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RETURN MIGRATION IN A LIFE-CYCLE SETTING:
An Exploratory Study of Pakistani Migrants in Saudi Arabia

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This paper sets up a choice theoretic, dynamic optimisation model in a life-cycle setting, within which a temporary international migrant attempts to maximise a lifetime utility function. The choice variables are consumption at each point in time and the period of stay abroad. Determinants of the latter choice are the time stream of benefits and costs associated with migration. Benefits consist primarily of the jump in income levels. Costs comprise, first, of initial job-search and travel costs, second, of higher living costs abroad and, third, of 'psychic' costs due to family separation and cultural alienation.

The model is applied to a data set of 417 Pakistani workers in Saudi Arabia. The impact of income 'shocks' of varying magnitude on planned lengths of stay abroad is simulated. It appears that the decline in wages has to be substantial, over 50 per cent, before, more or less, immediate large-scale return migration can commence to Pakistan.

I. Introduction

The extended fall in oil export revenues of the OPEC countries in the Middle East and the consequent decline in the level of domestic economic activity has implied a major reduction in the derived demand for labour. This fall in demand assumes special significance when a large segment of the labour force consists of expatriate workers who may either have to be sent back or voluntarily return to their countries of origin in the wake of the recession.

The prospect of return migration raises important policy issues both for the countries of origin and destination. For the OPEC countries the

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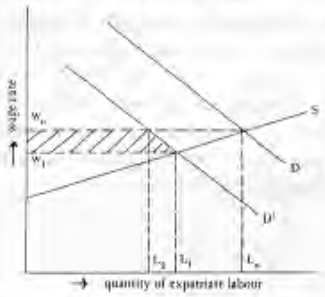
policy choice lies clearly between forcing an adjustment of the labour market via compulsory repatriation or allowing a market solution via falling wages.[1] For the countries of origin (Pakistan, Egypt, Yemen, India, Bangladesh, Sri Lanka, Philippines, Korea and so on) the policy issues pertain to the ability to absorb major additions to the domestic labour force, especially unskilled and semi-skilled workers, in a limited period of time and the nature of adjustment to the fall in foreign exchange remittances to which these economies had become accustomed to in recent years.[2] For the individual foreign worker in the Middle East the basic decisions are whether to return, under what conditions and when.

Analysis of some of these issues requires a framework for modelling the impact of different factors on the rate of international return migration. This paper represents a first attempt to develop such a model and to test it empirically, for illustrative purposes only, on a small data set pertaining to Pakistani workers in Saudi Arabia.[3]

[1] The two options of immigration policy for the host government are shown in the diagram below:



With rigid wages, the number of workers who are forced to leave is L_0L_2. With flexible wages, on the other hand, the volume of return migration is L_0L_1, with $L_0L_1 < L_0L_2$. The important difference is that in the latter case the departure is voluntary whereas in the former case, there is a forced reduction in the expatriate labour force.

There is some evidence that the United Arab Emirates have adopted the first policy. Saudi Arabia appears, however, to have allowed a free operation of market forces. The policy of flexible wages is apparently a more efficient policy. The producer surplus for the host country is larger by the shaded area shown in the figure.

It should be noted that forced repatriation or restrictions on the period of employment will only be effective if recirculation of migrants on fresh fixed-term contracts is controlled. Otherwise the situation is conceptually the same as under voluntary choice and flexible wages, the only difference being increased job search costs appearing as a time stream instead of being concentrated at the beginning. Casual observation suggests that this process of recirculation has been assuming increasing significance in recent years.

[2] For the importance of foreign remittances to the Pakistani economy, see, Tsakok (1982).

[3] Saudi Arabia represents the principal destination of migration for Pakistani workers. It is estimated that out of the 2.5 million workers and their dependents abroad, [ILO-ARTEP (1984)], almost 45 per cent are in the Kingdom.

Section II of the paper presents the behavioural assumptions underlying the model and its structure. Section III develops the methodology for quantifying the impact of an income shock on the planned length of stay abroad of the worker. In section IV the model is empirically applied to the available data set. The principal findings from the model simulations are highlighted in this section and a summary of the conclusions of the study in section V. Also included is an appendix describing the methodology used for undertaking numerical simulations of the model.

II. The Model

The uniqueness of the proposed framework for the model stems from our contention that we are dealing with a phenomenon in which the decision to return home is a conscious and deliberate part of the calculations by the prospective migrant. Reasons for anticipating such return migration include the denial of nationality status by host governments, the absence of opportunities for onward migration and the restriction on family members accompanying the migrant, especially in the case of unskilled and semi-skilled workers who represent the bulk of the migrants, [see Weiner (1982)].

This knowledge of the temporary nature of stay abroad immediately sets apart the proposed framework from most existing models of migration that are built on the unstated presumption that the change of location is planned to be permanent in nature. The studies that acknowledge the existence of return migrants, perhaps influenced by the above bias, tend to identify them either as the unsuccessful ones or those whose initial wage expectations were not realised due to incorrect or incomplete information, [Farber (1983), DaVanzo and Morrison (1981), Yezer and Thurston (1976)].

Therefore, given the relative certainty of return migration, the basic decision variable for an individual migrant is when to return. Modelling this decision necessitates a choice theoretic, dynamic optimisation exercise in a life cycle setting, within which a migrant attempts to maximise a lifetime utility function. The character of the optimisation is identical to the Ramsey (1928) optimal savings type of problem, except that there is one additional choice variable, the period of migration, superimposed on it.

