AN ECONOMIC ANALYSIS OF RURAL-URBAN MIGRATION IN TUNISIA

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CHAPTER I

INTRODUCTION

Rapid urban population growth rates largely a result of rural-urban migration are characteristic of many present-day less developed countries including Tunisia. Table 1.1 shows that Tunis, Tunisia's largest city, grew at an annual rate of 5.9 percent between 1956 and 1966.[1/] During the same period the Tunisian population increased at an annual rate of 2.6 percent.[2/] Using this figure for the natural rate of population growth in Tunis, net migration flows contributed more than half of the city's growth during the decade.

There is considerable variation in the growth rates of the other urban centers shown in the table. With the exception of Le Kef, they all grew more slowly than did Tunis. In the coastal plains of the Sahel, Sfax, the country's second largest city, grew at an annual rate of 3.3 percent, a small part of which can be attributed to net immigration. The third largest city, Sousse, grew at an annual rate of 2.1 percent, and thus apparently experienced net out-migration.

1/The growth rates in Table 1 refer to the Tunisian population only. The overall populations of the large cities, including foreigners, grew more slowly over the period reflecting the large numbers of French and other foreigners who left the country following independence in 1956.

2/République Tunisienne, Direction de l'Aménagement du Territoire, Les villes en Tunisie: Annexe, prepared by Groupe Huit (Tunis, 1971), p. 431.

Table 1.1. 1966 population and annual growth rates 1956-1966 for selected Tunisian urban areas*

	1966 Population	% Annual Growth Rates (1956-1966)
Tunis	721,126	5.88
Sfax	221,104	3.25
Sousse	146,925	2.01
Bizerte	67,915	4.45
Kairouan	47,313	3.58
Menzel Bourghiba	34,745	4.88
Gafsa	35,348	3.45
Beja	30,963	3.83
Le Kef	23,244	5.91

*Figures exclude non-Tunisians.

Source: Republique Tunisienne, Direction de l'Amenagement du Territoire, Les villes en Tunisie: Annexe, prepared by Groupe Huit (Tunis, 1971), p. 439.

Faced with the prospect of continued rapid urban growth, especially of Tunis, policy makers have expressed considerable interest in migration. This is evidenced by frequent discussion in government documents and the newspapers of rural-urban migration and of the urban problems it is thought to create and/or intensify. Some steps have already been taken to slow migration and additional measures are being considered. Proper evaluation of the effects of migration and the relative merits of alternative methods of altering future migration flows requires broad knowledge of the migration process.

Tunisian Migration Research

Migration in Tunisia has been the subject of a number of research efforts primarily by those interested in its demographic, sociological, and geographic aspects. Previous research has provided valuable information about the rates and patterns of migration flows and the transition of migrants from rural to urban society, but has been much less illuminating regarding the relationship between economic factors and migration, particularly those that may act as determinants in the decision to leave the rural areas.

Picouet provides the most complete descriptions of past and more recent migration streams in his analyses of population census data from the first census in 1921 to the latest in 1966.[3/]

3/Michel Picouet, Description et analyse rapide des migrations intérieures en Tunisie, Institut National de la Statistique (Tunis, 1970); and, "Aperçu des migrations intérieures en Tunisie," Population, Numéro Special (Mars, 1971), pp. 125-148.

His conclusions are based on relative changes in population between regions for the earlier censuses and on the results of two questions relating to past migrations of those enumerated which were included for the first time in the 1966 census.4/

Picouet's research points out that the rapid growth of Tunisian urban areas began over forty years ago when Tunisia was a French Protectorate. Traditional migration patterns had consisted primarily of the drift of nomads and others from the arid South and the Center to the more fertile areas in the northern regions. These patterns were changed in the 1920's and 1930's by the concentration of the best agricultural land, especially in the North, in the hands of colonialists who proceeded to rapidly mechanize their extensive grain operations. Deprived of the best grazing and farm land, Tunisians were concentrated in the less fertile hills and mountains in the North and Center, the densely populated coastal plains of the Sahel, and the oases in the South.

Picouet observes that concurrent with these changes in the agricultural sector was an expansion of industrial and commercial activity in the urban areas. These developments stimulated large-scale population shifts especially to the Northeast which included the most important industrial centers, Tunis and Bizerte-Menzel Bourghiba.

4/ Although they represent an important source of migration data, the nature of the two questions asked in the 1966 census about the last area of residence and the year of migration limit the uses that can be made. The limitations are discussed and most of the census results regarding migration are reported in République Tunisienne, Secrétariat d'Etat au Plan et aux Finances, Direction Générale du Plan, Recensement générale de la population, 3 mai 1966: Migration, 3ième Fasicule, n.d.

The proportion of the population living in the Northeast increased from 22 percent to 29 percent between 1936 and 1946 while the proportion in the other regions, the Haut Tell, Sahel, Center, and South all declined. The Northeast increased its domination in the years following World War II especially between 1956 and 1966, growing to 32 percent of the population. Picouet attributes part of this latest growth to the large numbers of Tunisians who moved to the urban areas, mainly Tunis, to fill jobs left vacant by the departing foreigners after 1956, and to a general anticipation of new urban economic opportunities following independence. He also notes that the rapid rates of rural-urban migration indicated by the census appear to have accelerated after 1963 and to be continuing without diminution.

The predominant role played by Tunis is a striking feature of Picouet's analysis. The gouvernorat of Tunis increased its proportion of the population from eight percent in 1936 to 17 percent in 1966, and grew at an annual rate of 4.6 percent over the thirty year period. Tunis was the destination of 58 percent of all migrants enumerated in the 1966 census who had changed gouvernorats, and migrants made up fully 36 percent of the gouvernorat's population.[5/]

Tunis attracts migrants from all parts of the country as shown in Figure 1.1, borrowed from Picouet, which is based on

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[5/] Data from the 1966 census show that 54 percent of the labor force in the gouvernorat of Tunis were migrants. [/] République Tunisienne, Secrétariat d'Etat au Plan et a l'Economie Nationale, Recensement générale de la population, 3 Mai 1966: Caracteristiques économiques, n.d., p. 90; and unpublished 1966 census data from Institut National de la Statistique. [/]

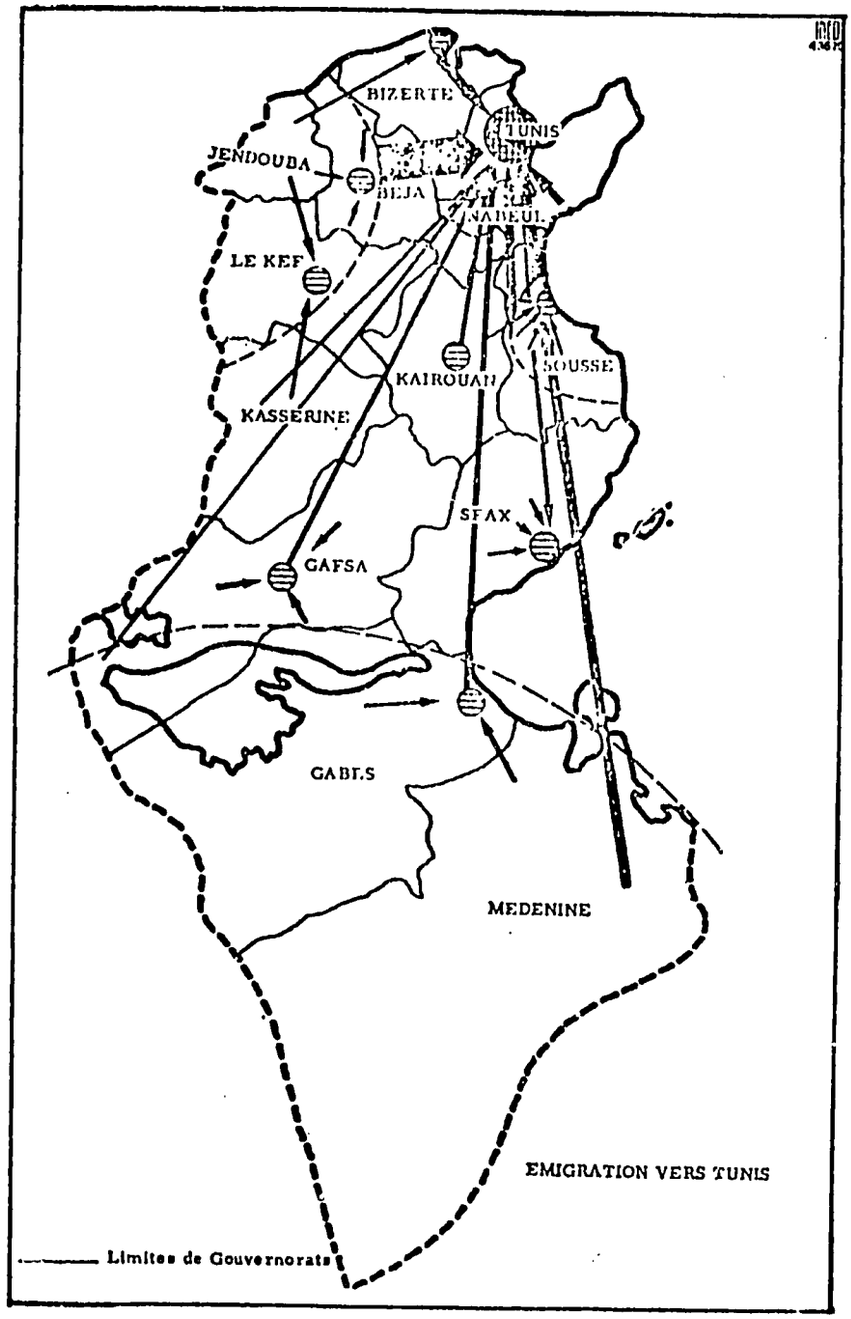

Figure 1.1. Migration to Tunis

Source: Michel Picouet, "Aperçu des migrations intérieures en Tunisie," Population, Numéro Special (Mars, 1971), p. 131.

net migration flows between the different areas of Tunisia and Tunis.

In terms of both numbers of migrants and the rate of migration (migrants per 1,000 population), the most important source of migrants was the Haut Tell consisting of the gouvernorats of Beja, Jendouba, and Le Kef which together provided 36 percent of the migrants to Tunis.

The second most important source is the South especially the gouvernorats of Medenine and Gabes. Gafsa, also in the South, provides relatively few migrants to Tunis due, according to Picouet, to the opportunities provided by its phosphate mines.

