Jerusalem	0.00	0.00	0.00	0.00	0.00	0.00	3.67	3.67
Sum of column	12.41	2.35	16.17	12.83	31.85	20.69	3.71	100.00

F. Residential Location Lump-Sum Subsidy

Place of Residence	Work Location: Tel Aviv	Sharon	Shfela	Haifa	Galilee	Negev	Jerus.	Sum of row
Tel Aviv	1.17	0.09	0.48	0.00	0.00	0.00	0.00	1.74
Sharon	0.73	0.52	0.14	0.18	0.00	0.00	0.00	1.57
Shfela	0.95	0.03	2.44	0.00	0.00	0.00	0.00	3.42
Haifa	0.00	0.02	0.00	1.80	0.09	0.00	0.00	1.92
Galilee	0.04	0.01	0.04	9.87	46.91	0.02	0.09	56.97
Negev	0.02	0.00	0.02	0.02	0.01	33.05	0.03	33.14
Jerusalem	0.00	0.00	0.00	0.00	0.00	0.00	1.23	1.23
Sum of column	2.90	0.68	3.12	11.87	47.01	33.08	1.34	100.00

Table 16b: Predicted Residence-Work Locations for Blue-Collar Workers

Simulation	Work and Residence Location						
	Tel Aviv	Sharon	Shfela	Haifa	Galilee	Negev	Jerus.
Basic Model	7.01	10.23	28.24	16.32	15.77	12.94	9.50
Wage Subsidy	4.63	6.82	16.09	8.86	35.91	21.81	5.90
Transportation Subsidy	6.53	11.40	29.09	15.68	15.94	13.13	8.24
Rent Subsidy	4.75	6.20	11.97	6.58	47.59	18.53	4.37
Residential Lump-Sum Subsidy	0.94	0.85	1.21	0.99	70.68	24.78	0.55

Table 17: Distribution of Work Location by Place of Residence, for White-Collar Workers

A. Actual Data

Place of Residence	Work Location: Tel Aviv	Sharon	Shfela	Haifa	Galilee	Negev	Jerus.	Sum of row
Tel Aviv	57.63	3.39	38.98	0.00	0.00	0.00	0.00	100.00
Sharon	47.47	30.30	14.14	8.08	0.00	0.00	0.00	100.00
Shfela	25.96	5.14	58.10	4.11	3.34	0.51	2.83	100.00
Haifa	0.00	0.00	0.00	90.58	9.42	0.00	0.00	100.00
Galilee	0.00	1.31	3.27	32.03	63.40	0.00	0.00	100.00
Negev	1.88	0.00	9.38	0.00	0.00	88.75	0.00	100.00
Jerusalem	0.00	0.00	0.00	0.00	0.00	0.00	100.00	100.00

B. Basic Model

Place of Residence	Work Location: Tel Aviv	Sharon	Shfela	Haifa	Galilee	Negev	Jerus.	Sum of row
Tel Aviv	59.67	7.34	32.55	0.13	0.08	0.14	0.10	100.00
Sharon	45.48	29.02	11.63	13.54	0.06	0.15	0.11	100.00
Shfela	31.95	2.87	64.97	0.03	0.01	0.09	0.08	100.00
Haifa	0.03	2.35	0.02	84.73	12.76	0.05	0.06	100.00
Galilee	0.04	0.00	0.04	14.81	85.05	0.02	0.04	100.00
Negev	0.04	0.01	0.02	0.01	0.01	99.87	0.04	100.00
Jerusalem	0.01	0.01	0.02	0.01	0.02	0.05	99.87	100.00

C. Wage Subsidy Simulation

Place of Residence	Work Location: Tel Aviv	Sharon	Shfela	Haifa	Galilee	Negev	Jerus.	Sum of row
Tel Aviv	67.71	5.32	26.90	0.02	0.01	0.03	0.02	100.00
Sharon	50.15	28.10	9.23	12.35	0.03	0.10	0.05	100.00
Shfela	29.03	1.39	69.45	0.03	0.00	0.06	0.04	100.00
Haifa	0.02	1.14	0.01	79.93	18.84	0.03	0.03	100.00
Galilee	0.03	0.01	0.02	6.06	93.80	0.04	0.03	100.00
Negev	0.03	0.01	0.01	0.02	0.01	99.88	0.04	100.00
Jerusalem	0.01	0.00	0.01	0.01	0.00	0.02	99.93	100.00

Table 17: (Continued)

D. Transportation Subsidy Simulation

Place of Residence	Work Location: Tel Aviv	Sharon	Shfela	Haifa	Galilee	Negev	Jerus.	Sum of row
Tel Aviv	51.88	7.81	34.81	0.02	3.69	1.74	0.04	100.00
Sharon	30.46	14.87	39.74	6.75	5.14	3.01	0.03	100.00
Shfela	25.49	7.05	59.13	0.01	4.90	3.39	0.03	100.00
Haifa	0.01	6.42	3.48	58.58	29.21	2.27	0.03	100.00
Galilee	0.01	1.06	6.39	10.35	78.35	3.80	0.04	100.00
Negev	0.02	1.05	6.09	0.01	7.86	84.94	0.03	100.00
Jerusalem	0.02	0.96	6.16	0.01	7.60	3.12	82.14	100.00