Determinants of this choice are the time stream of benefits and costs associated with migration. The former consists primarily of the jump in income levels. Against this, costs are of three types. First, costs are initially incurred in organising the process of migration in the form of

job search costs, charges of recruitment agents, travel costs, etc. Second, the cost of living abroad is generally higher than at home, especially for non-tradeables like housing and services (education, health, etc.), and the importance of these costs depends upon the number of dependents accompanying the worker abroad. Third, there are "psychic" costs. These psychic costs are partly the consequence of family and country separation and partly the result of the social, political, cultural and linguistic alienation that the worker frequently experiences in the new location.[4]

The importance of psychic costs in influencing migration decisions has already been recognised in the literature. Sjaasted (1962) had conceptualised psychic costs as the consumer surplus foregone rather than the resource costs associated with migration. Deaton, Morgan and Anschel (1982) report an earlier warning that "psychic costs of migration were probably quite significant and could not be ignored by policy makers. Subsequent empirical research has substantiated the suspicion that psychic costs are more important than monetary costs". Kiker and Traynham (1977) note that "a possible explanation of why so many migrants return involve the psychic costs associated with migration. Moving away from relatives and a familiar environment is usually a negative aspect of migration, one which may require substantial economic gains to offset. If an outmigrant does not perceive the relative increase in earnings as substantial enough to offset the psychic costs incurred, the migrant may return".

Psychic costs are captured in the model by postulating a state dependent utility function. There are two states of the world in the model: the first state in which the worker is abroad and the second when he is back home. In the former state, the presence of psychic costs deflates the level of real family consumption, such that if the consumption level is the same in both states, the utility attained is higher in the second state. Given the time profile of earnings at both locations and of psychic costs, it is then possible to define the optimality condition for the planned length of stay abroad.

A possible criticism [Hall (1978)] of the use of life cycle models for defining consumption behaviour is the presence of capital market imper-

[4] It is possible that in some cases return migration may be the consequence of underestimation of psychic costs prior to departure abroad. In other words, the worker may experience a 'cultural shock' particularly if he is illiterate and unskilled and moves from a rural environment to the urban living conditions in the large, modern cities of Saudi Arabia like Jeddah and Riyadh. However, there is very little evidence of, more or less, instantaneous return migration as a result of this shock. For this reason the sample selection bias in the estimation of psychic costs resulting from the inclusion of only those migrants who were still in Saudi Arabia at the time of the survey is likely to be negligible.

fections in developing countries which limit possibilities of borrowing for bringing about intertemporal shifts in consumption. However, in the context of international migrants the liquidity constraint is not likely to be operative. In fact, such migrants are generally making large consumption and capital remittances to their home countries. Due to the relatively high levels of income abroad, large savings actually take place in the earlier part of the working life and dissaving is likely to occur following return.

This absence of a liquidity constraint on current consumption of migrants and their families implies that such expenditures are more likely to be linked to expectations about the magnitude of lifetime wealth and permanent income which, in turn, depend upon the expected length of stay abroad. The decision on the level of current consumption expenditures must therefore contain within it an implicit estimate of the planned length of stay abroad. The paper exploits this intuition to extract the desired information by viewing consumption expenditures as an indicator of the planned length of migration.

Formally, for the purpose of setting up the life-cycle model for return migration, we define the following at time t: U_1 and U_0 are levels of family utility when the worker is abroad and at home respectively. C_1 and C_0 similarly are the levels of real family consumption during the two periods while CE_1 and CE_0 are the corresponding levels of consumption expenditure. S is a measure of psychic costs borne by the household due to the locational separation when the earning member goes abroad. Y_1 and Y_0 are total earned income levels of the household at the two locations. Here, for convenience, we can either assume only one earning member per household or consider Y_1 and Y_0 as the adjusted income levels of the earning member to represent total household incomes. F_1 and F_0 are the number of family members abroad and at home respectively while p is the relative cost of living abroad compared to that at home.

In addition, the following parameters are defined: T_1 and T_2 are the expected periods of working before retirement and of remaining life respectively at time of migration of the worker. W_o is the initial wealth at time of departure, net of any search costs for obtaining employment abroad. r and ρ are the real rates of return on capital and of time preference respectively. t^* designates the planned[5] length of stay of the worker abroad.

[5] The presence of fixed period contracts, especially at the time of departure, does not mean that the period of stay abroad is exogenously given for the individual worker. During the tenure of the contract or towards the end of the contract period, workers frequently search for alternative jobs in Saudi Arabia. This has generally been the practice adopted by expatriate Pakistani

As mentioned earlier, the utility function is taken as state-dependent, with two states: one in which the worker is abroad, with or without other family members, and the other when he is at home. The measure of psychic costs, S, captures the extent of divergence in utility in the two states.[6] It indicates by how much the real consumption level of the family has to be higher during the stay abroad of the migrant to attain the same level of utility as when he is home. Given this definition and the choice of the utility function, as the general form of the constant elasticity of substitution function, it follows that

for $0 \leqslant t \leqslant t^*$,

$$U_{lt} = \frac{1}{1-1/\sigma} \left(\frac{C_{lt}}{S_t}\right)^{1-1/\sigma}, S_t \geqslant 1, \sigma > 0 \qquad (1)$$

and for $t^* < t \leqslant T_2$

$$U_{ot} = \frac{1}{1-1/\sigma} (C_{ot})^{1-1/\sigma}, \sigma > 0^{7} \qquad (2)$$

workers. The prospects for finding the next job are improved by greater information on the labour market after a stay of some time in the Kingdom.