In the Sahel, the gouvernorats of Sousse and Sfax are the origins of 12 percent and 7 percent of the migrants to Tunis respectively, while as a region the Center consisting of Kairouan and Kasserine is the least important source providing only nine percent of the total. The two neighboring gouvernorats, Bizerte and Nabeul, which along with Tunis form the Northeast region, are the source of 17 percent of the migrants to Tunis.

Picouet concludes that, with the exception of the South, rates of migration are inversely related to the distance between Tunis and the area of origin. He also observes, as indicated by the smaller arrows in Figure 1.1, that certain regional urban centers act as relay points attracting residents of surrounding rural areas and small towns and, in a second stage, sending migrants to Tunis. In the case of larger cities like Sfax, Sousse, and Bizerte the attraction extends to other regions as well. The two-stage process appears to act within a single generation with the same migrant

moving first to the regional center and then to Tunis. Picouet notes, however, that the nature of the data precludes a definite conclusion about the time-span involved.

This two-stage process and the size of the different regional centers give rise to differences in the kind of background of migrants to Tunis from the various areas. For example, the relatively large sizes of the cities of Sousse and Sfax, their role as relay points, and the generally more urban population in the Sahel result in 78 percent of the migrants to Tunis coming from urban areas, according to Picouet. Conversely, migrants from the Haut Tell, South, Center, and Northeast all tend to come from rural areas with only about one-third coming from urban areas.

In addition to migration to and from Tunis, there are other less important inter-regional migration flows. These are shown in Figure 1.2, also from Picouet, which indicates the relative magnitudes of the net migration flows between regions other than Tunis. As before, the principal zones of departure are the Haut Tell, the South, and the Sahel around Sousse. These flows are directed primarily to the industrial centers of Bizerte-Menzel Bourghiba and Sfax, the mining center at Gafsa, and the rich agricultural area of the Cap Bon in Nabeul. Nabeul has also recently developed into an important area for tourism. As before, the regional centers of Beja, Le Kef and Gabes act as relay points in these migration flows.

In addition to establishing the rates and patterns of the various migration flows, Picouet obtains from the 1966 census results some detail on the demographic characteristics of the

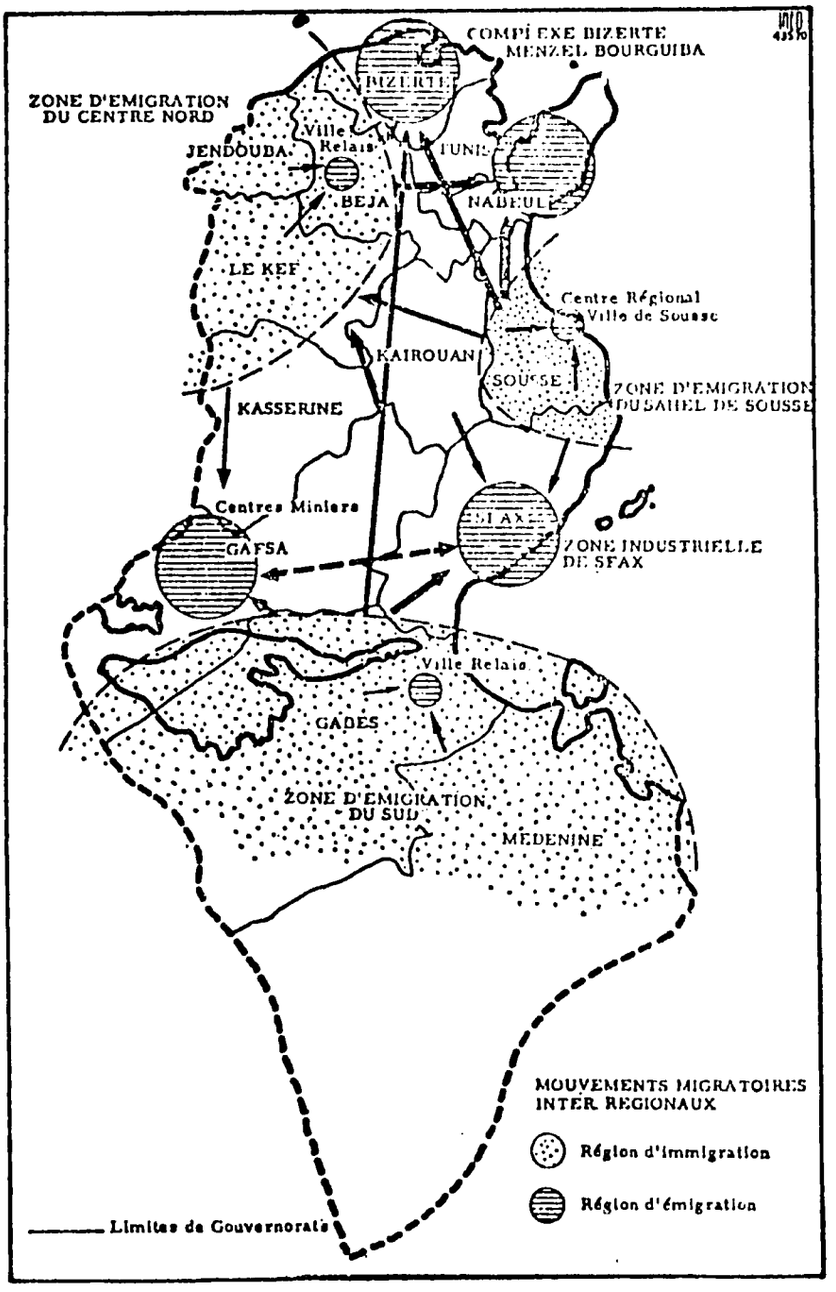

Figure 1.2. Interregional migration flows excluding Tunis

Source: Michel Picouet, "Aperçu des migrations intérieures en Tunisie," Population, Numéro Special (Mars, 1971), p. 138.

migrants. Migrants are relatively young and predominately male, with the percentage of males increasing the greater is the distance of the migration. Migration of households to Tunis is more common from the Haut Tell and other relatively close rural areas, while migration from the more urban Sahel and from the South consists mainly of single men.

In addition to the work of Picouet, there have been a number of other studies of Tunisian migration, many of which appeared together in a special issue of Revue Tunisienne de Sciences Sociales devoted to migration. These fall into two broad categories.

The first category consists of exploitations of the census data for more detailed analyses of migration into and within specific areas. Included in this category are the studies of Bechir and El Aouani for the gouvernorat of Tunis, and Attia for the Sahel.[6/] These studies describe population changes over time, the origins and destination of migrants, and provide some information on the nature of the various areas and their economies.

The second category of migration research consists of analyses based on primary and secondary data in addition to census results. These studies generally provide more information about the demographic and other characteristics of the migrants and have been primarily interested in the kinds of economic and social problems encountered by migrants in the urban destination areas.

6/Mongi Bechir, "Croissance démographique du gouvernorat de Tunis, 1956-1966," Revue Tunisienne de Sciences Sociales, No. 23 (Décembre, 1970), pp. 15-38; Mohamed El Aouani, "Les populations rurales de la région de Tunis," RTSS, No. 23 (Décembre, 1970), pp. 39-90; Habib Attia, "Croissance et migrations des populations Sahéliennes," RTSS, No. 23 (Décembre, 1970), pp. 91-118.

For example, in his study of migration to the small northern town of Mateur, Karoui is concerned mainly with the ethnic patterns of migration and the degree of integration of migrants into the urban society.7/ Another study was done by a research unit, Groupe Huit, which discusses migration as it relates to the phosphate mines in Gafsa, primarily the geographic origins of the miners and others who moved to Gafsa.8/

Studies by Deloge and Sebag in the 1950's and Cauche more recently considered the settlement patterns, occupations, and general standard of living in different sections of Tunis inhabited mostly by recent migrants.9/ The size and quality of the data bases of these studies is insufficient to allow generalizations about migration to Tunis considering the number of migrants and their heterogeneity.

In recognition of the need for better and updated data about what can be termed the "urban aspects" of rural-urban migration, the Institut National de la Statistique conducted a large sample survey of migrants in Tunis in 1972 and has plans for extending its survey efforts to other urban centers in the near future.

7/Hechmi Karoui, "Mateur, lieu d'immigration," RTSS, No. 23 (Décembre, 1970), pp. 119-142.

8/Damette-Groupe Huit, "Les migrations dans la région minière du Sud," RTSS, No. 23 (Décembre, 1970), pp. 175-208.

9/Michel Deloge, "Les perspectives de l'urbanisme Tunisienne," Bulletin Economique et Sociale de la Tunisie, No. 100 (Mai, 1955), pp. 74-88; Paul Sebag, Enquête sur les salaires de la région de Tunis (Paris: Presses Universitaires de France, 1956); J. J. Cauche, "Sur quelques aspects du gourbi-ville du Kram Ouest," Bulletin d'Information Géographique, No. 2 et 3 (1972), pp. 34-40.

Some of the results of that survey and of other studies will be considered again in later chapters. But the important characteristic of previous migration research in Tunisia is the paucity of information about economic aspects of migration in general and about the migrants' backgrounds before leaving the rural areas in particular. For example, a unanimous conclusion of previous research, and of other observers as well, is that unemployment, underemployment, and poverty are the root cause of current rural-urban migration. These are usually then related to characteristics of the various areas which contribute large numbers of migrants; population density in the Sahel, population density and the type and organization of the agricultural sector in the Haut Tell, and the limited agricultural opportunities in the arid South. However, although there may be apparent strong correlations between rates of migration and area-wide indications of unemployment and income, there is a need for analysis of the relationships between these and other factors and migration at a micro-level. None of the previous research has demonstrated that those who migrate from rural areas are poorer or richer than those who remain, nor do they provide evidence of any other differences in terms of employment, income, and wealth that may exist between migrants and non-migrants. Similarly, none of the previous research attempted a quantitative investigation of the effects and interrelationships of various factors proposed as the motivating forces behind rural-urban migration behavior.

Although previous research has provided some general indications of the selectivity and causes of the migration process, the

importance of the policy decisions being made, at least partly in consideration of their expected effects on migration, requires systematic empirical investigation of the selectivity and determinants of Tunisian rural-urban migration. This kind of information is needed both to evaluate the effects of migration on the rural sending areas and the urban destinations, as well as to predict the likely effects of policy choices on rural-urban migration flows.