E. Rent Subsidy Simulation

Place of Residence	Work Location: Tel Aviv	Sharon	Shfela	Haifa	Galilee	Negev	Jerus.	Sum of row
Tel Aviv	67.56	5.32	27.05	0.02	0.01	0.02	0.03	100.00
Sharon	50.73	28.58	8.74	11.78	0.03	0.07	0.07	100.00
Shfela	28.30	1.27	70.33	0.03	0.00	0.03	0.04	100.00
Haifa	0.02	1.14	0.01	90.89	7.89	0.01	0.03	100.00
Galilee	0.04	0.01	0.02	13.52	86.34	0.03	0.04	100.00
Negev	0.03	0.01	0.01	0.01	0.00	99.89	0.04	100.00
Jerusalem	0.02	0.01	0.01	0.02	0.02	0.02	99.90	100.00

F. Residential Location Lump-Sum Subsidy

Place of Residence	Work Location: Tel Aviv	Sharon	Shfela	Haifa	Galilee	Negev	Jerus.	Sum of row
Tel Aviv	67.11	5.17	27.66	0.01	0.01	0.02	0.02	100.00
Sharon	46.15	33.24	9.01	11.58	0.00	0.01	0.01	100.00
Shfela	27.68	0.93	71.36	0.00	0.00	0.01	0.02	100.00
Haifa	0.08	1.16	0.07	93.74	4.82	0.08	0.06	100.00
Galilee	0.07	0.01	0.07	17.32	82.34	0.03	0.15	100.00
Negev	0.05	0.01	0.05	0.06	0.02	99.74	0.08	100.00
Jerusalem	0.01	0.00	0.00	0.00	0.00	0.00	99.99	100.00

Figure 1: Density of Actual and Predicted Wages

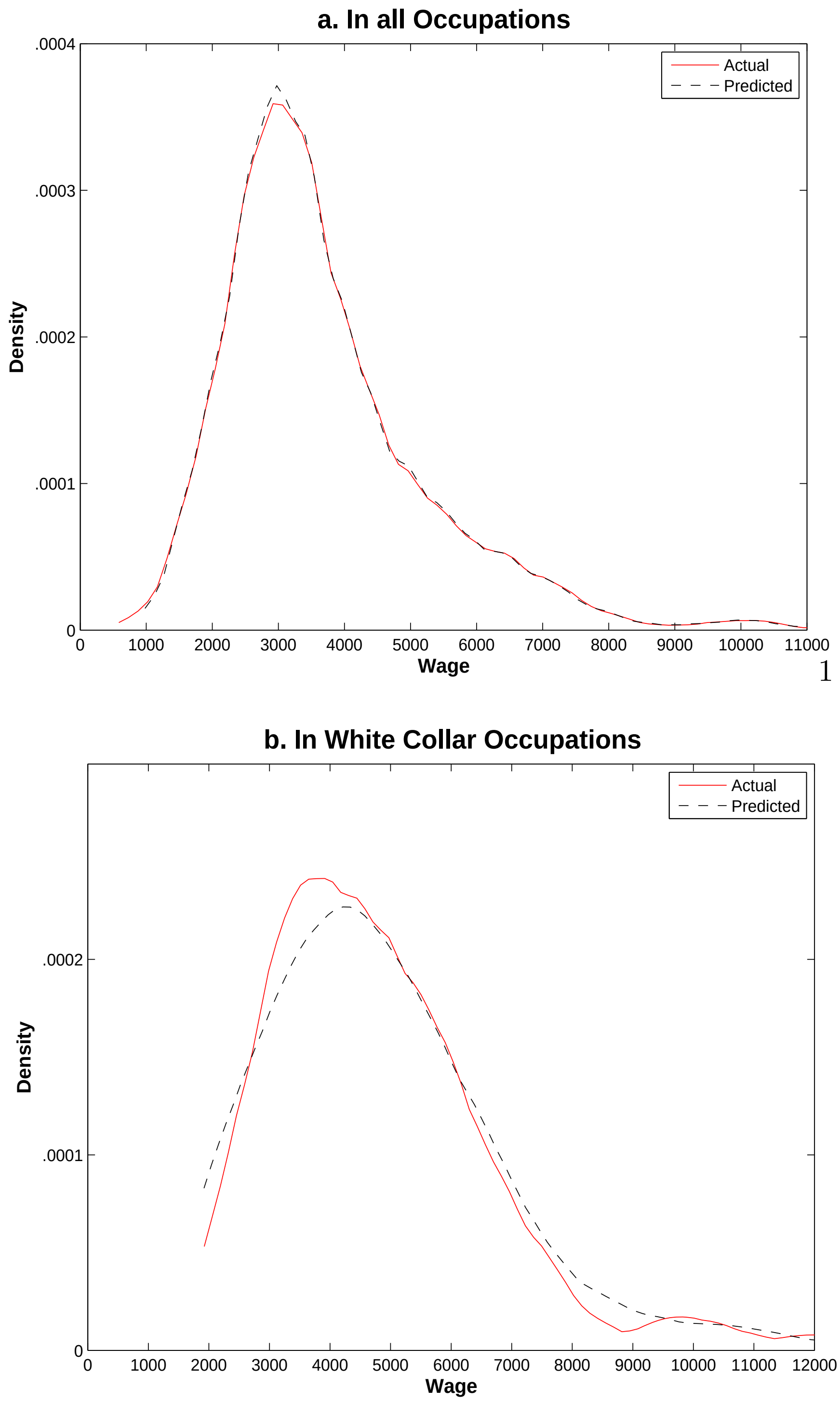

Figure 1: (Continued)