In recent years, however, transferability of work permits to another employer during the tenure of a contract has become increasingly difficult. Therefore, bulk of the labour turnover now takes place following the expiry of a contract period. Also, contract lengths have become shorter with the fall in labour demand and workers may temporarily have to return home before they obtain another job in Saudi Arabia. This has implied an effective reduction in income abroad due to higher travel and job search costs.

[6] The measure of psychic costs, S, used in this paper is analogous in a static one-period sense to that developed by Deaton, Morgan and Anschel (1982). For return migration $U(y_1/S) \leqslant U(y_o)$, where y_1 is the income at the place of migration and y_o at the origin. Therefore, return migration takes place if $(y_1/y_o) \leqslant S$ or $(y_1/S) \leqslant y_o$ and the measure of psychic costs used by them is $y_1(1-1/S)$.

[7] The utility function during the stay abroad can alternatively be specified as follows:

$$U_{lt} = \frac{1}{1-1/\sigma} * S_t' (C_{lt})^{1-1/\sigma}$$

in the presence of psychic costs, $S_t' < 1$. For U_{lt} to be the same as in (1) above, $S_t^{(1-\sigma)} = S_t'^{\sigma}$ Substituting this into equations (11) and (12) obtained with the above specification of the utility function yields the same equations as would be obtained directly with the alternative specification. Therefore, the two specifications of psychic costs are identical. It should also be noted that when $\sigma = 1$ the utility functions collapse to the logarithmic form.

The optimisation problem for the migrant worker can be set up as follows:

$$\mathcal{L}(C_{lt}, C_{ot}, t^*, \lambda) = \frac{1}{1-1/\sigma} \int_0^{t^*} \left(\frac{C_{lt}}{S_t}\right)^{1-1/\sigma} e^{-\rho t} dt + \frac{1}{1-1/\sigma} \int_{t^*}^{T_2}$$

$$(C_{ot})^{1-1/\sigma} e^{-\rho t} dt + \lambda [W_o + \int_0^{t^*} y_{lt} e^{-rt} dt + \int_{t^*}^{T_1} y_{ot} e^{-rt} dt -$$

$$\int_0^{t^*} [A_t p_t + (1-A_t)] C_{lt} e^{-rt} dt + \int_{t^*}^{T_2} C_{ot} e^{-rt} dt] \qquad (3)$$

A_t corresponds to the share of family consumption abroad. It is assumed to be determined in the following manner. α_{it} is defined at time t as the weight of the ith family member in terms of adult consumption equivalents [Deaton and Muellbauer (1980)]. These α_{it}'s could vary by age, sex, nature of relationship to the migrant worker, etc. In such a case

$$A_t = \frac{\sum_{i=1}^{F_{it}} \alpha_{it}}{\sum_{i=1}^{F_{ot}+F_{it}} \alpha_{it}}, \quad (0 < A_t \leqslant 1) \qquad (4)$$

At this stage we also define γ_t such that

$$\gamma_t = A_t p_t + (1-A_t); \text{ if } p_t \geqslant 1 \text{ then } \gamma_t \geqslant 1 \qquad (5)$$

γ_t can be interpreted as the pecuniary cost of one unit of family consumption during the period that the worker is abroad.[8]

[8] It may be hypothesised that $S_t = S_t [\{F_{it}/(F_{ot}+F_{it})\}, Z_t]$, where Z_t is a vector of exogenous variables. Psychic costs may depend upon the share of the family abroad with the worker. Since γ_t rises with the share of the family abroad, there is, therefore, an implicit optimisation decision for the worker as to how many family members he should take with him and how many he should leave behind. However, this choice has not been included in the analysis because of regulatory controls on the number of accompanying dependents by the host government. Such controls are operative especially in the case of unskilled workers and/or workers earning below a certain income level in Saudi Arabia.

The first order conditions from (3) are as follows:

for $0 \leqslant t \leqslant t^*$,

$$\frac{\partial \mathcal{L}}{\partial C_{lt}} = (C_{lt})^{-1/\sigma} (S_t)^{-(1-1/\sigma)} e^{-\rho t} - \lambda \gamma_t e^{-rt} = 0 \tag{6}$$

implying that

$$C_{lt} = \lambda^{-\sigma} e^{\sigma (r-\rho)t} \gamma_t^{-\sigma} S_t^{1-\sigma} \tag{7}$$

Similarly, for $t^* < t \leqslant T_2$,

$$\frac{\partial \mathcal{L}}{\partial C_{ot}} = (C_{ot})^{-1/\sigma} e^{-\rho t} - \lambda e^{-rt} = 0 \tag{8}$$

and

$$C_{ot} = \lambda^{-\sigma} e^{\sigma (r-\rho)t} \tag{9}$$

These results define the path of real consumption for the family. There is a discontinuity in this path at t^*, when the migrant returns home. Depending upon the magnitude of σ, there is a rise or fall in real consumption at this time. That is

$$C_{lt^*} \gtrless C_{ot^*}, \text{ if } \gamma_{t^*}^{-\sigma} S_{t^*}^{1-\sigma} \gtrless 1 \text{ or } \sigma \lesseqgtr \frac{\log S_{t^*}}{\log S_{t^*} + \log \gamma_{t^*}}$$

