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SELF-SELECTION OF MIGRANT WORKERS: MIGRATION PREMIUM AND (NO) RETURNS TO SKILLS

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ABSTRACT

Self-Selection of Migrant Workers: Migration Premium and (no) Returns to Skills*

Why do low-skilled workers choose to work in a foreign economy and what determines their wages? The Paper empirically implements the Roy self-selection model to study this question. It does so using a unique dataset on Palestinian workers working locally and in the Israeli economy. The data permit examination of both migrants and non-migrants on a comparable basis and are used to construct the relevant wage equations. The results show that key determinants of self-selection are a substantial migration premium, which lures migrant workers, and very low returns to observable skills in the foreign economy, which deter skilled workers.

While the literature has found negative self-selection elsewhere, direct estimation of the relevant second moments - crucial for the determination of self selection - shows that the same findings can be re-interpreted. In particular, we find positive self-selection, leading to a reduction in wage inequality and to worker assignment such that wages are equalized across workers employed in the source and in the host economies. Correcting for selection bias demonstrates that estimates of skill premia for migrants - an important issue in the immigration literature - are upwardly biased if selection is not accounted for.

JEL Classification: F20, J30 and J60
Keywords: migrant workers, migration premium, selection bias, self-selection, skill premia and wage inequality

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Submitted 03 November 2003

Self Selection of Migrant Workers:

Migration Premium and (No) Returns to Skills[1]

1 Introduction

The presence of migrant workers has become widespread in many developed economies. A prevalent case is that of workers from less developed economies. Sometimes, though not always, these workers become immigrants and stay in the host country. As the gap between rich and poor economies persists and in certain cases widens, as mobility becomes easier and cheaper, as the population of rich countries ages and distaste for some low-skill occupations grows, this phenomenon is likely to continue and even expand.[2] This paper explores the self-selection process that takes place when workers of this type choose to work in a foreign economy.

It does so using data on Palestinian workers who worked in Israel and those who worked in the local economy (the West Bank of the Jordan river and the Gaza Strip), taken from quarterly labor force surveys. The size of migrant employment was substantial, with 30%-40% of male Palestinian workers employed in the Israeli economy in the 1980s and early 1990s. Their employment bears similarity, in terms of occupation and position in the wage distribution, to the employment of Hispanic workers in the U.S. and North African workers in Western Europe. The data, typically unavailable for migrant workers, are a rich source for studying the following two key questions:

(i) What determines the self-selection of migrant workers? The data-set covers workers that remained in the home economy as well as workers that became migrant workers in Israel. Thus it offers a rare opportunity to examine observed skills, their wage return profiles, and the resulting

[1] **I am grateful to Zvi Eckstein and Yoram Weiss for useful comments, to Joshua Angrist for the use of his processed version of the TLFS data set and helpful discussions of it, to seminar participants at the Hebrew University and Tel Aviv University for helpful suggestions, to Darina Vaisman and Ziv Nir for research assistance, and to the UIDRC at Tel Aviv University for financial support. Any errors are mine.**

[2] Some evidence is reviewed below; for detailed reviews see Stalker (2000) and Zlotnik (1998) .

choice of work in the local or foreign economy. A voluminous literature compares performance of migrant workers and natives; here we compare migrants and "stayers," which is the relevant comparison for the self-selection of migrants.

(ii) What kind of self-selection processes take place? The econometric framework used allows for the derivation of the type of selection that takes place in terms of both observable and unobservable skills. The paper characterizes the types of sorting that take place when workers self-select in terms of comparative or absolute advantage. This sorting affects the mean and dispersion of wages in the home and host economies.

The paper examines these issues by estimating wage equations derived from the Roy (1951) self-selection model. The Roy model is particularly well suited for this examination as it is an assignment model, highlighting worker heterogeneity and individual worker optimal employment decisions. The basic idea is as follows: workers select where to work according to the principle of maximizing income. Income depends on the return to the individual's skills (both observed skills, like education or experience, and unobserved skills) and on market prices for a suitably defined labor supply aggregate. Thus individuals sort themselves into the local or host economy and the data are conditioned on their selection decisions. Estimation is done using Heckman's (1979) methodology to correct for sample selection bias, which is inherent in the model.

Borjas (1987) has proposed using this model to analyze the self-selection of immigrants. In this framework the properties of the variance-co-variance matrix of unobservable skills plays a crucial role in determining the migration decision.[3] While several empirical studies of the model have been undertaken [see Borjas (1999, p. 1715)] they have not directly examined this key covariance matrix. The current analysis fills this important gap.

The wage regressions — for workers employed locally and in Israel — yield the following main findings: substantially different return profiles for experience and education existed in the local economy and in the Israeli economy. While in the former they assumed a standard shape, in

[3] In the afore-mentioned wage regressions system this is given by the variance-covariance matrix of the residuals. We elaborate below.

the latter they were low and flat. Israel, however, lured workers by offering a "migration" premium. This led to the self-selection of younger, less educated workers to the Israeli economy. The estimates with respect to unobservables uncover a variance-covariance matrix that is very reasonable: skills across the host and local economies are not highly correlated and the home wage distribution is more dispersed. This structure is to be expected given that it is low-skill workers, employed in low-skill industries that migrate, leaving the higher skilled workers working in high-skill industries "at home."

The paper makes several contributions:

First, it identifies the self-selection patterns of migrant workers. The afore-cited results highlight two key aspects of self-selection: one is that the migration premium interacting with the low skill premia in the host economy leads to the self-selection of workers from the lower part of the skill distribution. The second is that the type of migrant industries/occupations in the host economy are such that the correlation of unobserved skills in local and foreign employment is low or even negative. This is shown to generate positive self-selection. The availability of relevant data and the use of selection bias correction place this analysis on more solid footing relative to the existing literature on the self-selection of migrants.

Second, the results show how self-selection affects estimates of return to experience and education, which is a major issue in studies of migration. In particular, it finds that estimates uncorrected for selection are biased. More specifically, estimates of migrant skill premia are shown to be upward biased without the selection correction.

Third, the results show the implications of sorting via self-selection for mean wages and wage inequality. In particular, we find selection to be positive and to generate a significant reduction in wage inequality. These results stand in contrast to prevalent claims in the immigration literature, which has emphasized negative self-selection. We are able to re-interpret findings from other studies, claiming that the empirical findings are in fact similar. This new interpretation is due to the fact that (as far as we know) this is the first study to directly estimate the relevant second moments which are crucial for determining self selection patterns.

Fourth, it quantifies wage determination in a developing economy, including the earnings of its migrant workers. The paper shows that using aggregate, rather than sectorial data, gives a misleading characterization of skill returns.

The paper proceeds as follows: Section 2 presents the model and discusses the types of self-selection processes involved. Section 3 presents the essential background for the empirical work – key facts of the Palestinian labor market, Palestinian workers as migrant workers, and the results from previous studies. Section 4 discusses the data and econometric methodology. Section 5 discusses specification issues and reports the results. Section 6 discusses the implications of the results for selection patterns and wage inequality. Section 7 decomposes the wage difference between local employment and employment in Israel, highlighting the offsetting effects of the migration premium and skill premia. Section 8 concludes.

2 The Model

The model used is based on the seminal work of Roy (1951) on self-selection. The model has been formalized and applied to various labor market issues by Rosen (1978) and Willis and Rosen (1979). Extensive applications to the U.S. economy, as well as theoretical extensions, are presented in Heckman and Sedlacek (1985, 1990) whose notation is followed here. More recently, Moscarini (2001, 2003) has shown how the model may be used in the context of equilibrium models of the labor market. In sub-section 2.1 the model is briefly presented [for more extensive presentations see the afore-cited references]. Sub-section 2.2 examines alternative possible outcomes of the self-selection process.

2.1 Self-Selection

There are two market sectors $i(= 1, 2)$ in which workers can work. In the current context these are the host (Israel) and source (Palestinian) economies. Agents are free to enter the sector that gives them the highest income but are limited to work in only one sector at a time. Each sector

requires a unique sector-specific task t_i. Each worker is endowed with a vector of skills (S) which enable him or her to perform sector-specific tasks. The vector S is continuously distributed with density $g(S \mid \Theta)$ where Θ is a vector of parameters. $t_i(S)$ is a non-negative function that expresses the amount of task a worker with the given skill endowment S can perform and is continuously differentiable in S. Note that there is a distinction here between tasks, which are the object of firms' demand, and skills, which reflect the endowments of workers. Packages of skills cannot be unbundled, and different skills are used in different tasks but some skills could be equally productive in all tasks.

Aggregating the micro supply of task to sector i yields:

$$T_i = \int t_i(S) g(S \mid \Theta) dS \tag{1}$$

The output of sector i is given by:

$$Y_i = F^i(T_i, \mathbf{A}_i) \tag{2}$$

where $\mathbf{A}$ is a vector of non-labor inputs. The production function F is assumed to be twice continuously differentiable and strictly concave in all its arguments. For a given output price P_i, the equilibrium price of task i equals the value of the marginal product of a unit of the task in sector i. This task price will be denoted by π_i and is assumed independent of the skill distribution:

$$\pi_i = P_i \frac{\partial F^i}{\partial T_i} \tag{3}$$

An income-maximizing individual will choose the sector i that will satisfy:

$$\pi_i t_i(S) > \pi_j t_j(S) \quad i \neq j; i, j = 1, 2 \tag{4}$$

Wages in this set-up are given by:

$$\ln w_i(S) = \ln \pi_i + \ln t_i(S) \tag{5}$$

Further analysis requires the adoption of specific functional forms for the density of skills g and the function mapping skills to tasks t. Roy (1951) assumed that these are such that the tasks are log-normal i.e. $(\ln t_1, \ln t_2)$ have a mean (μ_1, μ_2) and co-variance matrix Σ (with elements denoted by σ_{ij}) . Denoting a zero-mean, normal vector by (u_1, u_2) the workers choose between two wages:

$$\begin{aligned} \ln w_1 &= \ln \pi_1 + \mu_1 + u_1 \\ \ln w_2 &= \ln \pi_2 + \mu_2 + u_2 \end{aligned} \tag{6}$$

If for the worker $\ln w_1 > \ln w_2$ he or she enters sector 1. If the converse is true he or she enters sector 2.

With these functional specifications the proportion of workers in sector i is given by:[4]

$$\begin{aligned} pr(i) &= P(\ln w_i > \ln w_j) = \Phi(c_i) \\ i &\neq j; i, j = 1, 2 \end{aligned} \tag{7}$$

where $\Phi(\cdot)$ is the cdf of a standard normal variable and

$$\begin{aligned} c_i &= \frac{\ln \frac{\pi_i}{\pi_j} + \mu_i - \mu_j}{\sigma^*}, \ i \neq j \\ \sigma^* &= \sqrt{var(u_1 - u_2)} \end{aligned} \tag{8}$$

The proportion of workers in sector i will increase as the task price π_i in that sector gets relatively higher or as the mean of the task μ_i gets relatively bigger. In addition it depends on the variance co-variance terms in Σ via σ^*.

[4]The following equations are based on the properties of incidentally truncated bivariate normal distributions.