The present study is designed to provide some of the needed information by analyzing migration from a particular rural area. The decision was made to concentrate on migration from the Haut Tell which, as noted previously, exhibits the highest rates of out-migration and provides the largest numbers of rural-urban migrants to other regions of the country. Migration from the Haut Tell is oriented overwhelmingly towards Tunis. The census results show that 79 percent of all male migrants who left the Haut Tell had gone to Tunis.[10/]

In addition to its importance as a source of migration, another feature of the Haut Tell that makes it of special interest is its greater agricultural potential as compared with other regions, notably the South and Center. If it can be shown that increasing rural income has a retardant effect on migration, such increases could be more easily obtained in the Haut Tell than in less favorably endowed areas of Tunisia.

10/ Recensement générale de la population, 3 mai 1966: Migration, pp. 74-78.

In light of the need to rely primarily on survey-generated data and the limited survey resources available, it was further decided to restrict the survey to a single délégation of the Haut Tell. In selecting the délégation an effort was made to choose an area that was representative of the larger region. Although the results of the study therefore apply strictly only to the délégation surveyed, to the extent that similar conditions exist elsewhere the conclusions may be tentatively generalized to a broader area.

The choice of délégations was based on comparisons of eight délégations identified by key informants as being generally typical of the Haut Tell. The eight were then compared through brief inspection trips and consideration of available secondary data on relevant characteristics namely, migration rates, population density, degree of urbanization, distribution of agricultural land, cropping patterns and yields, and the occupational distribution of the labor force. On the basis of these comparisons, the délégation of Testour (1972 population approximately 26,000) was chosen for the study. Located in the gouvernorat of Beja about 80 kilometers west of Tunis, Testour's economy is predominately agricultural with the relatively small non-farm sector providing various supportive services.

As in the rest of the Haut Tell, the agricultural sector in Testour has a distinctive structure inherited from the era of the Protectorate when the best land of the broad alluvial plains was owned largely by colonial farmers and holding companies. Foreign-owned land was expropriated following independence, but the basic

structure remains intact, with the large mechanized cereals farms now privately owned by Tunisians or run as state-controlled production co-operatives while the large majority of farms are small family operations employing traditional production methods on the less productive land in the hills and mountains. This structure results in substantial variation of income and employment opportunities among farmers, farm wage laborers, and those in the non-farm sector.[11/]

Objectives and Organization

With this background, the principal objectives of this study are to:

1) Describe and analyze the selectivity of the labor migration process from Testour in terms of economically relevant characteristics by comparing migrant men and the non-migrant rural labor force.
2) Describe and analyze the kinds of urban employment for a sample of recent migrants from Testour, and make comparisons with the permanent urban labor force and the results of other studies.
3) Estimate the parameters of a statistical model of migration behavior to identify the determinants of rural-urban migration that influence the probability that a man will migrate.

11/ The various means by which colonial owners gained control and the characteristics of the resulting agricultural sector are discussed in Jean Poncet, La colonisation et l'agriculture européennes en Tunisie depuis 1881 (Paris: Mouton et Cie, 1961).

4) Apply the knowledge gained about the causes of migration and the employment patterns of rural-urban migrants in an analysis of the likely effects of policy alternatives on migration flows.

In Chapter II a model of migration behavior is presented from which hypotheses are derived about the determinants of the probability of migration. In Chapter III the results of a sample survey are used to characterize migrants and non-migrants in Testour. In Chapter IV the survey is used to discuss the destinations and employment of the migrants after leaving Testour. Chapter V considers the survey information about urban and rural incomes and how it is used in the probability of migration function. In Chapter VI least-squares regression and probit estimates of a probability of migration function are presented and the two techniques are compared. Chapter VII consists of the conclusions and policy implications of the study.

CHAPTER II

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

This chapter is devoted to the development of an economic model of rural-urban migration. The choice of a model of migration behavior based on economic factors reflects a belief that such factors are the primary motivating force behind migration in Tunisia. It is recognized, however, that social and cultural considerations may also influence both the rates and composition of migration flows.

The appropriateness of an economic model is supported by previous investigations of migration in Tunisia. Although, as noted in the preceding chapter, none of this research has systematically analyzed determinants of migration, several authors have concluded that employment and other economic considerations are the primary causes of Tunisian rural-urban migration.[1/]

Support for the use of an economic model can also be found in numerous studies of migration in the U.S. and less developed countries which emphasize the importance of economic factors in

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1/M. C. Becker, La Tunisie et le Grand Tunis (Tunis: Municipalité de Tunis, 1971), p. 40; Fredj Stambouli, "Sous-emploi et espace urbain: Les bidonvilles au Maghreb," Manpower and Unemployment Research in Africa, Vol. 5, No. 2 (November, 1972), p. 37; Attia, p. 93.

the decision to migrate.[2] A number of the analyses of migration in the LDC's have attempted quantitative tests of the effects of these factors on migration. In studies based on aggregate census data, Beals et al. in Ghana, Sahota in Brazil, and Schultz in Columbia conclude that migration in these countries is responsive to inter-regional income differentials.[3] In the only previous quantitative analysis of migration in North Africa, Greenwood analyzed census data for the United Arab Republic and found migration rates to be significantly correlated with wage differences between regions.[4]

Two recent analyses based on samples of individual migrants in LDC's provide less conclusive results. Speare gathered data on migrants and non-migrants in Taiwan and concluded that the cost-benefit model he used to explain migration "... provides a reasonable representation of the decision process followed by

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[2]The literature on migration relating to developing countries, especially Africa, is reviewed in Derek Byerlee, "Research on Migration in Africa: Past, Present and Future," (Rural Employment Paper No. 2, Department of Agricultural Economics, Michigan State University, 1972); and Charles R. Frank, "Causes and Effects of Migration in Africa," Proceedings of the National Meetings: Association for Comparative Economics, Northern Illinois University (July, 1971).

[3]Ralph E. Beals, Mildred B. Levy, and Leon N. Moses, "Rationality and Migration in Ghana," Review of Economics and Statistics, Vol. 49, No. 4 (November, 1967), pp. 480-486; Gian S. Sahota, "An Economic Analysis of Migration in Brazil," Journal of Political Economy, Vol. 76, No. 2 (March/April, 1968), pp. 218-245; T. Paul Schultz, "Rural-Urban Migration in Columbia," Review of Economics and Statistics, Vol. 53, No. 2 (May, 1971), pp. 157-163.

[4]Michael J. Greenwood, "The Determinants of Labor Migration in Egypt," Journal of Regional Science, Vol. 9, No. 2 (August, 1969), p. 286.

people in deciding whether or not to move."[5] In another recent study, however, Rempel's analysis based on a sample of migrant men in the urban areas of Kenya found only limited evidence of the effect of expected income differentials on migration behavior.[6]

The studies cited above attempted to resolve the considerable theoretical and empirical problems relating to the analysis of migration in LDC's with varying degrees of success.[7] The present study represents a somewhat different combination of theoretical model and quantitative technique in an analysis of Tunisian migration.

The basic premise of this study is that when deciding whether or not to migrate, potential migrants in Testour choose between their expected incomes if they remain and what they think their incomes would be in an alternative urban location. The behavioral model that will be used is based on work by human capital theorists as formalized by Sjaastad.[8] The theoretical treatments of

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[5] Alden Speare, Jr., "The Determinants of Rural to Urban Migration in Taiwan," (Unpublished Ph.D. dissertation; University of Michigan, 1969) p. 211.

[6] Henry Rempel, "Labor Migration into Urban Centers and Urban Unemployment in Kenya," (Unpublished Ph.D. dissertation, University of Wisconsin, 1971) p. 75. Methodological limitations of Rempel's study are noted by Byerlee, pp. 9, 20.

[7] These problems are discussed and some previous migration studies are critiqued in Byerlee and in J. B. Knight, "Rural-Urban Income Comparisons and Migration in Ghana," Bulletin of the Oxford University Institute of Economics and Statistics, Vol. 34, No. 2 (May, 1970), pp. 489-520.

[8] Larry A. Sjaastad, "The Costs and Returns of Human Migration," Journal of Political Economy, Supplement, Vol. 70, No. 1 (October, 1962), pp. 80-93.

migration in an investment framework have given rise to a number of more or less direct empirical tests of the theory's implications in recent years, notably those of Osburne, Schwartz, DaVanzo, and Bowles in the U.S., and those of Schultz and Speare in LDC's noted previously.[9/]

The human capital approach as presented by Sjaastad treats the decision to migrate as an investment decision involving costs and returns distributed over time. In deciding to move, migrants are hypothesized to be seeking to maximize their net real life span incomes. In the case of this study, it is reasonable to assume that potential migrants have at least a rough idea of what their life span income streams would be in Testour and in an urban area and of the costs involved in migration. Thus, a rational potential migrant would move if the present value of the expected income gain exceeds the cost of relocation, or

$$(1) \qquad V = \sum_{t=1}^{n} \frac{Y_u(t) - Y_R(t)}{(1+\delta)^t} > C$$

where:

V = the present value of the gain in net real income.

9/ D. D. Osburn, "Returns to Investment in Human Migration," (Unpublished Ph.D. dissertation, North Carolina State University, 1966); Abba Schwartz, "Migration and Life Span Earnings in the U.S.," (Unpublished Ph.D. dissertation, University of Chicago, 1968); Samuel Bowles, "Migration as Investment: Empirical Tests of the Human Investment Approach to Geographical Mobility," Review of Economics and Statistics, Vol. 52, No. 4 (November, 1970), pp. 356-362; Julie DaVanzo, A Family Choice Model of U.S. Interregional Migration Based on the Human Capital Approach, P4815 (Santa Monica: The Rand Corporation, 1972).

$Y_u(t)$ = expected urban income in period t.

$Y_R(t)$ = expected rural income in period t.

δ = the interest rate used to discount future income.

n = the number of periods in the individual's planning horizon.

C = the cost of relocating in the urban area.

This simple behavioral model will be used as the basis for the analysis of the migration behavior of a sample of potential migrants in Testour some of whom migrated during the period 1966-1972 while others did not. The sample data will be used to estimate the effects of differences in the present value of the income gain and the costs of relocation on the probability of migration.