Alternatively, the condition for consumption expenditure of the family to rise or fall at t^* can be derived as

$$CE_{lt^*} \gtrless CE_{ot^*} \text{ if } \sigma \gtrless 1$$

The first order condition of (3) with respect to t^*[9] is given by

[9] The first order condition with respect to t^* has been derived for a worker who has already migrated abroad. However, it can also be used for finding the condition under which migration will take place in the first instance. For this to happen, $\left.\frac{\partial \mathcal{L}}{\partial t^*}\right|_{t^*=0} > 0$.

$$\frac{\partial \mathcal{L}}{\partial t^*} = (T_1 - t^*)\left\{\frac{1}{1-1/\sigma}\left[\left(\frac{C_{lt^*}}{S_{t^*}}\right)^{1-1/\sigma} - (C_{ot^*})^{1-1/\sigma}\right] e^{-\rho t^*}\right.$$

$$\left. + \lambda e^{-rt^*}\left[(y_{lt^*} - y_{ot^*}) - (\gamma_{t^*} C_{lt^*} - C_{ot^*})\right]\right\} = 0 \qquad (10)$$

There are thus two possible outcomes. Either there is a corner solution with $t^* = T_1$, and the worker stays abroad till retirement, or there is an interior solution with $t^* < T_1$. Also, since λ corresponds to the marginal present value of lifetime utility with respect to wealth, t^* can be interpreted from equation (10) as the time at which the increment in lifetime utility due to staying abroad resulting from the increase in wealth is exactly compensated for by the loss of utility, as indicated by the first part of the equation, due to the presence of psychic costs.

In the case when $t^* < T_1$, substitution of C_{lt^*} and C_{ot^*} from equations (7) and (9) into (10) yields

$$\frac{1}{1-\sigma}\left(\lambda^{-\sigma} e^{\sigma(r-\rho)t^*}\right)\left\{(\gamma_{t^*} S_{t^*})^{1-\sigma} - 1\right\} = y_{lt^*} - y_{ot^*} \qquad (11)$$

Also, substituting for C_{lt} and C_{ot} into the wealth constraint (3)[10], we have

$$W_o + \int_0^{t^*} y_{lt} e^{-rt} dt + \int_{t^*}^{T_1} y_{ot} e^{-rt} dt = \lambda^{-\sigma}\left[\int_0^{t^*} (\gamma_t S_t)^{1-\sigma} e^{[\sigma(r-\rho)-r]t} dt\right.$$

$$\left. + \int_{t^*}^{T_2} e^{[\sigma(r-\rho)-r]t} dt\right] \qquad (12)$$

Equations (11) and (12) form a two equation system for undertaking comparative statics of t^* and λ with respect to the exogenous variables.

[10] It is possible that the path of y_{ot} ($t \geq t^*$), income at home following return migration, may itself be a function of the period, t^*, spent abroad. $(\partial y_{ot}/\partial t^*) > 0$, if the human capital acquired abroad confers skills which are relatively scarce at home and, therefore, in greater demand. Alternatively, $(\partial y_{ot}/\partial t^*) < 0$, because the nature of experience gained abroad may be in sectors and/or in use of relatively capital-intensive technologies which are not so relevant in the domestic labour markets. Also, a career break, especially for professionals, in Pakistan may make it more difficult to find appropriate managerial positions on return. Recognition by the worker of the nature of the relationship between period of stay abroad and income level on return home may also have a bearing on the length of planned stay outside Pakistan.

The detailed computations are available from the authors and only the summary results are presented below:

Partial Derivatives of	With Respect to				
	W_0	T_1	T_2	y_{lt}^a	y_{ot}^a
λ	−	−	+	−	+/−
t^*	−	−	+	+/−	−

[a]The partial derivatives are with respect to parallel shifts of these variables.

It is of interest to note that unlike $(\partial t^*/\partial y_0)$ which is unambiguously negative the crucial partial derivative, $(\partial t^*/\partial y_1)$, is ambiguous. This indicates that the impact of a negative income shock during the stay abroad of a worker could be either to shorten or lengthen his stay, and not only to lead to earlier return migration as has generally been presumed. The basic reason for this ambiguity can be seen from equation (11). If $dy_{lt} < 0$ then λ increases while $(y_{lt^*} - y_{ot^*})$ decreases, as a result of which the impact on t^* is ambiguous. The comparative statics exercise indicates that the likelihood that $(\partial t^*/\partial y_1) > 0$ depends upon, first, the lower W_0 is, and second, the larger T_1 is (that is, the younger the worker is at the time of migration). As opposed to this, $(\partial t^*/\partial y_0)$ is unambiguously negative because both λ and $(y_{lt^*} - y_{ot^*})$ become smaller when $dy_0 > 0$.