2.2 Patterns of Self-Selection

Post-selection the *conditional* mean and variance of the sectorial wage distribution can be characterized; note that these will also characterize the *observed* distribution if the model holds true:

$$E(\ln w_i \quad | \quad \ln w_i > \ln w_j) = \ln \pi_i + \mu_i + \frac{\sigma_{ii} - \sigma_{ij}}{\sigma^*}\lambda(c_i) \tag{9}$$

$$var(\ln w_i \quad | \quad \ln w_i > \ln w_j) = \sigma_{ii}\left\{\rho_i^2[1 - c_i\lambda(c_i) - \lambda^2(c_i)] + (1 - \rho_i^2)\right\} \tag{10}$$

$$i \quad \neq \quad j; i, j = 1, 2$$

where:

$$\begin{aligned} \rho_i &= correl(u_i, u_i - u_j),\ i \neq j; i, j = 1, 2 \\ \lambda(c_i) &= \frac{\phi(c_i)}{\Phi(c_i)} \end{aligned}$$

with $\phi(\cdot)$ denoting the density of a standard normal variable. The term $\lambda(c)$, denoted the inverse of "Mill's ratio" or the hazard rate in reliability theory, has the following properties, with sub-scripts denoting partial derivatives:

$$\begin{aligned} \lambda(c) &\geq 0 \\ \lambda_c &< 0 \quad \lambda_{cc} > 0 \\ \lim_{c\to\infty} \lambda(c) &= 0 \quad \lim_{c\to-\infty} \lambda(c) = \infty \end{aligned}$$

This set-up provides for a rich set of outcomes. The focus here is on issues that will be relevant to the empirical work below. The discussion which follows refers to equations (9)-(10) i.e. to the two moments of the conditional log-normal wage distribution.

2.2.1 Mean and Variance of Log Wages

Equation (9) shows that the post-selection *mean* wage differs from the unconditional mean by the term $\frac{\sigma_{ii}-\sigma_{ij}}{\sigma^*}\lambda(c_i)$. This term has two elements: (i) Selectivity as expressed by $\lambda(c_i)$. As task prices

and task means change, and as σ^* changes, the proportion of workers choosing the sector changes according to equation (7). Note that if all workers choose sector i, then $\lambda(c_i) = 0$ and so the task mean becomes $\ln \pi_i + \mu_i$. (ii) The relation between the variance of the sectorial distribution σ_{ii} and the co-variance with the other sector σ_{ij}, which is reflected in the term $\frac{\sigma_{ii}-\sigma_{ij}}{\sigma^*}$.

As mean skills in one sector μ_i rise relative to the other μ_j or as task prices in one sector π_i rise relative to task prices in the other sector π_j the proportion of workers in sector i rises (see equation 7). What is the change in quality of workers in sector i? This is given by the change in the difference between the conditional and unconditional mean:

$$E(\ln w_i \mid \ln w_i > \ln w_j) - E(\ln w_i) = \frac{\sigma_{ii} - \sigma_{ij}}{\sigma^*}\lambda(c_i) \tag{11}$$

As c rises λ falls. If $\sigma_{ii} - \sigma_{ij} > 0$ then this difference falls; quality, which is higher than in the case of random assignment, declines; if $\sigma_{ii} - \sigma_{ij} < 0$ quality, which is lower than in the random assignment case, increases.

The selection bias in estimation is related to these outcomes; we return to this issue below.

Regarding the *variance*, note from equation (10), that the sectorial variance observed is smaller than the population variance of the relevant log task, as the term $[1 - c_i\lambda(c_i) - \lambda^2(c_i)]$ is less than or equal to 1. Generally, sectorial variances decrease with increased selection. Suppose for example that $\rho_i \neq 0$ for each sector and $\frac{\pi_1}{\pi_2}$ increases, so people move from sector 2 to 1. Thus selection increases in Sector 2 and declines in Section 1. In this case c_1 increases and c_2 declines; with $\lambda(c_i)$ being a convex, decreasing function of c_i the term $[1 - c_i\lambda(c_i) - \lambda^2(c_i)]$ increases for $i = 1$ and declines for $i = 2$. Thus the conditional variance increases in 1 and declines in 2. Only when $\rho_i = 0$ (which requires $\sigma_{ii} = \sigma_{ij}$) will the variance of log task i actually employed in sector i (variance of the post-selection distribution) be identical to the variance of log task i in the population.

2.2.2 The Wage Distribution and Sorting Patterns

It is possible to classify the selection outcomes in terms of the relations between the elements of Σ: σ_{11}, σ_{22} and σ_{12} or alternatively between $\frac{\sqrt{\sigma_{22}}}{\sqrt{\sigma_{11}}}$ and $\rho_{12} = \frac{\sigma_{12}}{\sqrt{\sigma_{11}}\sqrt{\sigma_{22}}}$.[5] Assuming, without loss of generality, that $\sigma_{22} \geq \sigma_{11}$,the different outcomes depend on the relation between the ratio of the standard deviation in each sector $\frac{\sqrt{\sigma_{22}}}{\sqrt{\sigma_{11}}}$ and the correlation between the two sectorial distributions ρ_{12}.

Three cases are possible (remarking that ρ_{12} is bounded from above by $1 \leq \frac{\sqrt{\sigma_{22}}}{\sqrt{\sigma_{11}}}$) :

(i) The correlation between the sectors is positive and relatively high, i.e. $\rho_{12} \geq \frac{\sqrt{\sigma_{11}}}{\sqrt{\sigma_{22}}}$. In this case the term $\frac{\sigma_{ii}-\sigma_{ij}}{\sigma^*}$ in equation (9) is positive for sector 2 and negative for sector 1. Thus the conditional mean in sector 2 (sector 1) is higher (lower) than the unconditional mean, $\ln \pi_i + \mu_i$ (note that $\lambda(c_i)$ is positive). Selection is positive in sector 2 and negative in sector 1. Note that the Roy model cannot have negative selection in the two sectors (as $\sigma_{11} + \sigma_{22} - 2\sigma_{12} \geq 0$). Because of the high correlation, this is a comparative advantage case rather than absolute advantage, i.e. workers who do well in a certain sector may still select the other one and workers may select a sector that they do badly in.

(ii) The correlation between the sectors is negative, i.e. $\rho_{12} < 0$. In this case the term $\frac{\sigma_{ii}-\sigma_{ij}}{\sigma^*}$ in equation (9) is positive for each sector so the conditional mean in each sector is higher than the unconditional mean. This is a case of positive selection in the two sectors or of absolute advantage – each sector tends to be filled with the workers that perform best in the sector.

(iii) The correlation between the sectors is positive but relatively low, i.e. $0 \leq \rho_{12} < \frac{\sqrt{\sigma_{11}}}{\sqrt{\sigma_{22}}}$.

[5] Note the following definitions which will appear below:

$$\begin{aligned} \rho_1 &= \frac{\sigma_{11} - \sigma_{12}}{\sqrt{\sigma_{11}}\sigma^*} \\ \rho_2 &= \frac{\sigma_{22} - \sigma_{12}}{\sqrt{\sigma_{22}}\sigma^*} \\ \rho_{12} &= \frac{\sigma_{12}}{\sqrt{\sigma_{11}}\sqrt{\sigma_{22}}} \end{aligned}$$

In this case too the term $\frac{\sigma_{ii}-\sigma_{ij}}{\sigma^*}$ in equation (9) is positive for both sectors, and in each sector there is positive selection, though it is once more comparative and not absolute advantage which dictates selection. Note that this case includes $\rho_{12} = 0$, i.e. the endowment of tasks are uncorrelated.

One can interpret this set-up as follows: when the correlation ρ_{12} is negative, workers self-select in terms of absolute advantage, i.e. they go to the sector suited for their skills. When the correlation is positive, then comparative advantage applies. The latter case breaks down into two sub-cases: when the correlation is moderate, self-selection induces positive selection effects in the two sectors via worker sorting by comparative advantage. When the correlation is sufficiently high, some workers will work in a sector which is not well suited for them; hence there will be a negative selection effect for those workers.

Case (i) would be more likely to occur than the other two the lower is the variance in sector 1 (σ_{11}) or the higher is the co-variance between the sectors (σ_{12}).

Willis and Rosen (1979) and Willis (1986) discuss the nature of the correlation ρ_{12}. They point out that there is a difference between a one-dimensional approach, whereby skills reflect one factor such as IQ, and a multi-dimensional approach, whereby there are different abilities that have differential importance in different tasks. Examples would be strength, agility, dexterity, creativity, intelligence, visual acuity, etc. They define case (i) above as "hierarchical sorting" – those in the high-wage sector are drawn from the upper portion of the potential earnings distribution while those in the low-wage sector are drawn from the lower portion of the potential earnings distribution, and cases (ii) and (iii) as "non-hierarchical sorting." These terms relate to Roy's (1951) notion of a hierarchy of occupations that is affected by the ability variances. Two phenomena are apparent here: an "anybody-can-do-it effect" when the variance is relatively low and there is no worker with a big comparative advantage; this tends to reduce positive selection. The other phenomenon is the opposite: a "superstar" phenomenon whereby the variance is large and very high ability workers positively self-select into that occupation.

Note that task prices and mean abilities operate through c and $\lambda(c)$. They do not determine the afore cited selection patterns but they do affect the magnitude of selection.

2.2.3 Sorting Patterns in Immigration

Borjas (1987) offered a classification of the afore-cited outcomes in terms of immigration selection patterns:

(i) Positive selection of immigrants – when the host economy has greater wage inequality (i.e. the higher σ_{ii}) and the inter-sector correlation (ρ_{12}) is relatively high, then the "best" workers leave the home economy and perform well in the host economy (i.e. negative selection at home and positive selection in the host economy).

(ii) Negative selection of immigrants – when the home economy has the greater wage inequality and ρ_{12} is relatively high then the immigrants come from the lower tail of the home distribution and these immigrants do not perform well in the host economy.

Both these cases correspond to the one classified as (i) above, each case defining sector 1 and sector 2 differently. The key point here is that it matters which economy has the bigger wage inequality.

(iii) Refugee sorting – the correlation is relatively low so the host economy draws below average immigrants but they do well in the (host) economy. These are cases (ii) and (iii) above with positive selection in each sector.

Borjas (1999, p. 1715) cites empirical evidence, mostly related to the U.S., in support of the negative selection case outlined above. We return to this issue after reporting the results.

3 Background for the Empirical Analysis

This section provides the background for the empirical analysis which follows. It presents key facts on the Palestinian economy and its labor market (3.1), discusses the stylized facts on migrant workers in the Western world, defining the work of Palestinians in Israel in this context (3.2), and reports pertinent results from the literature (3.3).

3.1 The Palestinian Economy and Its Labor Market

The West Bank and the Gaza Strip – the constituents of the Palestinian economy – are occupied by Israel since June 1967. In 1968 Palestinian workers started to flow to employment in Israel and the labor market turned out to be the major link between the two economies. The flow reached its peak in the 1980s. Beginning in December 1987 it underwent a series of severe shocks: at the latter date a popular uprising (the first 'intifada') broke out against the occupation, leading to strikes, curfews and new security regulations such as occasional closures of the territories. In 1993, following peace negotiations, the Oslo accords were signed, giving the Palestinians autonomous control over parts of the West Bank and the Gaza Strip. In September 2000 a second uprising broke out with even greater ensuing turbulence. Consequently Palestinian employment in Israel since the end of 1987 was much more volatile and, generally, on a declining trend.

In this paper we use data from 1987, a period of high Palestinian labor market involvement pre-dating the events cited above. Table 1 documents GDP per capita of the Palestinian and Israeli economies in this period.

Table 1

The table shows that GDP per capita in the Palestinian economy was 10% (Gaza) or 18% (West Bank) of the Israeli figure.