The probability of migration, P, is hypothesized to be directly related to the present value of the expected income gain and inversely related to the cost of relocation, or

(2) $$P = f(V,C)$$

$$\frac{\partial P}{\partial V} > 0$$

$$\frac{\partial P}{\partial C} < 0$$

where $V = g(Y_u(t), Y_R(t), n, \delta)$

$$\frac{\partial V}{\partial Y_u(t)} > 0$$

$$\frac{\partial V}{\partial Y_R(t)} < 0$$

$$\frac{\partial V}{\partial n} > 0$$

$$\frac{\partial V}{\partial \delta} < 0$$

Thus, (2) is a composite function and the direction of the hypothesized effects of the determinants of V on the probability of migration is also apparent.

(3) $$P = f[\bar{g}(Y_u(t),\ Y_R(t),\ n, \delta),\ \bar{C}]$$

$$\frac{\partial P}{\partial Y_u(t)} > 0$$

$$\frac{\partial P}{\partial Y_R(t)} < 0$$

$$\frac{\partial P}{\partial n} > 0$$

$$\frac{\partial P}{\partial \delta} < 0$$

$$\frac{\partial P}{\partial C} < 0$$

The probability of migration is, therefore, hypothesized to be positively related to the level of expected urban income and the length of the planning horizon. It is hypothesized to be inversely related to the level of rural income, the cost of relocation, and the discount rate. The discount rate will be assumed to be the same for all potential migrants in the sample and will not be considered as a source of variation of migration behavior.

In the following sections, factors will be identified which give rise to differences in the other variables in (3) among the sample potential migrants. This will lead in turn to testable hypotheses of the effects of these factors on the probability of migration.

It should be noted, however, that since migration is seen as a response to an expected net income gain that is determined

jointly by both income streams and the costs, the hypothesized effect of any single factor on these terms, and therefore on migration, is based on the assumption of other things being equal.

Returns from Migration:

Sjaastad divides the returns from migration into money and non-money components. Money returns can result from changes in earnings and from returns to the migrant as a consumer. Non-money returns can include changes in the cost of employment and "psychic benefits" as a result of locational preferences.

Of these different kinds of returns most attention has been focused on changes in earnings as a result of migration. Studies of migration in developed economies, mainly the U.S., generally consider the relevant measure of what a migrant could earn in a destination area to be the earnings there of people with similar earnings affecting characteristics. However, researchers in developing countries have noted that high urban unemployment rates mean that a migrant may include in the decision to migrate an assessment of his chances of getting an urban job.[10/] The most recent comprehensive figures on unemployment in Tunisia are from the 1966 census which reports an unemployment rate of 13 percent for the urban male labor force.[11/] Although there is debate

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10/See for example, Peter Kilby, "Industrial Relations and Wage Determination: Failure of the Anglo-Saxon Model," Journal of Developing Areas, Vol. 1, No. 4 (July, 1967), p. 499; and C. R. Frank, Jr., "Urban Unemployment and Economic Growth in Africa," Oxford Economic Papers, Vol. 20, No. 2 (July, 1968), p. 297.

11/The unemployed were those who had worked less than 10 days during the preceding month. (Recensement générale de la population, 3 mai 1966: Caractéristiques économiques, p. 79).

about whether or not this measure accurately reflects the extent of unemployment, it is apparent that the prospect of being unemployed may be very real for potential migrants from Testour.

In this context a useful model is provided by Todaro which allows specifically for migration into urban areas characterized by high rates of unemployment and underemployment.[12/] Todaro suggests that the decision to migrate includes the perception by the potential migrant of an "expected" stream of urban income that is a function of both the prevailing urban wage structure and a subjective probability of obtaining an urban job.

Todaro and other authors consider the urban labor force as distributed between a relatively small modern sector and an "urban traditional" sector. The modern, or organized sector includes public employment and the larger industrial, commercial, and service establishments where wage rates are influenced or controlled by labor unions and minimum wage standards. The important factor is that wages and earnings in the modern sector are higher than those that would prevail under competitive conditions and are downwardly inflexible.[13/]

12/Michael P. Todaro, "A Model of Labor Migration and Urban Unemployment in Less Developed Countries," American Economic Review, Vol. 59, No. 1 (March, 1969), pp. 138-148.

13/For discussion of political and other forces that influence modern sector wages in developing countries see Kilby; and Elliot J. Berg, "Wages and Employment in Less-Developed Countries," Discussion Paper No. 13, Center for Research on Economic Development, University of Michigan, 1970.

The urban traditional sector is a residual in the sense that it consists of that part of the urban labor force not regularly employed in the modern sector. The traditional sector includes a variety of occupations such as workers in labor-intensive small-shop manufacturing, and small-scale commercial and private service establishments, as well as part-time casual laborers and the openly unemployed.[14] Wage rates in the traditional sector are not subject to the same set of forces that maintain high modern sector wages, but are determined competitively. As a result of the lower wage rates and less permanency that characterize traditional sector employment, earnings in this sector are substantially lower than modern sector earnings.

In this context, Todaro portrays rural-urban migration as a two-stage process. In the first stage the migrant arrives in the urban area and is either unemployed or underemployed in the traditional sector while he searches for a modern sector job. The second stage is reached when he obtains a modern sector job and the higher earnings that accompany it. From a life span income viewpoint the modern sector earnings during this second stage are sufficiently high so as to offset the zero or low traditional

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[14] Some detail on the kinds of traditional sector jobs in Tunis is provided by a 1968 survey of part of the Medina, a frequent residence of recently arrived migrants. That survey found that 51 percent of the active population had occupations such as porters, occasional day laborers, watchmen, maids, street vendors and repairmen, shoeshiners, cafe waiters, and the unemployed. [Ekkerhart Eckert, "La medina de Tunis: Faubourg ou gourbiville," (Tunis: Association Sauvegarde de la Medina, Atelier d'Urbanisme, 1970), pp. 9-11 (mimeo.)]

sector earnings during the first stage. Thus, even if a migrant experienced an initial current income loss as a result of migration, he could still be acting rationally as long as the present value of lifespan urban income exceeded the present value of rural income plus the costs of relocation as proposed by the original behavioral model.

Todaro's model assumes that modern sector job openings in a given time period, t, are filled by random selection from the permanent urban and migrant workers in the traditional sector. An individual's probability of being selected in a given period, $\pi(t)$, depends on the number of modern sector openings to be filled and the size of the "pool" of traditional sector workers.

The probability of having a modern sector job in a given time period, $\gamma(t)$, depends on the probability of being selected in that period and in previous periods, or

$$(4) \qquad \gamma(t) = \gamma(t-1) + [1 - \gamma(t-1)]\pi(t)$$

As Todaro demonstrates: $\gamma(t) \rightarrow 1.0$ as $t \rightarrow \infty$.

An individual's expected urban earnings in a given time period can then be written as

$$(5) \qquad Y_u(t) = \gamma(t)W_M + [1-\gamma(t)]\, W_T$$

where:

W_M = average earnings in the modern sector.

W_T = average earnings in the urban traditional sector.

Since it is assumed that $W_M > W_T$ and $\gamma(t) > \gamma(t-1)$, $Y_u(t)$ is expected to increase with the length of time in the urban area.

Todaro develops his model for the "typical" unskilled migrant.

Thus, the probability of selection for a modern sector job, $\pi(t)$, is the same for all those in the traditional sector pool and there is only one modern sector wage rate. The heterogeneity of potential migrants in Testour requires further elaboration to allow for the effects of a number of characteristics on the individual's expected urban income. These characteristics will be used to represent $Y_u(t)$ implicitly in the probability function with those that tend to increase $Y_u(t)$ expected to result in a greater likelihood of migration among potential migrants when rural incomes and costs are held constant.

The Todaro formulation assumes that all potential migrants have equal amounts of information about the urban labor market and that access to urban jobs does not differ between individuals. A more reasonable assumption is that those potential migrants who had previously lived in the urban area or who had a friend or relative there who could help in finding a job are more likely to be aware of a particular job opening, and, perhaps, to have assistance in getting that job. This last function is especially important in Tunisia where patronage and influence-peddling have become part of the labor market vernacular.[15/] Having such an urban contact would increase the probability of getting an urban job and therefore an individual's expected urban income. It is

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15/Distinction is often made between those who got their jobs on their own accord and those who were "put in" to a job. Similarly, influential patrons (piston de cuivre) are distinguished from those less able to help (piston de sable).

hypothesized that knowing a friend or relative in the destination area who could help in obtaining a job increases the probability of migration.

Migration research in other countries suggests that education may also increase the probability of getting an urban job. Schwartz found that education appears to reduce the cost of obtaining information about job opportunities.[16] In addition, Fields notes that employers in many LDC's appear to be using education as a criterion of employee selection and show a preference for the best educated not necessarily because they are believed to be more productive. He suggests that a "bumping model" of labor market behavior in which the educated are hired first at all skill levels may be more applicable than alternative models in such situations.[17]

In addition to possibly increasing the probability of getting an urban job, education is expected to increase earnings once a job is obtained. Unfortunately, there are only limited data available on urban earnings for different levels of educational attainment in Tunisia. One source is the results of a sample survey of men with varying amounts of education working in Tunisian industrial establishments reported by Al-Bukhari. The

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[16] Schwartz, p. 5.

[17] Gary S. Fields, "The Private Demand for Education in Relation to Labor Market Conditions in Less Developed Countries," Economic Growth Center, Yale University, Discussion Paper No. 160 (1972), pp. 8-14.

average earnings among workers with three years of secondary school were more than twice the average of men with six years of primary school, while earnings of workers with six years of secondary school plus an additional year of vocational training were more than three times larger than the average for the primary school group.[18] Similar evidence of the effect of schooling is reported by Simmons who found years of formal schooling to have a significant positive effect on earnings in a sample of workers in the Tunisian shoe industry.[19]

Another indication of the urban earnings differences for different educational levels can be found in Tunisia's minimum wage legislation which specifies wage rates and premiums for 113 different occupations. Although it is difficult to make precise comparisons, there are generally substantial differences between the wage minimums for occupations with specific education or skill requirements and the minimum for unskilled labor.[20] Similar differences exist in the occupational categories that specify wages for government employees.

The two possible effects of education on expected urban

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[18] Najati Mohammed Amin Al-Bukhari, "Issues in Occupational Education and Training: A Case Study of Tunisia," (Stanford: Stanford International Development Education Center, Stanford University, 1968), pp. 92, 95, 106.

[19] John S. Simmons, "The Determinants of Earnings: Towards An Improved Model," (The World Bank, 1973), p. 6 (mimeo.).

[20] République Tunisienne, Ministère des Affaires Sociales, Inspection Générale du Travail, Règlement des salaires, 1972.

earnings, increasing the probability of getting a modern sector job, π (t), on one hand, and the wage rate received, W_M, on the other, lead to the hypothesis that the probability of migration increases with the level of education.