III. Impact of Income Shocks

The model developed above for determining optimal period of international migration can be relatively easily modified to capture the effect of unanticipated income shocks[11] of varying magnitude on different types of workers, for example, in terms of the completed length of stay abroad. The approach used essentially involves reinitialising the optimisation

[11] There has generally been a decline in basic pay for most expatriate workers in Saudi Arabia in recent years. In addition, fringe benefits, especially for professionals, have been reduced in a number of ways. For example, coverage of children's education costs in Saudi Arabia has either been wholly or partially withdrawn. Air tickets for home trips which were given annually are now being given biannually. Home leave has been reduced from 21–30 days to 15 days, and so on. In such cases the income shock can be measured in terms of the compensating variation of the reduction in fringe benefits. Given that the sudden collapse of oil prices caught even the experts by surprise it is reasonable to assume that the income shocks were, by and large, unanticipated by the workers.

problem for the migrant worker at t_i when the shock is registered on him. Prior to t_i, he is assumed to behave in a manner consistent with the optimisation undertaken at time of migration.

The first step is determination of W_{t_i}, the wealth accumulated by the worker after t_i years of stay abroad. This is given by

$$W_{t_i} = W_0 e^{rt_i} + \int_0^{t_i} (y_{l\tau} - CE_{l\tau}) e^{r(t_i - \tau)} d\tau \tag{13}$$

$CE_{l\tau}$ is given by

$$CE_{l\tau} = \lambda^{-\sigma} e^{\sigma(r-\rho)\tau} (\gamma_\tau S_\tau)^{1-\sigma}, (0 \leqslant \tau \leqslant t_i) \tag{14}$$

and λ is determined by the optimisation exercise undertaken at time of migration.

If t_i^* is the incremental length of stay abroad by the worker following the income shock where $\hat{y}_1$, $\hat{C}_1$, $\hat{C}_o$, and so on represent magnitudes at time t, where $t \geqslant t_i$, then (11) is transformed to

$$\frac{1}{1-\sigma} (\hat{\lambda}^{-\sigma} e^{\sigma(r-\rho)t_i^*}) \{(\gamma_{t_i+t_i^*} S_{t_i+t_i^*})^{1-\sigma} - 1\}$$

$$= \hat{y}_{lt_i+t_i^*} - y_{ot_i+t_i^*} \tag{15}$$

and (12) becomes

$$W_{t_i} + \int_0^{t_i^*} \hat{y}_{lt_i+t} e^{-rt} dt + \int_{t_i^*}^{T_1 - t_i} y_{ot_i+t} e^{-rt} dt \tag{16}$$

$$= \hat{\lambda}^{-\sigma} \left[\int_0^{t_i^*} (\gamma_{t_i+t} S_{t_i+t})^{1-\sigma} e^{[\sigma(r-\rho)-r]t} dt + \int_{t_i^*}^{T_2 - t_i} e^{[\sigma(r-\rho)-r]t} dt \right.$$

Equations (15) and (16) can be used to solve for t_i^* and $\hat{\lambda}$, given W_{t_i} from (13) and the magnitude of $\hat{y}_{lt}$ for $t \geqslant t_i$.

The impact, Δt^*, on the total length of stay abroad of the worker is given by

$$\Delta t^* = t^* - t_i - t_i^* \tag{17}$$

IV. Empirical Application

In order to test the model it has been applied on a small data set containing information on personal and family characteristics, income, expenditure and remittances of 417 Pakistani workers in Saudi Arabia[12] for the year 1979.[13]

The data obtained from this cross-sectional sample has been aggregated to yield the characteristics of three representative types of workers, viz. unskilled, skilled, professional and technical, in order to determine the likely pattern of return of the different skill categories.

It needs to be emphasised that given the limited nature of the data set the results obtained are presented essentially for illustrative purposes only and are not meant to be in the nature of hard forecasts of the likely pattern of return of Pakistani workers in Saudi Arabia.

(a) Simulation Methodology

In the absence of time-series data, the model can presently be simulated only under *static* expectations,[14] that is, on the assumption that

$$y_{1t} = y_1, y_{ot} = y_o, S_t = S, \gamma_t = \gamma, \text{ for } t \geq 0.$$

In such a case equations (11) and (12), representing the first order condition with respect to t^* and the wealth constraint respectively, reduce to the following

$$\frac{1}{1-\sigma}\left(\frac{\lambda^{-\sigma}}{y_1}\right) e^{\sigma(r-\rho)t^*}\{(\gamma S)^{1-\sigma}-1\} = 1 - \frac{y_o}{y_1} \qquad (18)$$

[12] The sample is spatially concentrated in Jeddah, a commercial and administrative metropolis of the Kingdom. As such, there are unlikely to be local variations in psychic costs due to place of residence. For example, such costs may be higher, other things being equal, for expatriates working in remote construction sites.

[13] The costs of the survey were financed by the Hajj Research Centre, Ummal Qura University, Makkah, Saudi Arabia.

[14] It was not possible to allow for dynamic earnings profiles because of the problem of incomplete cohorts. Few expatriate workers had spent more than four years in the Kingdom at the time of survey. Also, if time series information had been available on CE_t it might have been possible to test for some variation in S_t over time.

$$\text{and} \qquad \frac{W_o}{y_1} + \int_0^{t^*} e^{-rt}dt + \frac{y_o}{y_1}\int_{t^*}^{T_1} e^{-rt}dt$$

$$= \left(\frac{\lambda^{-\sigma}}{y_1}\right)\left[(\gamma S)^{1-\sigma}\int_0^{t^*} e^{[\sigma(r-\rho)-r]t}\,dt + \int_{t^*}^{T_2} e^{[\sigma(r-\rho)-r]t}\,dt\right] \tag{19}$$

Equations (18) and (19) can be used to estimate t^* and λ subject to the knowledge of the values of γ, S, y_1, y_o and the magnitudes of W_o, r, ρ and σ. However, in the context of empirical application of the model to cross-sectional data, while plausible values of r and ρ can be assumed and while γ, y_1, y_o and W_o are observed, σ and S are not known a priori or observed and have to be identified through the simulations.