Two key features of the Palestinian labor market are relevant for the current analysis:

(i) Men constitute the bulk of the labor force. Participation rates for men aged 14 and above have increased from around 63% in the early 1980s to over 70% by the mid-1990s. All the while women have had low participation rates – around 10% for women in the West Bank and around 3% for women in Gaza.

(ii) Figure 1 depicts the employment share in Israel, separately for Gaza and for the West Bank. The period covered is from 1970, soon after the Israeli and Palestinian labor markets began integrating, till the Oslo accords in 1993.

Figure 1

Employment in Israel was substantial: 37% of employment for Gaza residents and 30% for West Bank residents on average in the period 1970-1993. Israeli employment peaked at 46% in 1985-1988 for Gaza residents and at 36% in 1989 for West Bank residents.

3.2 Palestinians as Migrant Workers

Recent data on migrant workers in developed economies point to some key facts and trends:

(i) *The share of foreign residents in developed economies has generally increased in the post-war period and in particular in the 1990s.* Zlotnik (1998, Table 1) reports that foreign-born population as a share of total population in developed countries has increased from 3.1% in 1965 to 4.5% in 1990. In Western Europe the rise in that period was from 3.6% to 6.1%; in Northern America from 6.0% to 8.6%. From 1988 to 1998 the share of foreign or foreign born population in 20 OECD economies (OECD (2001, Table 2)) has further risen from 5.7% to 6.9%.

(ii) *Migration into developed economies has seen a big increase in the share of migrants from developing economies.* Zlotnik (1998, Tables 3 and 4) reports that the share of migrants (annual flow) from developing economies, going from the 1960s to the 1990s, has risen from 42% to 80% in the U.S.,[6] from 12% to 78% in Canada, from 25% to 31% in Germany, and from 46% to 79% in the Netherlands.

(iii) *The share of low-skill migrant workers in developed economies is substantial.* OECD (2003, page 45) reports that the percentage of the population with lower secondary education is typically higher among foreigners than among natives; thus, for example, it is 30.1% among foreigners in the U.S. as compared to 9.3% among natives (in 2000-2001); the numbers for France are 66.7% vs 34.9%, for Germany 48.5% vs 15.1%, and for the U.K. 30.1% vs. 18.8%.

[6] Specifically in the U.S. almost 48% of immigrants came from Hispanic countries in the period 1991-1999 compared to less than 25% in 1951-1960 [see INS (1999, Table 2)].

Palestinian employment in Israel can be seen as a case of phenomena (ii) and (iii): low skill migrant workers (as shown below) from a developing economy working in a developed one. This classification is further evidenced by the substitution that took place in the course of the 1990s: in 1990, Palestinian workers constituted 8.8% of business sector employment in Israel, while only 0.1% were non-Palestinians. Since then the Palestinian share has fallen, reaching 1.5% in 2002; concurrently the share of non-Palestinian migrant workers, coming from Eastern Europe, East Asia and West Africa, rose, reaching 12.6% in 2002 [Bank of Israel (2003, page 141)]. The latter kind of workers entered the same industries in which the Palestinians had previously worked. This substitution is evident also at the micro level: in the construction sector, which is the major industry for migrant workers in Israel, Palestinians constituted 43% of employment in 1992 with no other migrant workers; by 1996 the Palestinian share fell to 12% while the non-Palestinian share stood at 26% [Amir (1999)].[7]

3.3 Results from the Literature

Three findings from previous literature are pertinent to the issues examined here:

In a descriptive analysis, Kleiman (1992) suggested that it is mostly unskilled and inexperienced labor that tended to flow to work in Israel. A certain part of it came to specialize in work in Israel, as evidenced by relatively long employment spells. The key demographic characteristic of these workers was the young age.

Angrist (1996) estimated a short-run Israeli demand function for Palestinian labor, finding it relatively inelastic. Till 1990 movements along this demand curve can explain the fall in the daily wage premium for working in Israel from 18% in 1981 to zero in 1984 and its subsequent rise to as high as 39% in 1989. These changes paralleled supply changes – Palestinian absences from work due to the uprising and events associated with it.

Semyonov and Lewin-Epstein (1987) proposed the view that Palestinian workers entered

[7] For an extensive recent discussion of migration to Israel see Cohen and Eckstein (2002).

occupations in Israel that were low in social status and remained there. Having little ability to negotiate employment conditions and few alternatives, they were given less desirable jobs enabling other ethnic groups to move up the occupational ladder in Israel.

4 Data and Methodology

4.1 The Data

The data are taken from the Territories Labor Force Survey (TLFS) conducted by the Israeli Central Bureau of Statistics [see CBS quarterly serial on the TLFS; here the source is the 1995 issue published in early 1996 (CBS (1996))]. The TLFS was conducted regularly from August 1968, after the occupation of the West Bank and Gaza by Israel in June 1967. Following the 1993 autonomy (Oslo) accords with the Palestinian Authority, the Survey was last conducted in Gaza and Jericho in the first quarter of 1994 and in the West Bank in the third quarter of 1995. Its principles are similar to the Israeli Labor Force Survey done by the CBS, which is akin to other such surveys, such as the U.S. Current Population Survey. The Survey used a 1967 CBS-conducted Census as the sampling frame, with a major update in 1987. It was conducted quarterly, using rotation groups (households were randomly divided into four groups; each group was interviewed for two consecutive quarters, excluded for two consecutive quarters and interviewed again for two consecutive quarters). Beginning in mid-1974 the Survey included 6,500 households, surveyed by local Palestinian enumerators employed by the Israeli Civil Administration in the Territories. The first Palestinian uprising ('intifada') – which began in December 1987 – caused disruptions in data collection and probably diminished data accuracy. The TLFS contains questions on demographics, schooling and labor market experience.

In this paper we use observations on men[8] aged 18-64 from the TLFS in the year 1987. This year represents the time of highest data quality (following the sample frame revision) and, as

[8] Women, when working in the market economy, did so locally, not in Israel.

mentioned, a high share of Palestinian employment in Israel. It was the last one before the uprising and the ensuing turbulence.

Table 2 presents descriptive sample statistics.

Table 2

Table 3 reports the industry distributions of salaried workers with positive labor income (all of them men aged 18-64).

Table 3

The table shows that around 80% of all workers are concentrated in three industries: 40% of all workers are in construction, and 20% in manufacturing and in government (each). The remaining 20% work in agriculture, commerce, or in different services.

4.2 Econometric Methodology

Estimation of equations (6) for workers employed locally and employed in Israel will yield estimates of all the key elements of the model, i.e. $\ln \pi_i, \mu_i$ and the elements of Σ. To do that the following procedure is used:

(i) Posit that $\ln t_i = c_i S$ where S is decomposed into measured and unmeasured variables S_o and S_u, and c_i their associated coefficients, are c_{io} and c_{iu}, respectively. Thus equations (6) become:

$$\ln w_i = \ln \pi_i + \beta_i X + u_i, \quad i = 1, 2 \tag{12}$$

where $\beta_i = c_{io}, X = S_o$ and $c_{iu} S_u = u_i$.

(ii) When estimating (12) correct for sample selection bias – which is inherent in the model – using the methodology proposed by Heckman (1979). In what follows we briefly present this methodology, referring the reader to the above reference for full details.

Define the variable z^* :

$$\begin{aligned} z^* &= \ln w_1 - \ln w_2 \\ &= \ln \pi_1 - \ln \pi_2 + \beta_1 X - \beta_2 X + u_1 - u_2 \end{aligned} \tag{13}$$

and the indicator variable z :

$$\begin{aligned} z &= 1 \; if \; z^* > 0 \\ z &= 0 \text{ otherwise} \end{aligned} \tag{14}$$

According to the model we shall observe $\ln w_1$ only if $z^* > 0$ i.e. when $z = 1$. Paralleling (7) we have:

$$\begin{aligned} \Pr(z &= 1) = \Phi(\ln \frac{\pi_1}{\pi_2} + \beta_1 X - \beta_2 X + u_1 - u_2) \\ \Pr(z &= 0) = 1 - \Phi(\ln \frac{\pi_1}{\pi_2} + \beta_1 X - \beta_2 X + u_1 - u_2) \end{aligned} \tag{15}$$

Based on equations (9) - (10) we know that the observed $\ln w_1$ is thus given by:

$$\ln w_1 \mid (z = 1) = \ln \pi_1 + \beta_1 X + \left[\frac{\sigma_{11} - \sigma_{12}}{\sigma^*} \right] \lambda (c_1) + u_1 \tag{16}$$

This may also be written as follows:

$$\ln w_1 \mid (z = 1) = \ln \pi_1 + \beta_1 X + \rho_1 \sqrt{\sigma_{11}} \lambda (c_1) + u_1 \tag{17}$$

The Heckman methodology consists of two stages: in the first stage, Probit analysis is used to estimate (15). Then an estimator for λ for each observation can be computed. In the second stage least squares is used to estimate (17) replacing λ by its estimator from the previous stage. It

is also possible to obtain separate estimates for $\sqrt{\sigma_{11}}$ and ρ_1. Evidently, a similar procedure may be undertaken for sector 2.

Following Heckman (1979) one can interpret the selection bias here as an omitted variable bias. If $\lambda(c_i)$ is not included in the regression, the estimates of the vector of coefficients β_i may be biased. The intuition is as follows: not including $\lambda(c_i)$ as a regressor ignores the influence of all the variables in question on the dependent variable – which is the *conditional* wage – through the self-selection process. This influence comes in addition to the direct effect expressed by β_i. Thus the uncorrected OLS estimate does not take into account the co-variation between the variable x_k in question (education, for example) and the selectivity variable λ. The sign of the bias depends on the effect of x_k on selection and on the effect of selectivity on the dependent variable, i.e. on wages in this case. The following equation expresses this bias formally. For any variable x_k in X:

$$\frac{\partial E(\ln w_i \mid (z=1))}{\partial x_k} = \beta_{ik} + \left[\frac{\sigma_{ii} - \sigma_{ij}}{\sigma^*}\right] \frac{\partial \lambda}{\partial c_i} \frac{\partial c_i}{\partial x_k} \tag{18}$$

There are three components to the selectivity bias term (the second term on the RHS):

(i) $\left[\frac{\sigma_{ii}-\sigma_{ij}}{\sigma^*}\right]$ – this is the term determining the type of selection taking place (based on unobservables) as discussed above. Note that it can be negative (case i above) or positive (cases ii and iii). This term expresses the effect of selectivity on wages.

(ii) $\frac{\partial \lambda}{\partial c_i} < 0$ – this negative term expresses the relation between the selectivity regressor λ and the proportion c_i of the workers in the sector or the probability that an observation be included in the sample; as this proportion (or probability) increases, the bias diminishes.

(iii) $\frac{\partial c_i}{\partial x_k}$ – this term expresses the influence of the variable in question on selection. Note that $\Pr(z=1) = \Phi(\sigma^* c_i)$. Thus the sign of this component is determined in the Probit analysis.

The sign of the bias depends on the type of selection process (point i) and on the direction of influence of the relevant variable on the sectorial selection (point iii). The magnitude depends on these factors as well as on the $\frac{\partial \lambda}{\partial c_i}$ term. Evidently, this magnitude will be different for different x_k depending on the third term.

5 Specification Issues and Results

In this section we estimate the wage equation corrected for self-selection in two cases:

(i) West Bank residents working in Israel and East Jerusalem as one sector and working locally as the other sector.