An additional characteristic that is expected to increase $Y_u(t)$ is having had job experience in Testour that resulted in a skill transferable to the urban economy. The expected urban earnings of potential migrants with construction and mechanical skills, for example, would probably be higher than those of men whose specific job skills are limited to agriculture. Thus, it is hypothesized that possessing transferable skills increases the probability of migration.

A further aspect of rural job experience among potential migrants is the development of work habits and capabilities not resulting in a specific identifiable occupational skill such as a mason or mechanic. To the extent that such experience enhances a worker's productivity in the urban economy it is expected to result in higher expected urban earnings, implying that $Y_u(t)$ may be higher for older experienced potential migrants than for young recent labor force entrants, other factors held constant.

This possible effect of experience (age) has implications for the expected relationship between age and the probability of migration. In (3) the present value of a given level of income gain is directly related to the length of the planning horizon. Thus, the longer expected working life of young as compared to older migrants suggests an inverse relationship between age and

the probability of migration if the other factors in (3) are held constant.

However, a positive effect of experience on expected urban earnings would tend to counteract the negative effect of the shorter planning horizon for older men with some experience as compared to young men with none.[21] This suggests the hypothesis that age is parabolically related to P with the probability of migration first increasing and subsequently decreasing with age. Sjaastad emphasizes, however, that rural-urban migration almost always requires occupational as well as geographical mobility. Thus, the effect of rural job experience on urban earnings depends on the degree of transferability of rural on-the-job learning to the urban economy. In the case of migration from Testour there is no a priori evidence of the effect of such experience on urban earnings. This will be considered again in a later chapter.

Bowman and Meyers consider other factors that may influence a migrant's expected earnings in the destination area in addition to schooling, age, and work experience.[22] Of these sex, race, quality of schooling, and environmental experience as a youth

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[21] From (3) $\partial P/\partial Y_u > 0$ and $\partial P/\partial n > 0$. A 30 year old man with 15 years of experience would have a higher Y_u than a 15 year old with no experience, other things being equal. However, n is smaller for the 30 year old so that the net effect of experience-age on P can not be determined a priori.

[22] Mary Jean Bowman, and Robert G. Meyers, "Schooling, Experience, and Gains and Losses in Human Capital Through Migration," American Statistical Association Journal, Vol. 62 (September, 1967), p. 881.

can be considered as held constant by the limitation of the study to men from the same rural area. Ability is another factor which would differ between individuals, but no measure of ability is available for the sample members.

Thus, expected urban earnings will be represented implicitly in the probability function by schooling, skills, and urban job contact variables. The effect of general rural work experience on expected urban earnings is reflected in the hypothesized parabolic relationship between age and the probability of migration as discussed above. The effect of these factors on the urban earnings of those in the sample who had migrated will be considered in Chapter V.

In addition to changes in earnings as a source of returns to migration, Sjaastad includes as a money return the change in unearned income received by the migrant as a consumer. Observers frequently note a distinct bias in the provision of social services in favor of the urban areas of developing countries. Although the actual value is difficult to measure, the availability of publicly provided services is apparently higher in Tunisia's urban areas where schools, health facilities, utilities, etc., are concentrated than it is in Testour. Thus, a migrant may experience a return to migration in the form of unearned income just by moving to the urban area. However, the size of the gain would not differ appreciably between individuals since it can be assumed that they all received the same initial amount in Testour. Differences would arise, however, between unmarried and married migrants whose

families would also benefit from the higher urban level of social services. This would increase $Y_u(t)$ for men with families.

Another source of possible extra urban income for migrants with minor children is the family allowance paid through the social security system. Modern sector employees covered by the social security system receive a monthly allowance for each minor child up to four children per family. These allowances can amount to a significant premium. For example, an unskilled laborer working full-time at the minimum wage rate in 1972 would have received a family allowance for four children equal to about 50 percent of his basic earnings.[23/] The family allowances would therefore substantially increase modern sector earnings for migrants with young children. Thus, social service income and family allowances may result in higher expected urban income for men with families.

Sjaastad proposes that "psychic benefits" can provide a non-money return to migration in addition to the money components discussed above. The attraction of the "bright lights" of the city is frequently cited as a primary cause of rural-urban migration in LDC's, especially among the educated who are often thought to be disenchanted with rural life. Thus, the hypothesized effect of education on the probability of migration may reflect this attraction rather than the effect of urban earnings discussed above. However, there is some reason to believe that the apparent

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23/Based on data provided by the Direction Générale, Caisse Nationale de la Sécurité Sociale, in Tunis.

strong effect of the attraction of urban life among the educated noted in developing countries is a result of inadequate measures of the comparative income gains from migration for the educated and the uneducated. Citing recent migration research in Africa, Frank states: "There is the strong suspicion, then, that if one controls for income differences, relative degree of education is not an explanatory factor in rural-urban migration."[24/] Similarly, in a study based on a survey of Tunisian school leavers, Kinsey observes that rural-urban migration is apparently a result of expectations of better jobs and incomes in the urban areas rather than a result of a preference for urban life. He also indicates that those school leavers who had migrated exhibited a preference for the rural areas if comparable jobs were available there.[25/] However, even if preferences for urban life are not a by-product of education, such preferences probably still exist among some of the potential migrants. As these preference differences cannot be measured, they will remain unaccounted for.

Costs:

The costs of migration can also include both money and non-money components. The most important cost of migration is the stream of

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24/Frank, "Causes and Effects of Migration in Africa," p. 6. Emphasis in the original. See also, Josef Gugler, "On the Theory of Rural-Urban Migration," in Sociological Studies 2: Migration, J. A. Jackson (ed.), (Cambridge: Cambridge University Press, 1969), p. 145.

25/David C. Kinsey, "L'éducation de masse et ses implications socio-économiques en Tunisie," RTSS, No. 24 (Mars, 1971), p. 179.

rural income foregone as a result of migration, represented by $Y_R(t)$ in the behavioral model. The nature of the rural economy and the structure of agriculture in Testour give rise to significant variation of rural income and employment opportunities among the potential migrants. This variation results from differences in cash earnings from wage and non-farm self employment as well as differences in farm size and type. In the subsequent analysis it is assumed that a potential migrant bases his expectation of future rural income on his own recent past experience. A measure of $Y_R(t)$ based on survey data will be included in the probability function and is hypothesized to be inversely related to P when other factors are held constant, as indicated in (3).

However, some of the factors proposed above as determining expected urban earnings (schooling, skills, experience) may have similar effects on rural incomes. This will be considered in Chapter V. But to the extent that $Y_R(t)$ and P are both stochastic functions of these variables, this leads to problems in estimating the probability of migration function because of the possibility of correlation between the two error terms. This will be discussed in Chapter VI.

Other costs of migration include travel expense and the increase in food and lodging cost in the urban area. Given the restriction of this study to migration from a single rural area, travel expenses would not differ among individual potential migrants. Food and lodging expenses would probably increase less for those who had a friend or relative in the urban area. The largest

differences in both travel and other expenses would probably be between unmarried migrants and married migrants whose families migrated with them.

An additional cost if a married migrant's family moves with him may result from a decrease in household production income. If instead the family remains in Testour, the migrant may experience "psychic" costs as a result of separation from his family. In either case the costs of migration are probably higher for married men, other things being equal.

Thus, being married may have two offsetting effects on migration: higher urban income from social services and family allowances on one hand, and higher costs of migration on the other. No hypothesis is made about the direction of the net effect of being married on the probability of migration.[26]

The migration model is cast in terms of real rather than nominal income differences between urban and rural locations. It is generally acknowledged that living costs are higher in urban than in rural areas of Tunisia, but there are no relative price data to evaluate the difference. This, and the lack of a measure of social service incomes, make it impossible to provide meaningful estimates of real incomes in the two locations. In this study

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[26] Previous research suggests that migration and marriage behavior may be jointly determined. For example, Nerlove and Schultz consider migration, marriage, and other household decisions in a simultaneous model in recognition of their probable interdependence. Thus, including marriage as an explanatory variable in the probability function leads to estimation problems as will be discussed in Chapter VI. [Marc Nerlove, and T. Paul Schultz, Love and Life Between the Censuses: A Model of Family Decision Making in Puerto Rico, 1950-1960, RM-6322-AID (Santa Monica: the Rand Corporation, 1970)].

no attempt will be made to solve the considerable theoretical and empirical problems involved in estimating rural-urban real income differentials or the real income gains of migrants from Testour.[27] As noted previously, the approach of this study is to analyze the effects on migration of variations in expected income gain between individuals. Since all potential migrants lived in Testour, the price differences between the rural and urban areas are assumed to be the same for them all.

The discussion so far has centered on the costs and returns of migration and nothing has been said about financing the migration investment. DaVanzo has noted that investments in human capital including migration are risky and illiquid because of the uncertainties about future income streams and the fact that the investment is "embodied" in the migrant.[28] This makes it very difficult to borrow on the capital market to finance such investments and leads to a reliance on self-financing.[29]

DaVanzo also observes that self-financing is more easily accomplished by people with sufficient (non-human) wealth which leads her to the hypothesis that the propensity to migrate is

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[27] For a discussion of problems relating to the proper measure to use, and estimation of real rural-urban income differentials in Ghana, see Knight.

[28] DaVanzo, pp. 2-3.

[29] As an indication of the importance of self-financing of migration in LDC's, 52 percent of migrants surveyed in Ghana financed their move from their own sources and 38 percent through gifts or loans from relatives. Only nine percent obtained money from other sources. [John C. Caldwell, African Rural-Urban Migration (New York: Columbia University Press, 1969), p. 135.]

directly related to non-human wealth. In her empirical analysis DaVanzo uses the level of income in the area of origin as a proxy measure of non-human wealth which is hypothesized to be positively related to the propensity to migrate.[30]

In this study it has been hypothesized that there is an inverse relationship between the probability of migration and rural income. Other than rural income as a proxy as suggested by DaVanzo, no measure of non-human wealth of the sample individuals is available. Thus, to the extent that self-financing of migration from Testour is facilitated by larger farm and cash rural incomes, this will tend to reduce the observed negative effect of rural income on the probability of migration.

To summarize the factors expected to influence the probability of migration:

A) Education is hypothesized to be directly related to P.

B) Transferable job skills are hypothesized to increase P.

C) Having an urban job contact is hypothesized to increase P.