The observed consumption expenditure in the year of survey can be used to generate one additional equation. However, the survey elicited information only on the expenditure abroad and not for the family as a whole. CE^A is defined as consumption expenditure abroad. From equations (6) and (4)

$$\frac{CE_{ti}^A}{y_1} = A\,p\left(\frac{\lambda^{-\sigma}}{y_1}\right)e^{\sigma(r-\rho)t_i}\,\gamma^{-\sigma}S^{1-\sigma} \tag{20}$$

on the assumption that $A_t = A = F_1/(F_1+F_o)$ and $p_t = p$ at the time of survey.

The last equation for identification of the model is based on the concept of return migration reservation wage.[15] Respondents were asked in the survey what the minimum income level in Pakistan was that would induce them to return immediately. This income level has been taken

[15] While the reservation wage relates to the minimum income level at home required to induce return migration, as mentioned earlier, the reservation wage for outward migration defined as the required minimum wage level abroad, can be determined from equation (19) as the $\hat{y}_1$ where $t^* = 0$. This leads to the following equation for $\hat{y}_1$:

$$\frac{1}{1-\sigma}\left(\frac{y_o}{\hat{y}_1}\right)\frac{\int_0^{T_1} e^{-rt}dt}{\int_0^{T_2} e^{[\sigma(r-\rho)-r]t}dt}\cdot\{(\gamma S)^{1-\sigma}-1\} = 1 - \frac{y_o}{\hat{y}_1}$$

Therefore, given σ, y_o, T_1, T_2, r, ρ, γ, and S, $\hat{y}_1$ can be determined.

to correspond to the reservation wage for return migration. It is equivalent to the income level, $\hat{y}_o$, at which $r_i^* = 0$ in equation (15). On this basis we obtain the following equation.

$$\frac{\frac{W_{ti}}{y_1} + \frac{\hat{y}_o}{y_1}\int_0^{T_1-t_i} e^{-rt}dt}{\int_0^{T_2-t_i} e^{[\sigma(r-\rho)-r]t}dt} \quad \{\frac{(\gamma S)^{1-\sigma}-1}{(1-\sigma)}\} = 1 - \frac{\hat{y}_o}{y_1} \qquad (21)$$

Equations (18) to (21) constitute a system of four equations that can be used to solve for the values of σ, S, r^* and λ. The actual procedure used for solution of the model is given in Appendix I.

b) Results

Values of the observed variables used in the simulation of the model are presented in Table 1. As mentioned earlier, these are average values

TABLE 1

Average Magnitude of Observed Variables by Type of Worker

Type of Worker	Age at Time of Migration (Yrs.)	Completed Length of Stay Abroad (Yrs.)	Number of Family Members Abroad	Number of Dependents at Home	Annual Income Abroad ('000SR)	Ratio of Income Abroad to Income at Home	Consumption Expenditure Abroad as Proportion of Income Abroad	Return Reservation Wage Differential
		(t_i)	(F_1)	(F_o)	(y_1)	$(\frac{y_1}{y_o})$	$(\frac{CE_{ti}^A}{y_1})$	$(\frac{\hat{y}_o}{y_o})$
Unskilled	28.3	3.2	1.2	5.0	22.1	7.4	0.241	2.12
Skilled	28.9	3.7	2.2	3.7	39.4	8.1	0.310	2.28
Professional, Technical	30.2	3.3	2.8	2.9	73.2	6.8	0.335	2.46

derived from the available data set to represent the three distinct types of workers.

It can be seen that most migrants were relatively young with the average age between 28 and 30 years at the time of migration and that they had been in Saudi Arabia for three to four years at the time of the survey in 1979. The ratio between income abroad and at home was uniformly high ranging from 6.8 on the average for professional and technical workers to over eight for skilled workers. While the total family size varied only marginally between different types of workers, its distribution between number abroad and at home was most uneven for unskilled workers who were generally single migrants whereas professional and technical workers had nearly half their dependent family members living with them in Saudi Arabia. This differential family distribution is reflected in γ, the pecuniary cost per unit of family consumption, which rises with the skill category of the worker. In addition, it influences the level of consumption expenditure abroad which ranges from about a quarter of earned income for unskilled workers to approximately a third for the highest category of workers.

In the simulations, initial wealth, W_0, at the time of migration has been taken effectively as zero for all types of workers. While this is primarily because wealth information was not available in the data set it seems a reasonable assumption because, firstly, most migrants are relatively recent entrants into the labour force and, secondly, initial wealth has been defined net of search costs. In fact, it is quite possible that the latter might even render W_0 negative for low income workers if they borrow to finance the fees of recruiting agents, travel costs, etc. In such cases the assumption of zero initial wealth will exert a downward bias on the planned length of stay abroad.

Workers when asked in the survey the level of income in Pakistan that would induce them to come back, more or less, immediately generally mentioned an income figure roughly two to two and a half times what they were being paid at the time of departure. This ratio has been taken as the reservation wage differential for return migration.