(ii) Gaza residents working in Israel as one sector and working locally in Gaza as the other sector.

In what follows we discuss specification issues (5.1) and report the results (5.2). This section presents the econometric results, leaving the analysis and interpretation to the following sections.

5.1 Specification Issues

In each case we look only at wage earners (i.e. excluding the self-employed). For the task function variables we consider TLFS variables that are likely to be indicative of skills: education, experience, marital status, and residence in urban areas and in refugee camps. Education and experience have been often used in this context and appear to be "natural" candidates to represent skills. In addition, because about half the population resides in rural areas, other types of residence may also offer some indication of skills, hence the use of urban residence status (over 30% of each sample) and refugee camps residence (around 20%). Finally, marital status may affect work performance due to factors such as the availability of other sources of family income, the need to support household members, etc. We use the standard formulation with education, experience[9] and experience-squared, all measured in years. The other variables are indicator variables for singles (base group is married) and residents of urban areas and refugee camps (base group is residents of rural areas). In addition we use indicator variables for the quarters, which we do not report. We take into account the costs of commuting to Israel, i.e. the wage in Israel is $w(1-\tau)$ where τ expresses any relevant costs, assumed equal across workers. This term then becomes part of the constant of the equation. The estimated equation is thus the following:

[9] Experience being defined as age minus education minus 5.

$$\ln w_i \quad | \quad \text{sector } i = \ln \pi_i - \ln(1-\tau_i) + \beta_0 + \beta_1 educ + \beta_{21} exp + \beta_{22} exp^2$$
$$+\beta_3 single + \beta_4 urban + \beta_5 refugee$$
$$+ \sum_{m=2}^{4} \gamma_m Q_m + \left[\frac{\sigma_{ii} - \sigma_{ij}}{\sigma^*} \right] \lambda(c_i) + u_i \tag{19}$$

where i, j denote sectors, Q is an indicator variable for the quarter, and m denotes the quarter number.

The dependent variable is the log of real hourly wages, defined as the nominal monthly wage divided by hours worked and deflated by the CPI.[10] The use of hourly wages is designed to avoid confounding the choice of work place with the choice of work time (hours or days).[11]

5.2 Results

Table 4 reports the results separately for the two regions. Each stage of the regression is reported – the Probit estimates and the second-stage, corrected, least squares estimates.[12]

Table 4

In general the results are similar across the two local economy regions (the West Bank and Gaza). The following picture emerges:

(i) The constant of the equation is substantially higher in Israel.

[10] Real, rather than nominal, wages are used as inflation was relatively high (16.1%) in the course of 1987.

[11] We delete observations of nominal monthly wages of less than 200 NIS which constitute the lower 1% (for Gaza) or 3% (for the West Bank) of the wage distribution. For these observations monthly wages are extremely low, indicating that they are either measured with error or that they reflect very few hours of monthly work.

[12] It turned out that for Gaza workers in Israel the specification needed to be slightly changed in order to produce reasonable estimates for the second moments. This entailed: (i) adding an indicator variable for workers with 13 or more years of schooling [see the discussion in Card (1999, p. 1806) on non-linearities of the education premia function]; (ii) using schooling groups in the Probit first stage rather than education in years.

(ii) Education and experience premia are very low in Israel employment, not significantly different from zero or very nearly so.

(iii) Single men suffer a negative premium in both locations, particularly in Israeli employment.

(iv) Urban and refugee camp residence have a positive premium locally and a negative premium in Israel (though not always significant).

The results of the Probit analysis demonstrate that all independent variables have a positive effect on the probability of local employment – education, experience, single status, urban residence and refugee camp residence all increase the probability of choosing local employment. In other words it is the younger, less educated and less experienced workers, living in rural areas, that are more likely to be found working as migrant workers in Israel. Married men are also more likely to be doing so, perhaps because the need to support families created the relevant incentive.

We turn now to examine the implications of the results.

6 Selection Patterns

In this section we examine the implications of the results reported in Table 4. We first look at the premia: the constant of the equation, reflecting the migration premium, and the premia to education and experience (6.1). We then look at the estimates of the elements of the $\sum$ matrix and discuss the implications with respect to selection patterns (6.2). Next we do a graphical analysis that combines the estimates of the return premia and of the second moments of unobserved skills; this allows for a fuller account of the self-selection process (6.3). Finally, we draw the implications with respect to wage inequality (6.4). The next section decomposes wage differences across the local and host economies.

6.1 Migration Premium and Return Profiles

The equation's intercept – reflecting the task price π_i, the commuting cost τ_i, and the constant μ_i in the task function – is substantially higher in Israel. Note that this "migration premium" is much higher than the difference in mean wages between Israel and local employment: the difference in the constant of the equation between Israel and local employment is 0.97 for the West Bank case and 1.68 for the Gaza case, while the difference in mean wages is 0.03 and 0.05 respectively (all in terms of the log real hourly wage). We analyze this difference in more detail below.[13]

The skill premia are illustrated in Figure 2, which plots the coefficients reported in Table 4 together with 95% confidence intervals.

Figure 2

The figure shows that:

(i) Locally, schooling premia rise with years of education. In Israel these premia are not significantly different from zero and the premia function is flat.

(ii) Locally the experience premia profile of earnings has the familiar hump-shape while in Israel it is again not significantly different from zero.

The emerging picture is that while local premia for education and experience behave "normally," employment in Israel offers low – basically zero – rewards for these attributes. However, for given skills Israel offered higher wages (as reflected in the constant). Less educated and less experienced workers therefore chose to work in Israel; those with better skills chose to work locally and were compensated for the wage differential by the local returns given to their skills.

[13] As a by-product implication, note that the 0.13 difference in the intercept of the wage equations for workers coming from Gaza and from the West Bank to work in Israel probably reflects the higher commuting costs (captured by τ in equation (19)) for Gaza workers. This is so because distance from the Gaza strip to employment locations in Israel is greater for most workers than the distance from the West Bank.

This sorting pattern implied by the results of estimation is borne out in the actual, observed locational distributions by education and age. The following table describes the distribution of work locations by education and age.

Table 5

The table confirms that it is indeed the less educated and younger workers who worked relatively more in Israel. Panel (a) shows the location distribution by schooling groups; panel (b) reports key moments of the education distribution across locations. The emerging picture is that the level of education is higher in local employment: the mean and median schooling years are higher (and so is the standard deviation). Particularly striking are the results for the two extreme schooling groups: in the higher education group (school 5) local employment is over-represented (70% local employment compared to only 30% in Israeli employment) while in the zero education group Israeli employment is over-represented (almost 70%). These numbers contrast markedly with the 40% local employment and 60% Israeli employment in total. Panels (c) and (d) repeat the same exercise for age. The age of workers is higher in local employment with both panels offering a consistent picture of this difference.

There are several implications to these patterns:

First, the returns to the same skills are markedly for migrant and "stayers." The local economy rewards education and experience substantially more. This phenomenon can be explained by looking more closely at the types of jobs in each economy. Table 6 shows the distribution of employment across industries and occupations, and the distribution of schooling levels.

Table 6

Local employment is characterized by industries and occupations that presumably require the performance of more complex tasks. In particular, government and financial services are about

a third of employment in the West Bank and over a half of employment in Gaza. In Israel, employment is highly concentrated (over 80%) in three industries – construction, manufacturing and agriculture. In terms of occupations, 28% of West Bank workers and 39% of Gaza workers are employed in high-skilled occupations vs. less than 2% in such occupations in Israel. Hence it is not surprising that local employment offers higher rewards for education and experience. The higher returns to education in Gaza relative to the West Bank may also be explained by the higher share of employment in government.

Second, the results indicate that aggregation in these circumstances produces a misleading picture. Running regular OLS regressions for the entire Palestinian labor market or for the West Bank or Gaza economies (including both local workers and migrant workers in Israel) yields a return to education of 1.9% in the aggregate economy, 1.8% in Gaza and 2.0% in the West Bank. According to the selectivity corrected estimates reported in Table 4 these were 6.6% in Gaza, 4% in the West Bank and about zero in Israel. The return to experience is 1.2% overall, 1.2% in Gaza and 1.3% in the West Bank in the simple OLS regressions. In the corrected regressions of Table 4 they were 3% in Gaza, 2.7% in the West Bank, and again about zero in the Israeli economy. Though the simple OLS regressions yield similar estimates across specifications (the entire economy or the regions) they obscure the diversity of returns. The corrected regressions yields estimates that are much higher for workers employed in the local economy (with some differences across regions) and much lower for workers in the host (Israeli) economy.

6.2 Self-Selection and the Skill Distributions

Table 7 reports estimates of the $\sum$ matrix produced by the regressions reported in Table 4. These allow for the analysis of the self-selection process. The table reports the coefficient $\rho_i\sqrt{\sigma_{ii}}$ of the selectivity regressor $[\lambda(c_i)]$ and estimates of the latent moments (σ_{ii}, ρ_{ij}) as well as the actual standard deviation $(s.d.)$.

Table 7

As discussed in sub-section 2.2. above, a key issue is the relationship between the correlation of the unobserved distributions in the two sectors (ρ_{12}) and relative wage inequality $\frac{\sqrt{\sigma_{11}}}{\sqrt{\sigma_{22}}}$. The results indicate that:

(i) The correlation is positive in the West Bank case but is relatively low (0.29) and is smaller than $\frac{\sqrt{\sigma_{11}}}{\sqrt{\sigma_{22}}}(0.86)$. In the Gaza case it is even negative (-0.33).

(ii) The variance in local employment is higher than that of employment in Israel.

These results are reasonable: the relatively low correlation is probably due to the fact that government employment was predominant locally and required very different skills than those needed for the occupations that dominated employment in Israel – construction, manufacturing and agriculture. The latter require skills that are less dispersed than those in the more high-skilled occupations of local employment – the "anybody can do it" effect – hence the lower variance in Israel employment.

As a consequence selection was positive in each sector. This corresponds to cases (ii) and (iii) discussed in Section 2.2.2 above, with positive selection due to comparative advantage in the West Bank case and to absolute advantage in the Gaza case. Both constitute the "refugee sorting" case in the Borjas (1987) terminology.

How important is the selection bias? Figure 3 reports the education (panels a and c) and experience (panels b and d) coefficients for the wage regressions using OLS not corrected for sample selection bias as well as the coefficients of the corrected regressions reported in Table 4.

Figure 3

The figure reveals a substantial and systematic downward bias for the local economy and an upward bias for the Israeli economy. This is consistent with the afore-cited selection patterns. In terms of equation (18) the term $\frac{\partial c_i}{\partial x_k}$ is positive locally, negative in Israel. Thus experience age and education premia are overstated in the Israeli economy and understated in the local economy if one does not control for selection bias. As a result the difference between migrants and stayers

is understated in the uncorrected regressions. This is akin to the understatement of the college premium when the two sectors are college graduates and high-school graduates and when selection is positive in each sector (see Willis and Rosen (1979)). Note that this bias is important in the context of studying the labor market performance of migrants. While this issue is not at the focus of the current paper, the extent of the bias is noteworthy.