D) Age is hypothesized to be parabolically related to P.

E) Rural income is hypothesized to be inversely related to P.

F) Two offsetting effects of being married on migration were proposed, but no hypothesis was made about their net effect on P.

The Data:

The principal source of data for this study is the results of a sample survey conducted in the délégation of Testour from June

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[30] DaVanzo, p. 22.

through October of 1972. In the first stage of the survey a sample of households was selected from lists of households provided by the 1966 population census. The sample households were then classified as either having at least one migrant man since 1966 or no migrant man on the basis of interviews with the four cheikhs (village leaders) in the délégation. For the purpose of the survey, a migrant was a man 15 years or older who had gone outside the gouvernorat of Beja to work or look for work for two months or more, or who intended to remain away.

In the second stage, random samples of 220 households with at least one migrant and 80 households with no migrants were selected to be interviewed. Of the total of 300 households in the sample, 254 interviews were completed. In most cases the respondent was the head of the household and was asked to provide information concerning all the migrant and non-migrant men in his household. In his absence the information was supplied by his son, father, brother, or in a few cases, by another close relative. Thus, in the large majority of the interviews, information about the migrants was provided by someone other than the migrants themselves. The survey yielded useable interview schedules for 295 economically active men who had not migrated and 144 men who had migrated between 1966 and the time of the survey; substantially fewer migrants than had been anticipated on the basis of the information provided by the cheikhs. More detail about the survey and a discussion of problems encountered are included in Appendix A.

CHAPTER III

THE CHARACTERISTICS OF MIGRANT AND NON-MIGRANT MEN IN TESTOUR

The purpose of this chapter is to compare migrants and non-migrants in the sample in terms of socio-economic factors that have been hypothesized to differ between the two groups. The following presentation is not appropriate to test for the hypothesized relationships between these factors and migration because the other variables influencing migration are not controlled. Nonetheless, it provides a description of the selectivity of migration from Testour that may be compared with those of other migration studies.

Age:

As shown in Table 3.1, there are striking differences in age between the migrants at the time of migration and the non-migrants in the sample.[1/] The migrants were considerably younger as a group than the non-migrants; 76 percent were 15 to 29 years old compared to 33 percent of the non-migrants.

The migrants ranged in age from 15 to 52 years with 57 percent migrating between 20 and 29 years of age, and 43 percent in the 20-24 age category. Similar results are reported by Picouet. Using the 1966 census data, he concludes that the highest rates of

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[1/] The non-migrants are all economically active men, 15 years old or older. Students are excluded. The migrants are those who qualify under the definition given in the preceding chapter.

Table 3.1. Percentage distribution by age for non-migrants and age at time of migration for migrants

Age Group	Non-migrants (n=295)		Migrants (n=144)	
	%	Cumulative %	%	Cumulative %
< 20	13.2	13.2	19.4	19.4
20-24	11.2	24.4	43.1	62.5
25-29	8.8	33.2	13.9	76.4
30-34	7.1	40.3	6.9	83.3
35-39	8.1	48.4	6.3	89.6
40-44	7.5	55.9	5.6	95.2
45-49	10.8	66.7	2.8	98.0
50-54	8.5	75.2	2.1	100.1
55+	24.8	100.0	0	100.1

migration of men to Tunis occurred in the 20-30 year old age bracket with a maximum between 20 and 24.[2]

The relative youth of rural-urban migrants is a recurrent finding of migration studies in both less-developed and developed countries. Although the age at which migration rates reach their peak may differ from one area to another, the vast majorities of migrants move before they reach 30.[3]

Education:

The migrants in the sample were substantially better educated than the non-migrants as shown in Table 3.2 where years of school include formal occupational training as well as regular primary and secondary education.[4]

In both age groups relatively fewer migrants had no schooling and relatively more migrants had at least seven years. Separate χ^2 tests for the two age groups resulted in rejection of independence between education and migration at the 98 percent level.[5]

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[2] Picouet, Description et analyse rapide des migrations intérieures en Tunisie, pp. 53-54. Picouet stresses the tentative nature of his calculated figures as the census did not record the age of migrants at the time of migration.

[3] See, for example, Byerlee, p. 4; and Varden Fuller, Rural Worker Adjustment to Urban Life: An Assessment of the Research, (Ann Arbor: Institute of Labor and Industrial Relations, University of Michigan - Wayne State University, 1970), pp. 49-50.

[4] Substantial numbers of both groups, particularly older men, had attended traditional Koranic schools (koutab), and two men had participated in an adult literacy program. Neither of these are included in the figures.

[5] For those 25 and over it was necessary to use three schooling groups; 0, 1-5, and ≥ 6.

Table 3.2. Percentage distribution of migrants and non-migrants by education and age group

Age		Years of School and Occupational Training				
		0	1-5	6	7-9	≥10
15-24	% migrants n=89	19.1	13.5	15.7	23.6	28.1
	% non-migrants n=72	31.9	23.6	22.2	15.3	6.9
25 +	% migrants n=55	69.1	12.7	9.1	5.5	3.6
	% non-migrants n=222	86.5	7.7	4.5	0.5	0.9
ALL	% migrants n=144	38.2	13.2	13.2	16.7	18.7
	% non-migrants n=294	73.1	11.6	8.8	4.1	2.4

Among the younger men, significantly more migrants had continued their education beyond primary school; 52 percent compared to 22 percent of the non-migrants. However, the larger percentage of non-migrants who had terminated their education with 1-5 and 6 years suggests that attending primary school only does not increase the probability of migration in this age group.

Among the older men the education levels of both groups are substantially lower.[6/] Although migrants are still better educated, the percentage differences are not as large. In this age group, the percentage of migrants exceeds that of non-migrants in both the primary and secondary school categories.

One reason for the higher level of education among the migrants is the significantly larger percentage of migrants who had formal occupational training in addition to regular schooling; 25.7 percent of the migrants compared to 3.1 percent of the non-migrants. A variety of occupational training programs was represented in the sample.

The CFPA (Centers for Adult Occupational Training) program was developed primarily as a response to the large number of

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6/One possible explanation for the lower educational level is that the contemporaries of the older men who had the most schooling left Testour before the survey. A second possible explanation is that most of the younger men were of school-age during the rapid expansion of Tunisia's educational system following independence.

Tunisia's educational programs and their evolution since independence are discussed in Chedli Tarifa, "L'Enseignement du 1ere et du 2ième degré en Tunisie," Population, Numéro Speciale (Mars, 1971), pp. 149-180; The American University, Area Handbook for the Republic of Tunisia (Washington, D. C.: U.S. Government Printing Office, 1970); and Al-Bukhari.

school-leavers who had not acquired any marketable occupational skills. Through this program those who have terminated their formal schooling with six years of primary school, one or more years of secondary school, or, more rarely, less than six years of primary school, may be eligible for several kinds of training. The training is provided in programs of generally one or two years at numerous Centers that teach skills in such areas as agriculture, construction, and mechanics in addition to classroom instruction in languages, arithmetic, etc.. Substantially more migrants had received CFPA training; 13 percent of the migrants compared to two percent of the non-migrants.

In addition to the CFPA program, some sample members had received training in Tunisia's specialized education system, private schools, and overseas training programs (stages). Programs represented in the sample include the School of Public Administration, the School of Public Health, the National Fisheries School, the School of Hotel Administration, and privately operated "free schools" that teach accounting and secretarial skills. Generally these men had already completed part or all of the regular secondary school cycle. Many more migrants had received this kind of training; 13 percent compared to less than one percent of the non-migrants.

There are two other noteworthy points regarding the relationship between education and migration. First, 39 percent of the migrants had no formal schooling, and an additional 25 percent had only six years or less of primary school. Thus, migration is

not a phenomenon restricted to the highly educated. Secondly, although they represent a relatively small proportion, 20 non-migrants had some secondary school or occupational training. Some of these worked in Testour as teachers and other relatively well-paid government employees. Seven others were farmers, including two who had completed secondary school. Of the non-migrants under 25, 44 percent had at least six years of schooling. Thus, substantial numbers of school-leavers remain in Testour to live and work, although some may later leave. This suggests that education does not necessarily imply migration if good employment opportunities are available in Testour.

Other evidence of the effect of schooling on migration is reported in Kinsey's study of school-leavers in the gouvernorat of Le Kef. He found that those who had finished primary school were more likely to have moved than those who had not, while having had a few years of post-primary school increased the likelihood of migration even more.7/ As noted previously, he also reports that the migrants expressed a preference for the rural area if comparable jobs were available there. This kind of result emphasizes the need for an evaluation of the relationship between education and migration with other factors, particularly rural income, held constant.

Higher levels of education among migrants than non-migrants have been reported in rural-urban migration studies in several

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7/Kinsey, pp. 177-178.

other LDC's. For example, Caldwell found significant relationships between the extent of education and the incidence of migration among Ghanian men in several age categories. Similar results are reported by Speare in his study of migration in Taiwan.[8/]

Employment:

This section will consider the occupations of the migrants prior to their migration from Testour, and those of the non-migrants during the year preceding the survey, 1971-1972. The purpose is to provide a description of the employment and income opportunities that exist in Testour, as well as to make comparisons between the two groups.[9/]

8/ Caldwell, pp. 63-66; and Speare, pp. 81-82.

9/ A major change in Tunisian agricultural policy occurred during the period covered by the survey which may have had traumatic effects on the employment and income of some of the migrants, precipitating their move from the area.

An increasing policy emphasis on agricultural production co-operatives culminated in early 1969 with a move to incorporate all privately owned land. This policy was suddenly reversed in the fall of 1969. A few co-ops were dissolved and all privately owned land was returned to its owners. The 18 co-ops that remain in Testour operate the large farms expropriated from foreign owners following independence. Tunisia's co-operative experience is described in John S. Simmons, "Agricultural Cooperatives and Tunisian Development," Middle East Journal, Part I (Autumn, 1970), pp. 455-465, and Part II (Winter, 1971), pp. 45-51.

It is difficult to assess the effect of these policies and policy changes on the migrants and non-migrants in the sample. None of the large private farms and only some of the small farms in Testour were actually included in co-ops, and of those that were, the compensation and participation of the owners in the co-ops varied from case to case. The overall effects were more widespread, however, as many farmers apparently sold their draft animals and other livestock in anticipation of their eventual entry into a co-op. When the policy was reversed, and the land incorporated was returned, some farmers said they had no animals or seed to produce a crop. (continued on p. 48)

The economy of Testour is predominately agricultural. The 1966 census reports that 75 percent of the economically active men were engaged in the agricultural sector.[10] The non-farm sector consists of marketing and processing activities, crafts, and service occupations.