The basic results of simulations are summarised in Table 2. There is a clear pattern in the results. σ appears to be lower for unskilled workers while S is higher. Both findings are as expected. Intertemporal substitution possibilities in consumption are likely to be more limited at lower levels of expenditure. Psychic costs are higher for unskilled workers since most of them are separated from their families and because they probably experience greater social and cultural alienation in the country of migration.

TABLE 2

Estimated[a] Magnitude of σ, S and t* by Type of Worker

Type of Worker	σ	S	t*
Unskilled	0.90	2.31	17.7
Skilled	1.00	2.05	16.0
Professional, Technical	1.03	1.87	14.8

[a] with r = 0.04, ρ = 0.01. A change to r = 0.03, ρ = 0.01, does not significantly affect the magnitude of σ, S and t*. In the case of t* the change in magnitude is about 1.5 years for unskilled workers and about one year for skilled and professional and technical workers. In the empirical estimation, the total working life and life span of a typical worker is taken as 55 and 65 years respectively. Also, the value of p in the simulations is taken as 3.5.

It appears, however, that the level of psychic costs are relatively high as indicated by the result that S ranges from 1.9 to 2.3. Nevertheless, planned lengths of stay are still quite long inspite of the high psychic costs due mainly to the large income differentials between home and abroad. Broadly, the results indicate that the return flow of unskilled workers who migrated to Saudi Arabia soon after the dramatic oil price increases in 1974 could be centered around the early to mid-90's, and that of other workers around the late 80's to early 90's. It is of interest to note that even though psychic costs of migration for professional and technical workers are the lowest their planned lengths of stay are shorter. This is due to a number of reasons. First, the wage differential, y_1/y_o, is the smallest for them. Second, as mentioned earlier, γ is higher for them and, third, the marginal utility of wealth, λ, is smaller.

The methodology for quantifying the impact of income shocks on the period of international migration has been described in section III. The resulting estimates of incremental lengths of stay following income shocks of different magnitude are presented in Table 3. It needs to be emphasised that these income shocks are assumed to be permanent in character leading to a once-for-all reduction in earned income levels abroad. Of course, if the shocks are viewed by the worker as being random or cyclical in character then the extent of change in his plans will be less pronounced. The table displays the differential impact on the planned length of stay

TABLE 3

Impact of Income Shocks of Different Magnitude on Additional Length of Stay by Type of Worker and Completed Length of Stay Abroad

Type of Worker/Completed Stay (yrs)	Income Shock (%)					
	0	10	20	30	40	50
	Additional Stay* (yrs)					
Unskilled						
3	14.7	13.8	13.0	12.0	10.6	8.5
5	12.7	11.6	10.7	9.5	7.8	5.4
7	10.7	9.5	8.5	7.1	5.1	2.4
Skilled						
3	13.0	12.4	11.7	10.8	9.6	7.9
5	11.0	10.3	9.4	8.3	6.9	4.7
7	9.0	8.2	7.2	5.9	4.2	1.7
Professional, Technical						
3	11.8	11.2	10.4	9.5	8.1	6.1
5	9.8	9.1	8.2	7.0	5.3	2.9
7	7.8	6.9	5.9	4.5	2.6	0.5

* The total length of stay can be computed by adding completed stay to the additional stay.

of the timing (in terms of period of completed stay abroad of the worker) and the magnitude of the income shock. It appears that the incremental stay abroad is a concave declining function with respect to the magnitude of the shock and convex with respect to its timing.

The reduction in the planned length of stay, for low to medium income shocks, is not as dramatic as might have been anticipated by planning authorities in sender countries. For example, a 30[16] per cent decline for an unskilled worker who has completed seven years in Saudi Arabia could decrease his stay by 3.6 years. The corresponding reductions for skilled and professional and technical workers are 3.1 and 3.3 years respectively.

[16] Casual empiricism suggests that this is the order of magnitude of the average effective decline in incomes of foreign workers in Saudi Arabia in recent years.

These results underscore the influence of the very high initial wage differentials at the time of migration which imply that even after significant income shocks these differentials still remain high. However, the model indicates that if wages fall by about 50 per cent a, more or less, immediate return of the first cohort of migrants, who left Pakistan in 1974 or 1975, would take place. The extent of return migration is thus clearly linked to the degree of decline in incomes abroad which could both provoke a voluntary return and lead to a policy change favouring effective forced repatriation.

V. Conclusion

This paper has presented a framework for modelling the impact of different factors on the rate of international return migration. The model is motivated by the prospect of the return of the large expatriate labour force in the Middle East following the decline in economic activity in the oil-exporting countries of the region.

The principal features of the model stem from the fact that the prospective migrant knows that the stay abroad, although of long duration, is of a temporary nature. This makes the timing of return a key decision variable. This decision is modelled as a choice-theoretic, dynamic optimisation exercise in a life-cycle setting within which a migrant attempts to maximise a lifetime utility function that is state dependent and in which income and psychic cost differentials in the two states are key variables. The model has the flexibility to simulate the impact of income shocks upon the length of stay abroad.

The results obtained, which are tentative because of data limitations, indicate that despite high psychic costs planned lengths of stay abroad are long due to large income differentials between home and abroad. The reductions in planned length of stay abroad are small until income declines start approaching 50 per cent. At that level prospects of large scale return migration become quite significant. For this reason planners in Pakistan need to monitor the economic situation in Saudi Arabia continuously and carefully.