6.3 The Self Selection Process: Regression Analysis

To see the role of the different elements of the self-selection process, consider the following regression equation:

$$\begin{aligned} \ln t_2 &= \mu_2 + \frac{\sigma_{12}}{\sigma_{11}}(\ln t_1 - \mu_1) + \varepsilon_2 \\ &= \left(\mu_2 - \frac{\sigma_{12}}{\sigma_{11}}\mu_1\right) + \frac{\sigma_{12}}{\sigma_{11}} \ln t_1 + \varepsilon_2 \end{aligned} \tag{20}$$

where:

$$var\ \varepsilon_2 = \sigma_{22}[1 - \frac{\sigma_{12}^2}{\sigma_{11}\sigma_{22}}]$$

In $\ln t_2 - \ln t_1$ space this regression is shown in the following figure (based on the discussion in Heckman and Sedlacek (1985, Figures 1 and 2)). The figure uses the actual point estimates from Table 4.

Figure 4

For any given worker, the log task value in the local sector is given by a value of $\ln t_{local}$ on the horizontal axis; the regression line (the red line in the figure) gives the linearly predicted log task value in the Israel sector, i.e. predicted $\ln t_{Israel}$. Actual values lie along the normal distribution around the line, as shown in two places in the graph; note that the distributions plotted relate to the vertical $\ln t_{Israel}$ values. The data points are distributed – conditional on the $\ln t_{local}$ value –

with $var\ \varepsilon_{Israel}$. The regression line has the intercept given by $\mu_{Israel} - \frac{\sigma_{local,Israel}}{\sigma_{local}}\mu_{local}$[14], the slope given by $\frac{\sigma_{local,Israel}}{\sigma_{local}}$, and passes through the $(\mu_{local}, \mu_{Israel})$ point.

The other line in the figure (in blue) is the 45 degree line serving as the line of equal income ($w_{local} = w_{Israel}$). It starts from a negative intercept as $\pi_{Israel} > \pi_{local}$.[15] When the worker has a value below this line he chooses the local sector; above it, he chooses to work in Israel.

Using the actual estimates, the figure shows the positive selection in each sector. In terms of equation (11) in each sector $E(\ln w_i \mid \ln w_i > \ln w_j) > E(\ln w_i)$. Graphically this is seen by noting that when individuals are classified according to their task value, the fraction of people working locally increases as the local task level increases. As one moves up $\ln t_{local}$, the fraction selecting the local sector rises. To see the positive selection for the Israeli economy consider the alternative regression (not plotted) of $\ln t_{local}$ on $\ln t_{Israel}$ and note that there too the slope is less than 1 as $\sigma_{local,Israel} < \sigma_{Israel}$.

The figure shows the role of the migration premium through the position of the $w_{local} = w_{Israel}$ line, the role of observable skill premia through the intercept term, and the role of unobservable skills through the intercept, slope and the variance of the distribution at each point.

The estimates indicate three major features: (i) $\mu_{Israel} < \mu_{local}$ so the intercept is relatively low; (ii) $\frac{\sigma_{local,Israel}}{\sigma_{local}} < 1$ in the West Bank case and so the regression line is flatter than the 45 degree line and $\frac{\sigma_{local,Israel}}{\sigma_{local}} < 0$ in the Gaza case so the regression slope is negative; and (iii) $\pi_{Israel} > \pi_{local}$ so the line of equal income starts from below 0. All of these features are reasonable: $\mu_{Israel} < \mu_{local}$ as the host (Israeli) economy does not reward skills like education and experience in the low-skill occupations offered; there is not much correlation between these occupations and the local ones, hence the low value of $\sigma_{local,Israel}$; and the host economy, being richer and presumably more productive, has a higher task price i.e. $\pi_{Israel} > \pi_{local}$.

It is of interest to consider the effects of possible changes in the parameters that determine

[14] We use the point estimates of the coefficients and the sample means of the X variables to generate μ_{local} and μ_{Israel}. We adopt the normalization of $-\ln(1-\tau) + \beta_0 = 0$.

[15] Equal income means $\ln w_1 = \ln w_2$ or $\ln \pi_1 + \ln t_1 = \ln \pi_2 + \ln t_2$. Hence it is given by $\ln t_2 = \ln \pi_1 - \ln \pi_2 + \ln t_1$.

selection patterns:

(i) When the migration premium rises, i.e. when $\frac{\pi_{host}}{\pi_{local}}$ rises, the line of equal income shifts downwards. Fewer workers choose the local economy and more migrate.

(ii) When the host economy skill premia decline, i.e. μ_{host} falls, the intercept declines and the regression line shifts downwards. Now more workers choose local employment.

(iii) When the home country distribution becomes more dispersed, i.e. σ_{local} rises, several changes take place: the intercept rises and the slope declines so the regression line rises and flattens. In addition, the variance of the normal distribution around the line rises. The overall effect is ambiguous.

(iv) When the co-variance of the skills across the two economies declines, i.e. $\sigma_{local,host}$ falls, the same happens: the regression line shifts up and flattens and the normal distribution becomes more dispersed.

(v) When the host country distribution becomes less dispersed, i.e. σ_{host} falls, the variance of the normal distribution falls. The overall effect is ambiguous.

Hence effects (i) and (ii) are contradictory – a higher migration premium offsets lower skill premia. Effects (iii), (iv) and (v) yield ambiguous outcomes. Thus, for example, if tasks offered to migrant workers were to become more complex then $\sigma_{host}, \sigma_{local,host}$ and μ_{host} are all likely to rise. Only effect (ii) in reverse – the rise in μ_{host} – leads unambiguously to more migration. Effects (iv) and (v) in reverse imply that this change will not necessarily lead to more migration.

6.4 Implications for Inequality

Selection induces a reduction in wage inequality as measured by the standard deviation. In Table 7 we report the ratio $\frac{s.d.}{\sqrt{\sigma_{ii}}}$ i.e. the actual standard deviation relative to the latent (population) standard deviation which was estimated. Without selection, i.e. with random assignment, this ratio would be 1 (see the discussion in 2.2.1 above). In the case of West Bank workers the ratio is 0.94 for Israel employment and 0.87 for local employment; in Gaza the ratio is 0.88 for Israel

employment and 0.77 for local employment. These numbers essentially quantify the effects of positive self-selection in reducing wage inequality.

7 Decomposing The Wage Differential

The estimates allow us to decompose the wage differential between the two economies. The idea is to quantify the relative role played by the different elements of the model – task prices, skill premia and skill levels. We do this using the actual data and the estimates of Table 4, i.e. for the post-selection wage differential. We follow the methodology proposed by Oaxaca and Ransom (1994) and decompose the wage differential between the Israeli economy and the local economy into components: a part due to task prices, net of commuting costs, plus the intercept of the task function (i.e. the constant in the wage equation); a part due to differences in skill premia across the two sectors; a part due to differences in skill levels across the two sectors; and a part due to differences in selection effects. This is done on average values:

$$\begin{aligned} \overline{\ln w_2} - \overline{\ln w_1} \;=\; & \widehat{k}_2 - \widehat{k}_1 \\ & + \overline{X}_1(\widehat{\boldsymbol{\beta}}_2 - \widehat{\boldsymbol{\beta}}_1) \\ & + \widehat{\boldsymbol{\beta}}_2(\overline{X}_2 - \overline{X}_1) \\ & + \rho_2\sqrt{\sigma_{22}}\overline{\lambda_2} - \rho_1\sqrt{\sigma_{11}}\overline{\lambda_1} \end{aligned} \tag{21}$$

where $\overline{\ln w_i}$ is the mean log hourly wage in economy $i, \widehat{k}_i = \ln\widehat{\pi_0} - \ln(1-\widehat{\tau}) + \widehat{\beta_0}$ for economy i using the point estimates of the constant, $\widehat{\boldsymbol{\beta}}_i$ is a vector of the point estimates of the coefficients in economy i, $\overline{X}_i$ is a vector of the mean values of the independent variables in economy i, and $\rho_i\sqrt{\sigma_{ii}}\overline{\lambda_i}$ are the estimates of the second moments times the average of the inverse of Mills' ratio, all derived from the equations estimated in Table 4.

Table 8

The results indicate that the mean wage differential (in real hourly wage terms) between the economies is relatively small – about 3% to 5%. This masks big disparities: there is a much higher constant in Israel employment and much higher skill premia and skill levels in local employment. These then offset each other. The picture is qualitatively the same across regions (the West Bank and Gaza) but is more dramatic in terms of absolute numbers in Gaza. Note that most of the skill premia difference is due to differences in returns to skill; the differences in the skill levels are much less important. The key point emerging from the table is that wage equalization across economies (pertaining to workers from the source economy) is attained through the assignment of workers by the self-selection process. While clear disparities exist between the two economies – the migration premium and the wage skill premia – these cancel out through self-selection.

8 Conclusions

The results indicate that the self-selection model is able to explain migration decisions in the Palestinian labor market. They are likely to reflect other cases of low skill migrants working in developed economies. The main results may be summarized as follows: local employment has standard education and experience return profiles, while for employment in Israel these profiles are flat and low. Israel offered Palestinian workers low-skill jobs – mostly in construction, manufacturing and agriculture – where education and experience were almost not rewarded, but offered higher wages for given skills. Less educated and less experienced workers chose to work in Israel; those with better skills chose to work locally and were compensated for the wage differential by the local returns given to their skills.[16] In terms of the unobserved skill distribution, there was positive selection in

[16] Another application of the concept of self-selection to questions of immigration was suggested recently by Berman and Rzakhanov (2000). Their analysis pertains to fertility decisions combined with migration decisions. While this

each sector and so a reduction in wage inequality. This pattern of positive self selection emerged as a result of the relatively low correlation between local and Israeli employment, probably due to the difference in occupational tasks.

The paper's results are consistent with the evidence (mostly for the U.S.) cited in Borjas (1999) but suggest a different interpretation. The evidence concerns migrants from source economies with relatively high wage dispersion and relatively high returns to skill. It indicates that these migrants come from the lower part of the skill distribution and have low earnings in the host economy. The literature interprets these findings as an indication of negative self selection. This paper offers a different interpretation: migrants have low earnings in the host economy, as they work in low-skill industries or occupations that offer low wages. They migrate because the migration premium compensates them for their low levels of skills and for the absence of skill premia. Correlations between skill distributions across the source and host economies are low because the host economy offers low-skill tasks with relatively little skill dispersion. Workers self-select according to comparative or absolute advantage and attain positive selection, not negative as the literature has suggested. In the formal terminology of the model, both the literature and this paper find that $\frac{\sigma_{local}}{\sigma host} > 1$. The literature claiming negative self-selection then implies that $\frac{\sigma_{local}}{\sigma host} > \rho_{local,host} > \frac{\sigma_{host}}{\sigma_{local}}$ often with no direct evidence on ρ. The results here[17] indicate that $\frac{\sigma_{local}}{\sigma host} > \frac{\sigma_{host}}{\sigma_{local}} > \rho_{local,host}$, hence positive self-selection.

The importance of selection bias in the wage regressions indicates that uncorrected estimates lead to erroneous conclusions about skill premia of migrant workers. The bias operates to increase the estimated premia. This has implications both for studies that compare migrants to "stayers," as done here, as well as to studies that look at the economic performance of migrants.

A key point that emerges from this analysis is that a substantial migration premium coupled with very low skill premia lead workers to sort themselves so that the relatively highly skilled work

kind of analysis is not empirically relevant here, in a more general context their ideas can serve to strengthen the argument made here about a migration premium.

[17] Based on estimates of these second moments.

in local, more complex tasks, while the low skilled work abroad in relatively simple tasks. The paper has not looked at the reason foreign economies offer such tasks. An important question left for future research is the modelling of endogenous demand for tasks and the endogenous determination of the migration and skill premia.