As in other areas of the Haut Tell, agricultural land in Testour is unequally distributed between numerous small family farms that use mostly traditional methods, and a relatively few large mechanized farms that are either privately owned or state-run production cooperatives. In addition to those with land, the agricultural sector includes a sizeable group of landless farm laborers, some of whom work permanently on the largest private farms and the co-ops, while others find seasonal work on smaller farms.[11] The existence

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9/(continued from p. 47) However, during the interviews it was apparent that the respondents were eager to recount their bad experiences and express their dissatisfaction with co-ops in general. Thus, given the retrospective nature of the interviews, it was not possible to accurately determine what the relative impact of the co-op policies on the migrants and non-migrants had been, precluding any conclusion about their effect on migration.

10/Unpublished census data. Institut National de la Statistique.

11/Data are not available on a délégation basis, but a 1962 survey of the gouvernorat of Beja found that 19 percent of the farms were over 20 hectares in size and accounted for 84 percent of the operated agricultural land. Of the total number of farm operations, five percent were over 100 hectares in size and accounted for 66 percent of the total land area.

This same survey found that the total farm labor force including women consisted of 34 percent farm operators and partners, 48 percent family workers, and 18 percent permanent farm wage laborers. /République Tunisienne, Secrétariat d'Etat au Plan et aux Finances, Services des Enquêtes Statistiques, Structures agraires du gouvernorat de Beja: 1961-1962 (n.d.), pp. 21, 59./

of this wage labor market and the non-farm sector provides off-farm alternatives to farm operators and family workers who frequently combine off-farm work with work on their family farm.

Table 3.3 shows the distributions of the migrants and non-migrants in the sample in the principal employment groups suggested above.[12/] In both groups large majorities of the men had worked in the farm sector, although the percentage was higher for non-migrants; 78 percent compared to 65 percent of the migrants. Migrants were more likely to have had only a non-farm occupation; 29 percent of the migrants and 19 percent of the non-migrants. Ten percent of the non-migrants and four percent of the migrants had occupations in both sectors usually combining non-farm employment with work on the household farm.

Significantly more non-migrants belonged to households that operated farms; 57 percent of the non-migrants compared with 39 percent of the migrants. Conversely, fewer non-migrants had worked as farm laborers; 30 percent compared to 39 percent of the migrants. Migrants were both more likely to combine off-farm work as farm laborers with own-farm work, and to be in the group of landless laborers whose only occupations were as paid farm workers.

The last principal group, the unemployed for the first time, consists of those who were actively seeking work but had found none

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[12/]The figures in the table and the following discussion refer only to those migrants who were economically active (working or looking for work) before migration from Testour. Of the 144 migrants, 48 were inactive (in school, in the military, etc.) before moving.

Table 3.3. Distribution of non-migrants and migrants by occupational group

Occupational Group	Non-migrants (295)		Migrants (96)	
	Number	Percent	Number	Percent
1) Operated farm only (farm operators and unpaid family workers)	114	38.6	21	21.9
2) Operated farm and off-farm	53	18.0	16	16.7
Operated farm and farm labor	27	9.2	12	12.5
Operated farm and non-farm	26	8.8	4	4.2
3) Farm wage labor	62	21.0	25	26.0
Farm wage labor only	58	19.7	25	26.0
Farm wage labor and non-farm	4	1.3	0	0
4) Non-farm occupations only	56	19.0	28	29.2
5) Unemployed for first time	10	3.4	6	6.3

since entering the labor force and so had not established an occupation. Of the migrants six percent were in this group compared to three percent of the non-migrants.

The Agricultural Sector:

Table 3.4 gives the type of land (irrigated or unirrigated) and the farm size (hectares per active man in the household) for the migrants and non-migrants whose households operated farms.[13]

In some cases, households farmed both irrigated and unirrigated fields. In most cases, however, the farms did not include irrigated land. The figures relating to all of the migrants and all of the non-migrants show that only six percent of the migrants' and 20 percent of the non-migrants' households had irrigated land. Of the non-migrants, nine percent of the farms were all irrigated compared with none of the migrants.

Unfortunately, the numbers of observations are too small to allow a comparison of the size of irrigated land farmed between migrants and non-migrants. However, it is interesting to note

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[13]Testour is distinguished from other parts of the Haut Tell by the existence of a relatively small area of irrigated land along the Madjerda River. Introduced several centuries ago by Moors who settled in Testour, the irrigated area has been expanded somewhat in recent years, and mechanical pumps have almost completely replaced animals as a means of drawing water from shallow wells or directly from the river.

The irrigated land consists of orchards and truck farms and is divided into more than 200 plots owned and farmed principally by the people of the villages of Testour and Sloughia. It is apparently significantly more productive than unirrigated land. See Ahmed Kassab, "Les basses terrasses de la Madjerda dans la plaine de Testour-Sloughia," RTSS, No. 21 (Mai, 1970), pp. 119-157.

Table 3.4. Hectares per man for migrants and non-migrants whose households operated farms by occupational group

	Unirrigated Land		% with	Irrigated Land		% with
	Mean	Median	unirrigated	Mean	Median	unirrigated
MIGRANTS: All	3.9	2.7	100.0	1.7*	1.7*	5.6
Operated farm only (20)	5.3	3.2	100.0	1.7*	1.7*	10.0
Operated farm and farm wage labor or non-farm occupations (16)	2.2	1.3	100.0	-	-	0
NON-MIGRANTS: All	12.9	5.0	91.0	2.0	1.8	19.6
Operated farm only (113)	16.3	5.0	91.1	2.1	2.0	21.2
Operated farm and farm wage labor or non-farm occupations (53)	5.4	3.0	90.5	2.0*	1.5*	11.3

*less than 10 observations.

that among the non-migrants the median for irrigated land is 1.8 hectares compared with 5.0 hectares for unirrigated land.

Unirrigated hectares per man in the sample ranged from .5 to 15 for the migrants and .7 to 510 for the non-migrants. Comparing the size of unirrigated farms, the migrants as a group had substantially smaller farms than the non-migrants. The median of 5.0 hectares per man for all non-migrants is nearly twice as large as the 2.7 hectares per man median for all migrants. Comparing the means, the difference is even greater; 12.9 hectares per man for the non-migrants versus 3.9 hectares per man for the migrants.

In both groups there are substantial differences in unirrigated farm size between those who only worked on the household's operated farm and those who also worked in off-farm occupations either as farm wage laborers or in the non-farm sector. Among the migrants the median for the operated-farm-only category is 3.2 hectares per man compared to 1.3 hectares per man for those who performed off-farm work. Among the non-migrants the comparable figures are 5.0 and 3.0 hectares per man respectively.

Thus, migration seems to be selective of those farm operators and family laborers who are less well endowed in terms of land. This selectivity is maintained when the division is made into those who also work off the farm and those who do not. The farm size of the migrants in both groups is substantially smaller. In addition, the migrants were less likely to farm the apparently significantly more productive irrigated land.[14/] These findings lend support to

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14/See page 54.

the hypothesis that the probability of migration is inversely related to the level of rural income.

Farm wage earnings are often the only source of income for landless households and offer an off-farm alternative for those who work on the family farms.[15] Table 3.5 gives the percentage of migrants and non-migrants who had worked as farm laborers in each of several subcategories.

A striking difference between the two groups is the substantially larger percentage of migrants who had specific skills; nine percent of the migrants versus three percent of the non-migrants. All of the migrants in this group had skills that can be considered transferable to the urban econom., e.g., machinery operators and mechanics. However, only six of the 10 non-migrants in this group had such skills while the other four had skills applicable only to

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[14] Large majorities of both groups belonged to households that owned all the land they farmed; 72 percent of the migrants and 77 percent of the non-migrants. More of the migrants' households owned none of the land farmed (25 percent versus four percent), while more of the non-migrants' households farmed rented land in addition to what they owned (19 percent versus three percent). The rented farms of the non-migrants tended to be larger than those of the migrants, but there were no significant differences between the two groups in terms of either the type of land rented or the rental arrangement (e.g., fixed rent or share basis).

[15] Most farm laborers are paid a daily cash wage, a few are paid a monthly wage, and some manual tasks, particularly grain and olive harvesting, are often performed on a share basis (e.g., one-tenth of the amount of grain cut each day). In 1972 laborers working for the co-ops and the largest private farms were paid the legal minimum agricultural wage; 600 millimes per day for unskilled workers and more for those with skills. The daily wages of other non-migrant farm laborers ranged from 250 to 550 millimes per day depending on the individual, the kind of work, and the season. (1000 millimes = one Tunisian dinar. The official exchange rate in September, 1972 was one dinar = U.S. $2.12.)

Table 3.5. Migrants and non-migrants who worked as farm laborers

	Non-migrants		Migrants	
	Number	% of non-migrants	Number	% of migrants
Unskilled private employees	56	19.0	22	22.9
farm labor only	26	8.8	10	10.4
farm labor and own farm or non-farm occupations	30	10.2	12	12.5
Unskilled cooperative laborers	23	7.8	6	6.3
Skilled farm laborers (co-ops and private farm employees)	10	3.4	9	9.4

agriculture. Thus, the probability of migration is high among farm laborers with transferable job-learned skills, consistent with the hypothesis that having such skills increases the probability of migration by increasing expected urban earnings.

In the unskilled categories slightly more migrants than non-migrants worked for private employers, both among those who had only the one occupation and those who also worked on their household farm or in the non-farm sector, while slightly fewer migrants had worked as unskilled laborers on the co-ops.

The Non-farm Sector:

In the sample 33 percent of the migrants worked in the non-farm sector compared to 29 percent of the non-migrants. As noted previously, fewer migrants had also worked in the farm sector; four percent of the migrants versus 10 percent of the non-migrants. The non-farm occupations of the two groups are shown in Table 3.6.

Unskilled non-farm workers include laborers working permanently for the government, porters and helpers for the merchants in Testour, and others. There was a slightly higher percentage of non-migrants in this category which is generally well-paid, full-time employment compared with unskilled farm labor.

LCSD workers are those who work for the government's Struggle Against Underdevelopment (Lutte Contre le Sous-Développement) program designed to provide work for Tunisia's unemployed.[16/] Considerably

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16/See République Tunisienne, Office de la Formation Professionnelle et de l'Emploi, L'expérience Tunisienne de mobilisation de la main-d'oeuvre dans le cadre de la Lutte Contre le Sous-Développement, Mars, 1969.