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Appendix I

Methodology of Solution of the Model

The methodology used for solution of the model consists essentially of starting off with a particular value of σ and then solving equations (18), (19) and (20) to obtain values of S, t^* and λ which are consistent with this value of σ. In this manner a set of combinations of σ and S are obtained. As may be noticed, equation (21) can be used to generate another set of combinations of σ and S given y_o, $CE^A_{t_i}$ and y_1. The point of intersection of these two sets represents the solution for σ and S. Corresponding to this σ the value of t^* and λ from the first three equations can also be obtained.

The steps adopted are as follows. First, equation (18) can be written as

$$\frac{\lambda^{-\sigma}}{y_1}(\gamma S)^{1-\sigma} - \frac{\lambda^{-\sigma}}{y_1} = (1-\sigma)\left[1 - \frac{y_o}{y_1}\right] e^{-\sigma(r-\rho)t^*} \qquad \text{(A-1)}$$

From equation (20) we have that

$$\frac{\lambda^{-\sigma}(\gamma S)^{1-\sigma}}{y_1} = \left(\frac{CE^A_{t_i}}{y_1}\right)\left(\frac{\gamma}{Ap}\right) e^{-\sigma(r-\rho)t_i} = \phi \text{ say} \qquad \text{(A-2)}$$

The right hand side of the equation can be computed given the particular value assumed for σ. Substituting from (A-2) into (A-1)

$$\frac{\lambda^{-\sigma}}{y_1} = \phi - (1-\sigma)\left[1 - \frac{y_o}{y_1}\right] e^{-\sigma(r-\rho)t^*} \qquad \text{(A-3)}$$

Now equation (19) can be written as

$$\int_0^{t^*} e^{-rt}dt + \frac{y_o}{y_1}\int_{t^*}^{T_1} e^{-rt}dt = \phi \int_0^{t^*} e^{[\sigma(r-\rho)-r]t}dt + \frac{\lambda^{-\sigma}}{y_1}\int_{t^*}^{T_2} e^{[\sigma(r-\rho)-r]t}dt$$

Substituting from (A-3)

$$\int_0^{t^*} e^{-rt}dt + \frac{y_o}{y_1}\int_{t^*}^{T_1} e^{-rt}dt = \phi \int_0^{t^*} e^{[\sigma(r-\rho)-r]t}dt + \{\phi - (1-\sigma) \cdot$$

$$[1-\frac{y_o}{y_1}]\ e^{-\sigma(r-\rho)t^*}\ \} \cdot \int_{t^*}^{T_2} e^{[\sigma(r-\rho)-r]t}\,dt$$

which simplifies to

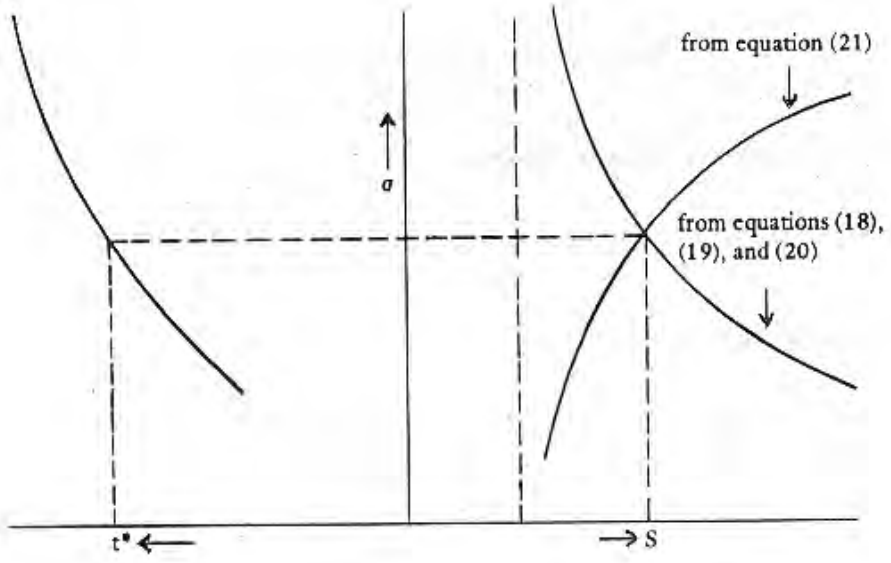
$$\phi \int_0^{T_2} e^{[\sigma(r-\rho)-r]t}\,dt - (1-\sigma)\,(1-\frac{y_o}{y_1})\,e^{-\sigma(r-\rho)t^*} \int_{t^*}^{T_2} e^{[\sigma(r-\rho)-r]t}\,dt$$

$$= \int_0^{t^*} e^{-rt}dt + \frac{y_o}{y_1} \int_{t^*}^{T_1} e^{-rt}dt \qquad \text{(A-4)}$$

Equation (A-4) can be solved to yield the value of t^*, given the assumed value of σ and ϕ. Once t^* is known we can find the corresponding $(\lambda^{-\sigma}/y_1)$ from (A-3), and given $(\lambda^{-\sigma}/y_1)$ then S can be determined from (A-2). In this way the set of combinations of σ and S can be identified, as shown in Figure 1. The second curve relating σ and S is also shown in the Figure. The point of intersection between the two curves can then be identified to yield the solution.

Figure 1

Solution of σ, S and t^*



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