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Table 1

Macroeconomic Indicators

GDP per capita, 1987

	current dollars	% of Israeli figure
West Bank	1,551	18%
Gaza	844	10%
Israel	8,392	100%

Note:

Source: Central Bureau of Statistics (1989), Tables VI/1 and XXVII/9.

Table 2

Sample Statistics

1987

variable	
sample size	39,222
employed (out of total sample)	79%
salaried employees out of employment	64%
mean schooling years	8.3
mean age	31.7
percent single	32%
percent urban residence	31%
percent refugee camps residence	16%

Note:

All variables - except for the first two rows - refer to salaried employees.

Table 3

Salaried Employees Industry Distribution

construction	38%
manufacturing	21%
government	17%
agriculture	9%
commerce	7%
personal services	4%
transportation	3%
financial services	1%

Table 4

Wage Regressions (dep. variable: log hourly real wage)

(a) West Bank Workers

FIRST STAGE	PROBIT
constant	-1.56
	(0.07)
education	0.066
	(0.035)
experience	0.038
	(0.004)
experience squared/100	-0.040
	(0.007)
single	0.08
	(0.03)
urban	1.05
	(0.03)
refugee	0.20
	(0.04)

SECOND STAGE	REGRESSION	
	Local	Israel
constant	-3.84	-2.87
	(0.04)	(0.03)
education	0.040	-0.001
	(0.001)	(0.002)
experience	0.027	0.0005
	(0.002)	(0.001)
experience squared/100	-0.033	-0.005
	(0.003)	(0.002)
single	-0.07	-0.13
	(0.02)	(0.01)
urban	0.23	-0.15
	(0.01)	(0.02)
refugee	0.02	-0.14
	(0.02)	(0.01)
n	5625	7950
Wald test (χ^2)	1421.5	653.2
	(0.00)	(0.00)
$\rho_i = 0$ test (χ^2)	150.9	27.2
	(0.00)	(0.00)

(b) Gaza Workers

FIRST STAGE	PROBIT
constant	-2.44
	(0.13)
education	0.096
	(0.006)
experience	0.039
	(0.007)
experience squared/100	-0.016
	(0.011)
single	0.27
	(0.06)
urban	0.45
	(0.07)
refugee	0.11
	(0.07)

SECOND STAGE	REGRESSION	
	Local	Israel
constant	-4.42	-2.74
	(0.09)	(0.04)
education	0.066	0.003
	(0.003)	(0.002)
experience	0.030	0.001
	(0.004)	(0.002)
experience squared/100	-0.025	-0.009
	(0.006)	(0.004)
single	0.02	-0.11
	(0.03)	(0.02)
urban	0.18	-0.04
	(0.04)	(0.02)
refugee	0.09	-0.10
	(0.04)	(0.02)
school 6		-0.21
		(0.03)
n	1333	3204
Wald test (χ^2)	556.3	224.4
	(0.00)	(0.00)
$\rho_i = 0$ test (χ^2)	89.5	47.8
	(0.00)	(0.00)

Notes:

1. Sample includes all wage earners except those with wages below 200 NIS a month.

2. n is the number of observations in the regression.

3. Standard errors of the coefficients are in parentheses.

4. The regressions included dummy variables for quarters, which are not reported.

5. Probit estimates refer to the probability of choosing the local economy.

6. The Wald test is distributed χ^2 with 9 degrees of freedom (except for Gaza workers in Israel where the degrees of freedom are 10). The $\rho_i = 0$ test using $\chi^2(1)$ is an LR test of the null hypthesis that $\rho_i = 0$. P-values appear in parantheses.

Table 5

Education and Age Distributions by Work Locations

a. Schooling Groups

	School 0	School 1	School 2	School 3	School 4	School 5	Total
Israel+E. Jerusalem	68%	60%	63%	65%	65%	30%	60%
West Bank and Gaza	32%	40%	37%	35%	35%	70%	40%
Total	7.8%	8.7%	20.5%	15.2%	35.0%	12.7%	19201

b. Education – Key Moments (in years)

	Israel+E.Jerusalem	West Bank and Gaza	Total
Mean	7.74	9.09	8.29
Median	8	9	8
Standard Deviation	3.88	4.60	4.24

c. Age Groups

	Age 1	Age 2	Age 3	Age 4	Age 5	Total
Israel+E.Jerusalem	67%	60%	52%	51%	57%	60%
West Bank and Gaza	33%	40%	48%	49%	43%	40%
Total	35.2%	32.7%	17.2%	9.7%	5.3%	19201

d. Age–Key Moments (in years)

	Israel+E.Jerusalem	West Bank and Gaza	Total
Mean	30.9	33.2	31.8
Median	27	31	29
Standard Deviation	11.0	11.3	11.2

Notes:

1. Sample include wage earners with wages above 200 NIS a month, with 19,201 observations.

2. In panels (a) and (c) the percentages in rows 1 and 2 refer to the number of workers within the schooling or age group. The percentages in row 3 refer to the share of the group in the total sample.

3. Schooling groups are: no schooling (school 0), 1- 4 years (school 1), 5-6 years (school 2), 7-8 years (school 3), 9-12 years (school 4) and 13 and more (school 5).

4. Age groups are 18-24 (age1), 25-34 (age 2), 35-44 (age 3), 45-54 (age 4) and 55-64 (age 5).

Table 6

Schooling, Industry and Occupation Distributions: Local vs. Israel Employment

a. West Bank (local) employment

education level	percentage
school 0	5.7
school 1	8.6
school 2	19.6
school 3	14.9
school 4	30.3
school 5	21.0

industry	percentage
agriculture	3.7
manufacturing	24.4
construction	23.7
commerce	6.1
government	30.1
transportation	6.1
personal	4.0
finance	1.1

occupation	percentage
high-skill	27.5

b. Gaza (local) employment

education level	percentage
school 0	7.7
school 1	8.8
school 2	16.1
school 3	7.7
school 4	32.6
school 5	27.1

industry	percentage
agriculture	5.9
manufacturing	20.5
construction	12.2
commerce	2.6
government	47.8
transportation	4.1
personal	5.9
finance	0.9

occupation	percentage
high-skill	39.4

c. Israel employment

education level	percentage
school 0	8.9
school 1	8.7
school 2	21.6
school 3	16.5
school 4	37.7
school 5	6.5

industry	percentage
agriculture	11.8
manufacturing	19.3
construction	49.2
commerce	8.8
government	6.0
transportation	1.5
personal	3.2
finance	0.1

occupation	percentage
high-skill	1.6

Notes:

1. Employment data refer to wage earners.

2. Schooling groups are: no schooling (school 0), 1- 4 years (school 1), 5-6 years (school 2), 7-8 years (school 3), 9-12 years (school 4) and 13 and more (school 5).

3. High-skill occupations include scientific, professional, managerial and administrative occupations.

Table 7: Estimates of $\sum$

a. West Bank Workers

	Local	Israel
$\rho_i\sqrt{\sigma_{ii}}$	0.32	0.21
	(0.01)	(0.02)

	$s.d.$	$\sqrt{\sigma_{ii}}$	ρ_i	$\frac{s.d.}{\sqrt{\sigma_{ii}}}$	$\frac{\sqrt{\sigma_{11}}}{\sqrt{\sigma_{22}}}$	ρ_{12}
$2 = Israel$	0.331	0.354	0.59	0.94		
$1 = WestBank$	0.359	0.412	0.78	0.87		
interaction					0.86	0.29

b. Gaza Workers

	Local	Israel
$\rho_i\sqrt{\sigma_{ii}}$	0.44	0.27
	(0.02)	(0.01)

	$s.d.$	$\sqrt{\sigma_{ii}}$	ρ_i	$\frac{s.d.}{\sqrt{\sigma_{ii}}}$	$\frac{\sqrt{\sigma_{11}}}{\sqrt{\sigma_{22}}}$	ρ_{12}
$2 = Israel$	0.313	0.356	0.76	0.88		
$1 = Gaza$	0.376	0.489	0.89	0.77		
interaction					0.73	-0.33

Note:

1. The above estimates were produced by the regressions reported in Table 4.

2. Standard errors are reported in parantheses.

Table 8

Wage Differentials Decomposed

$$\begin{aligned}\overline{\ln w_{local}} - \overline{\ln w_{Israel}} &= \widehat{k}_{local} - \widehat{k}_{Israel} \\ &+\overline{X}_{Israel}(\widehat{\boldsymbol{\beta}}_{local} - \widehat{\boldsymbol{\beta}}_{Israel}) \\ &+\widehat{\boldsymbol{\beta}}_{local}(\overline{X}_{local} - \overline{X}_{Israel}) \\ &+\rho_{local}\sqrt{\sigma_{local}}\overline{\lambda}_{local} - \rho_{Israel}\sqrt{\sigma_{Israel}}\overline{\lambda}_{Israel}\end{aligned}$$

a. West Bank

$\overline{\ln w_{local}} - \overline{\ln w_{Israel}}$	-0.03
$\widehat{k}_{local} - \widehat{k}_{Israel}$	-0.97
$\overline{X}_{Israel}(\widehat{\boldsymbol{\beta}}_{local} - \widehat{\boldsymbol{\beta}}_{Israel})$	0.73
$\widehat{\boldsymbol{\beta}}_{local}(\overline{X}_{local} - \overline{X}_{Israel})$	0.15
$\rho_{local}\sqrt{\sigma_{local}}\overline{\lambda}_{local} - \rho_{Israel}\sqrt{\sigma_{Israel}}\overline{\lambda}_{Israel}$	0.14

b. Gaza

$\overline{\ln w_{local}} - \overline{\ln w_{Israel}}$	-0.05
$\widehat{k}_{local} - \widehat{k}_{Israel}$	-1.68
$\overline{X}_{Israel}(\widehat{\boldsymbol{\beta}}_{local} - \widehat{\boldsymbol{\beta}}_{Israel})$	1.16
$\widehat{\boldsymbol{\beta}}_{local}(\overline{X}_{local} - \overline{X}_{Israel})$	0.17
$\rho_{local}\sqrt{\sigma_{local}}\overline{\lambda}_{local} - \rho_{Israel}\sqrt{\sigma_{Israel}}\overline{\lambda}_{Israel}$	0.35

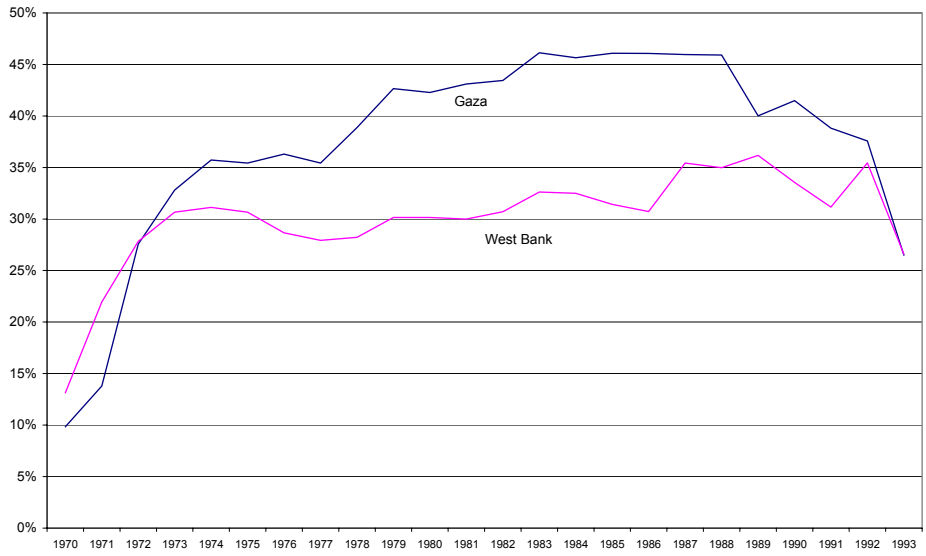

Figure 1: Employment in Israel (share of total employment in local region)

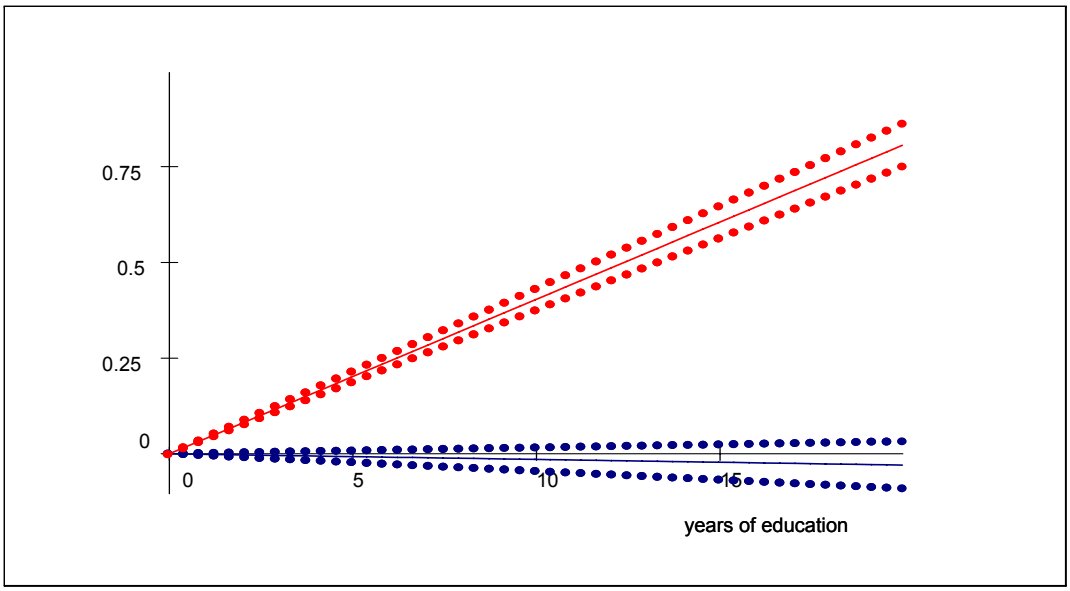

Figure 2a: Education Premia for West Bank workers (red-local, blue-Israel)

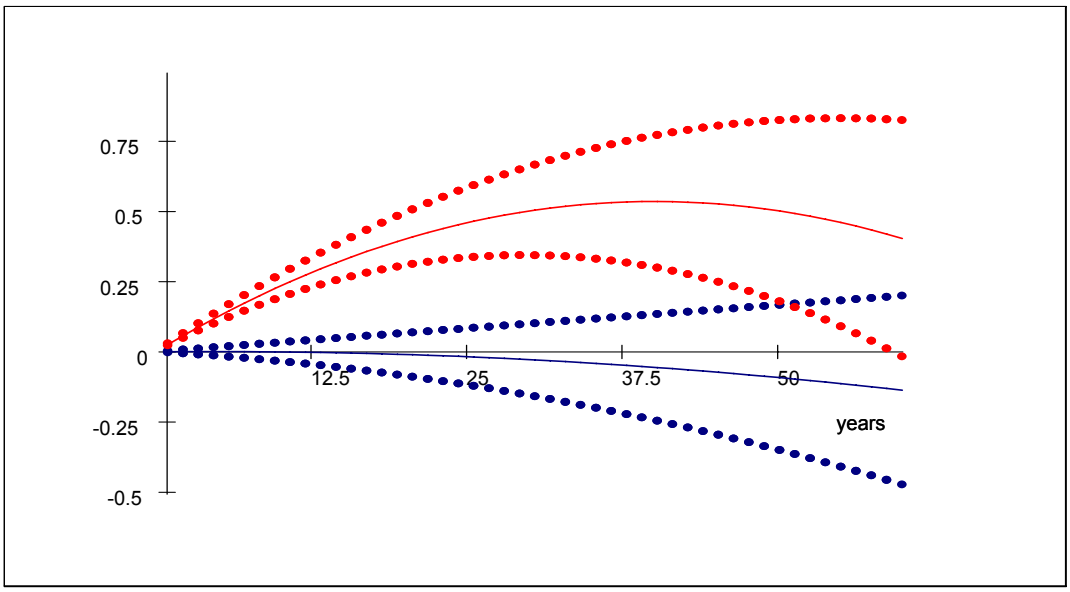

Figure 2b: Experience Premia for West Bank Workers (red – local, blue – Israel)

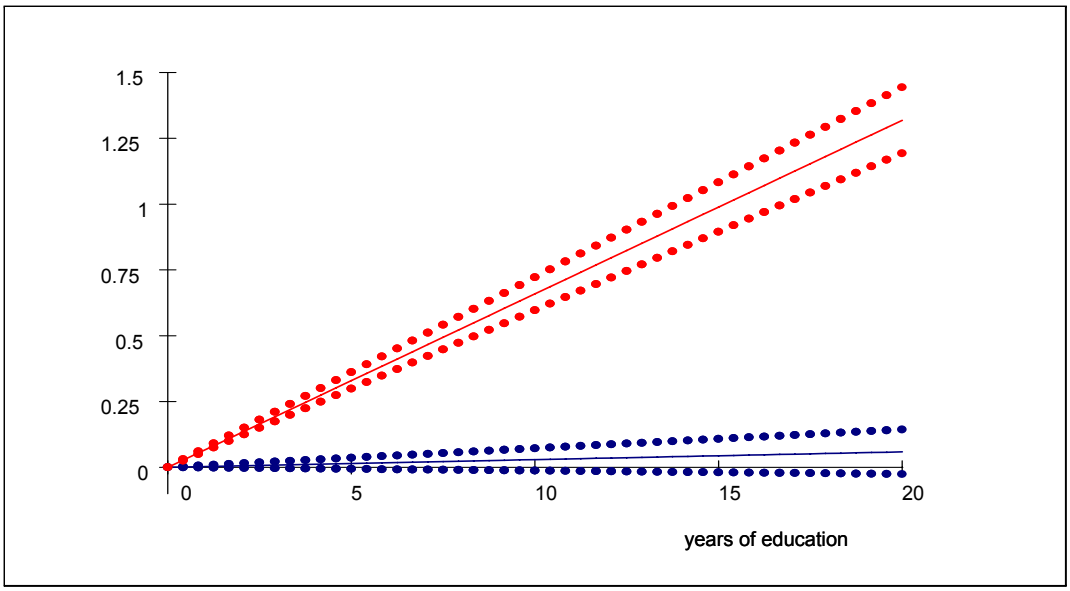

Figure 2c: Education Premia for Gaza workers (red-local, blue-Israel)

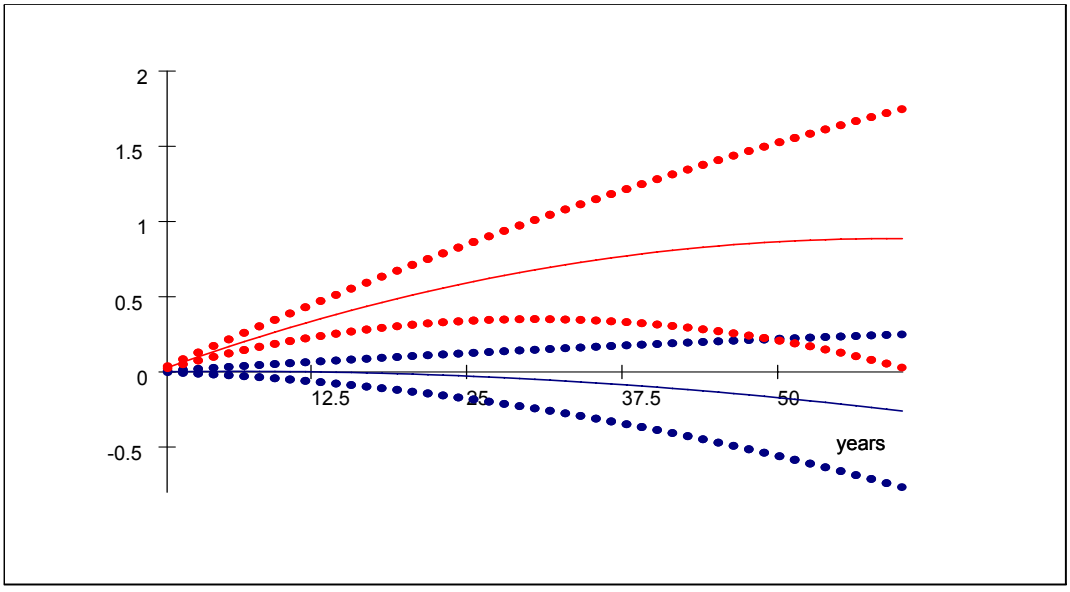

Figure 2d: Experience Premia for Gaza Workers (red-local, blue-Israel)

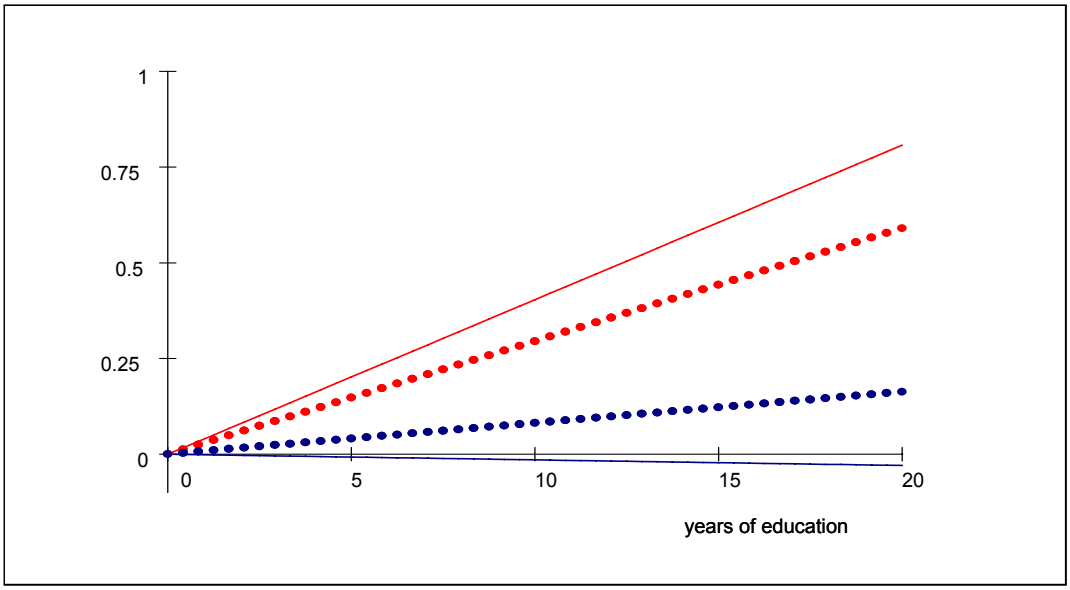

Figure 3a: Education premia for West Bank workers, corrected (solid) vs. uncorrected (dotted)

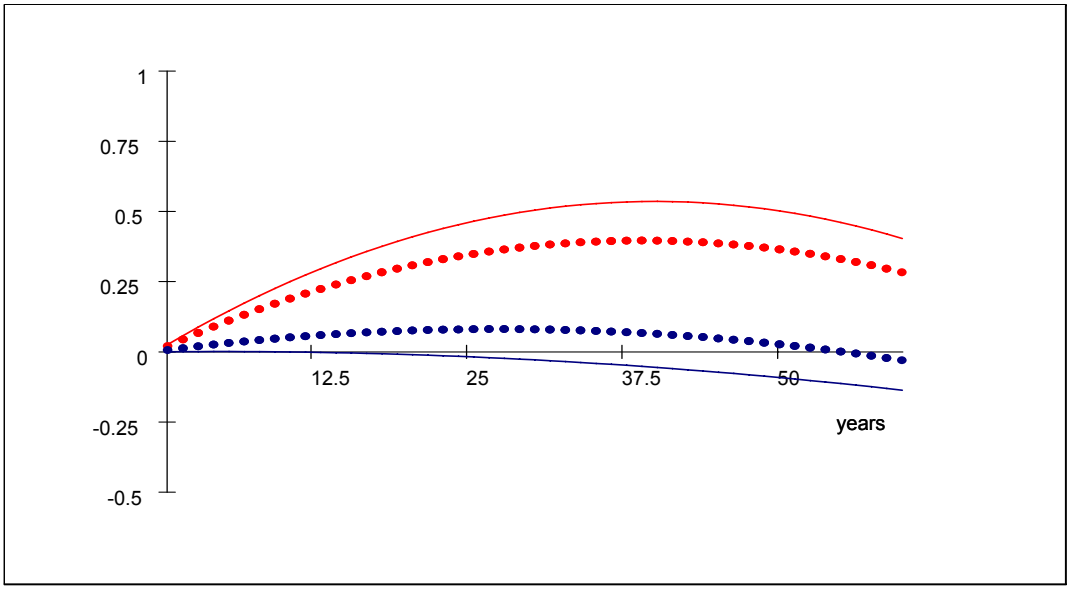

Figure 3b: Experience premia for West Bank workers, corrected (solid) vs. uncorrected (dotted)

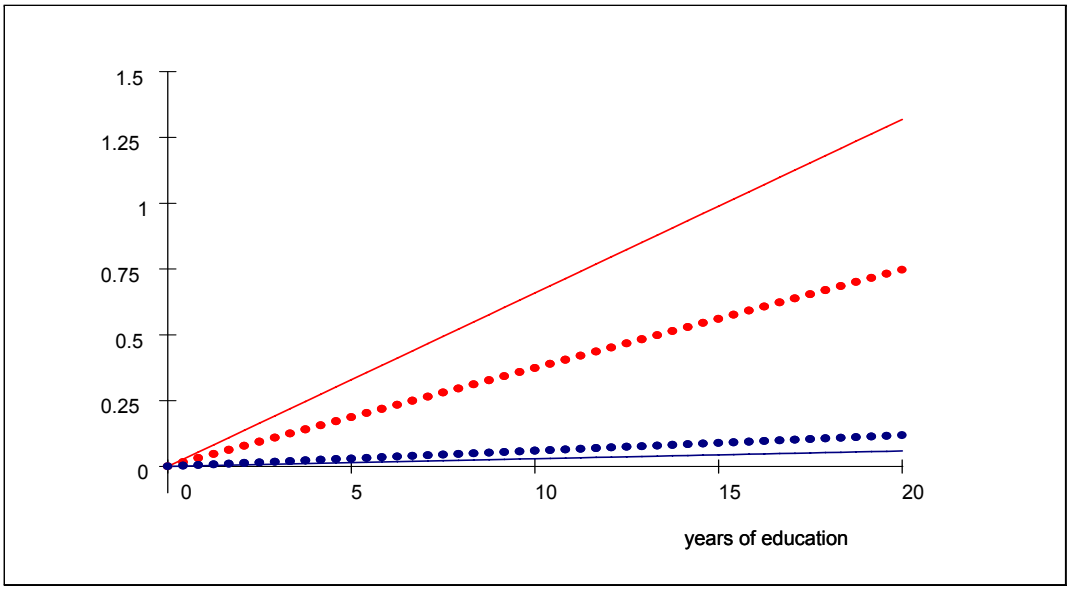

Figure 3c: Education premia for Gaza workers, corrected (solid) vs. uncorrected (dotted)

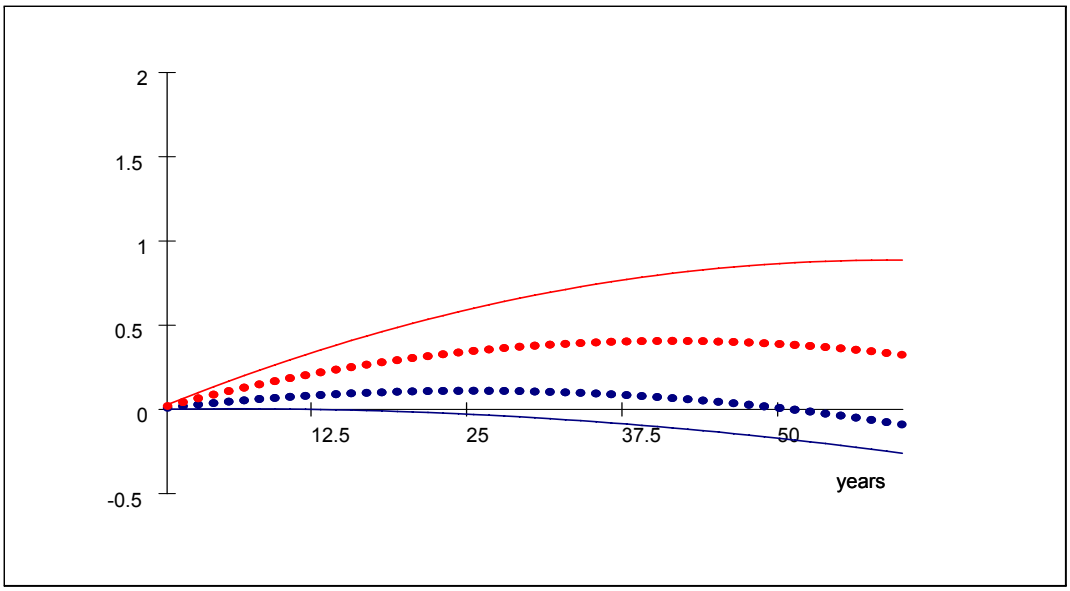

Figure 3d: Experience Premia for Gaza Workers, corrected (solid) vs. uncorrected (dotted)

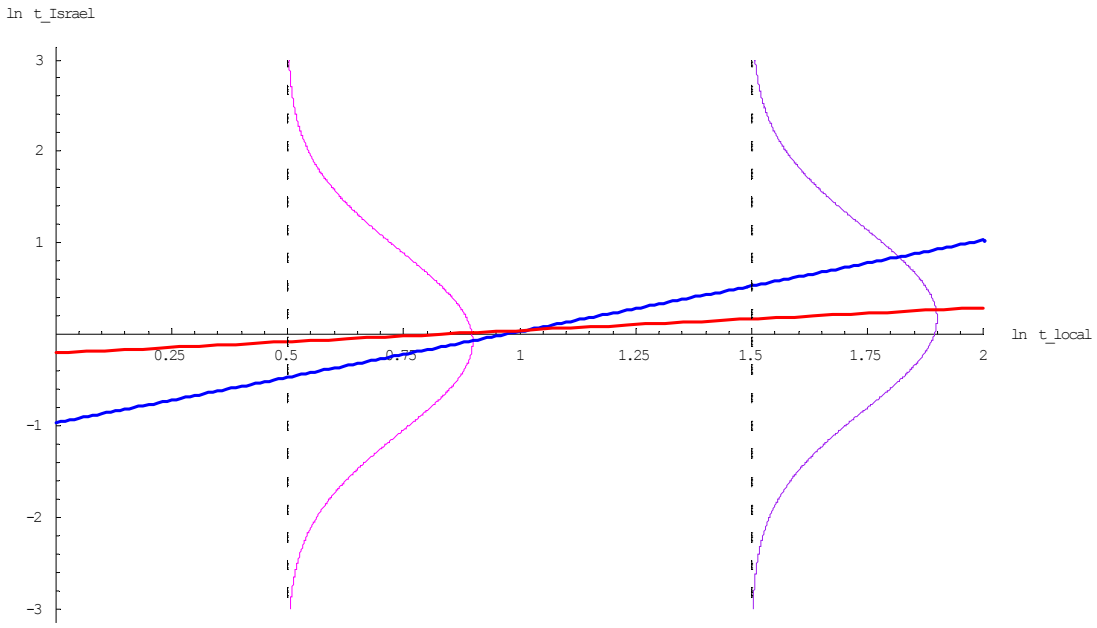

Figure 4a: West Bank regression

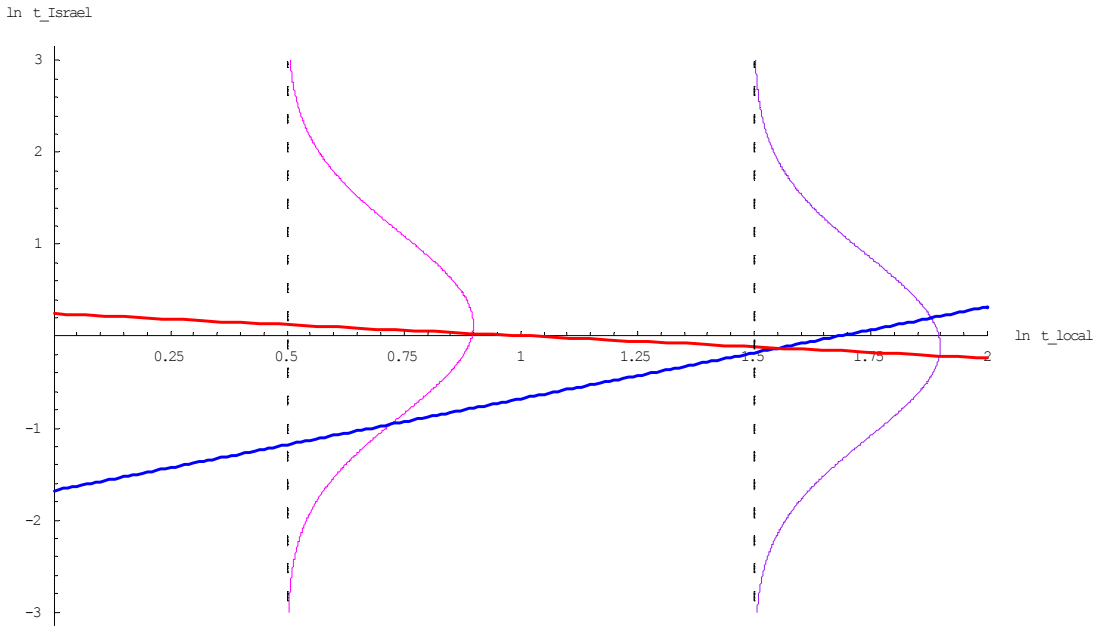

Figure 4b: Gaza Regression