Table 3.6. Non-farm occupations of non-migrants and migrants

	Percent of non-migrants (n=295)	Percent of migrants (n=96)
Unskilled non-farm employees	5.1	4.2
LCSD workers	1.4	10.4
Skilled trade laborers	2.0	6.3
Craftsmen, artisans	3.7	1.0
Commercial, private service workers	13.2	3.1
Teachers, functionaries clerks, etc.	4.4	9.4

more migrants worked on the LCSD projects; 10 percent of the migrants versus one percent of the non-migrants. This large difference reflects in part the diminished importance of the LCSD program in 1971-1972 compared with previous years. The fewer openings in Testour are a result of an overall cutback and redirection of Tunisia's LCSD program and the completion of a number of terracing and reforestation projects in Testour. It was apparent that at least some of the migrant LCSD workers left shortly after the project they had worked on was completed or the number of days worked per month was decreased.[17/]

Skilled trade laborers consists of masons, painters, electricians, etc.. Substantially more migrants were in this group; six percent of the migrants compared to two percent of the non-migrants. This is further evidence that such skills increase the probability of migration.

The category "craftsmen, artisans" represents different kinds of skills such as tailors and others making and repairing a variety of household goods and agricultural implements for the local market. In contrast to skilled trade laborers, these workers are not likely to migrate; four percent of the non-migrants and one percent of the migrants were in this group.

17/ According to the local manager of Testour's LCSD program, the total number of available work-days for each délégation is determined by the regional and national LCSD offices. The local officials then allocate their quota more or less evenly among the unemployed applicants. In 1972 this resulted in 15 days of work per month in most cases, with unskilled workers receiving a daily wage of 250 millimes plus 2½ kg. of semolina for a cash equivalent of about 400 millimes.

The category "commercial, private service workers" includes a variety of occupations such as store owners and clerks, itinerant traders, barbers, cafe owners, water and wood haulers, and religious figures. Non-migrants greatly outnumbered migrants in this category; 13 percent of the non-migrants and only three percent of the migrants.

Significantly more migrants were in the category "teachers, functionaries, clerks, etc."; nine percent of the migrants compared to four percent of the non-migrants. Besides teachers, occupations in this group included a cheikh, agricultural and public health agents, bookkeepers, mail clerks, etc.. Men in this group were generally better educated than those in other categories.

Thus, among the non-farm occupations migration is likely for those who are marginally employed on the LCSD program, skilled trade laborers, and teachers and office workers. On the other hand, migration is unlikely for men in commerce and private service activities and for craftsmen.

The Unemployed:

The last major occupational group includes those unemployed for the first time. This group consists of those who had never worked before but were seeking a first job and whose households did not operate farms. Migrants were more likely than non-migrants to be unemployed for the first time; six percent of the migrants and three percent of the non-migrants.

The migrants in this group ranged in age from 15 to 22 years old when they left Testour. They had been unemployed for an

average of about one year. The non-migrants were slightly younger and had also been unemployed for an average of about one year. Notably, five of the 10 non-migrants had education beyond primary school. In light of their apparent lack of employment opportunity in Testour, it is likely that some of the non-migrants in this group would also leave if given the opportunity.

The percentage of the sample who were unemployed for the first time is not an adequate measure of unemployment or underemployment in Testour. Men were considered as having an occupation if they had worked only a few days during the year or, in a few cases, if they had not worked at all but had previously established a profession. It was felt that this would avoid setting an arbitrary number of days worked as the limit between the unemployed and the employed. In addition, no attempt was made to establish the amount of work performed by self-employed farmers, merchants, and service workers. The relevant measure for the purposes of the model is rural income, and it was towards this that the survey was directed. However, the low average days worked among some wage workers, the small size of most of the farms, and the marginal nature of many of the non-farm occupations indicate there is considerable underemployment in Testour.[18/]

18/ Among wage workers, those with non-farm occupations were nearly all fully employed. However, there are indications of considerable underemployment among unskilled farm laborers. The average days worked per month of non-migrants whose only occupations were as unskilled privately employed farm laborers was about 12 days for most of the year and 18 days during the summer grain harvest. In contrast, unskilled co-op laborers were fully employed, working, on average, 26 to 28 days per month throughout the year.

To summarize the results of the survey regarding the employment in Testour of the migrants and the non-migrants.

-Migrants were less likely to have worked in the farm sector and to combine farm and non-farm occupations.

-Of those who worked in the farm sector:

  -Migrants were less likely to belong to a household that operated a farm and more likely to work as paid farm laborers.

  -Migrants' farms were smaller than non-migrants' and were less likely to be at least partially irrigated.

  -Migrant farm laborers were more likely to have job-learned skills that would be applicable to the urban economy.

-More migrants than non-migrants had only non-farm occupations.

  -Migrants were more likely to have worked as teachers, office workers, skilled trade laborers, and LCSD workers.

  -Migrants were less likely to have worked as craftsmen or in commerce and private service occupations.

  -More migrants had been unemployed for the first time.

Comparisons of occupational differences between migrants and non-migrants in the sample with migration studies in other LDC's are limited by the small number of studies that provide such information and by differences in the natures of the rural economies.[19]

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[19] As noted previously no previous research provides much evidence about the occupational selectivity of migration in Tunisia. One small (31 observations) study of migration intentions in rural Kairouan found that the men most likely to migrate were those in the middle income group consisting of medium-size land owners and skilled laborers. [H. Van de Belt, "Motivations de migration et d'adaptation des émigrants dans l'exode rurale à Kairouan," Université Agricole de Wangeningen, 1970 (mimeo.).]

However, a greater likelihood of migration among skilled and semi-skilled trade laborers and craftsmen was reported for rural areas of Ghana and Taiwan.[20] In Taiwan, migrants were also less likely than non-migrants to have worked as farmers, and more likely to have been employed as farm laborers or as professionals, managers, and clerks.[21] An additional similarity between this study and migration research in other countries is the large number of migrants, particularly school-leavers, who were not economically active before migrating.[22]

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[20] Caldwell, p. 60; Speare, pp. 83-84.

[21] Ibid.

[22] Byerlee, p. 5.

CHAPTER IV

DESTINATIONS AND EMPLOYMENT OF MIGRANTS FROM TESTOUR

The purpose of this chapter is to describe the results of the survey relating to the destinations and type of employment obtained by the migrants in the sample after leaving Testour.

Destinations:

As shown in Table 4.1 the destinations of the migrants fall into three categories; Tunis and its suburbs, other urban and rural areas of Tunisia, and foreign countries. Of the 144 migrants, 66 percent went to Tunis, 15 percent to other areas of Tunisia, and 19 percent to foreign countries. Of those migrants who remained in Tunisia, 81 percent went to Tunis. This coincides with the census results which show that 83 percent of male migrants from Testour who had moved out of the gouvernorat of Beja resided in Tunis at the time of the census.[1] Both sets of data emphasize the importance of Tunis as a destination of migration from Testour.

Most of the 22 migrants who went to other areas of Tunisia went to urban centers. These migrants apparently went to work at jobs that had been arranged in advance.

The most common destination of migrants going to foreign

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[1] Résultats de la recensement générale de la population, 3 mai 1966: Migration, p. 74.

Table 4.1. Destinations of migrants after leaving Testour

	Number	Percent
Tunis	95	66
Other Tunisia	22	15
Nabeul-Kelibia	4	
Bizerte-Menzel Bourghiba	3	
Sfax	3	
Sousse	3	
Le Kef	3	
Other	6	
Foreign	27	19
France	12	
Libya	7	
Germany	6	
Holland	1	
Switzerland	1	
TOTAL	144	100

countries was France followed by Libya, Germany, Holland and Switzerland. There are indications that increasing numbers of men are migrating from Testour to foreign countries as is true for Tunisia as a whole. Accurate figures on the number of Tunisian emigrants are not available as there is apparently considerable foreign migration in addition to the official organized programs administered by the Office of Professional Training and Employment. The number of migrants who left in organized programs increased from 2,814 in 1966 to 14,658 in 1971.[2/] The total number including those who migrated outside of official channels is certainly much larger.[3/]

In addition to 6.9 percent of the sample who had returned to live in Testour, 12.5 percent of the migrants had made additional moves subsequent to their departure from Testour. Most of these cases were of men migrating to a foreign country after an initial stay in Tunis, or returning to Tunis from abroad. As noted in Chapter I, Picouet found that the city of Beja acted as a relay

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2/ République Tunisienne, Office de la Formation Professionelle et de l'Emploi, Rapport annuel de l'émigration 1971, n.d., p. 1.

3/ As an indication of the proportion of total migrants recorded in the official statistics, the Employment Office lists 4,155 as the number of Tunisians going to France in 1969 while French records show 14,925 Tunisians entered France as permanent (as opposed to seasonal) workers in the same year. See Rapport annuel ---, p. 7; and Ian M. Hume, Migrant Workers in Western Europe, Economics Staff Working Paper No. 102, I.B.R.D., 1970, Table III-12.

Unofficial migration to Libya is apparently even larger. An article in La Presse (Oct. 12, 1972) cites 40,665 as the number of illegal Tunisian migrants expelled by Libyan authorities in 1971 while only 2,984 Tunisians went to Libya in organized programs that year. Rapport Annuel ---, p. 7.

point for migration to Tunis from the western Haut Tell. Although the definition of migration in this study precludes a definite conclusion, Beja and other regional centers do not appear to be important relay points for migration from Testour. This is not surprising given the relative proximity of Testour to Tunis (about 80 kilometers).

The following sections will deal with the employment of the sample migrants after leaving Testour with emphasis on comparisons of the migrants with the permanent urban labor force. For these purposes migrants to Tunis and other areas of Tunisia are grouped together as "internal migrants" as distinguished from those who went to foreign countries. With one exception all the migrants to areas of Tunisia other than Tunis obtained non-agricultural employment.[4/] Thus, grouping all internal migrants together simplifies the analysis while maintaining the model's premise of migration as a choice between rural and urban alternatives.

Internal Migration:

The following discussion draws on two sources of labor force data in addition to the sample of internal migrants from Testour. The first source is the 1972 migration and employment survey conducted in the city of Tunis and its suburbs by the Institut National de la Statistique (INS).[5/] The INS data is more recent

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4/Teachers, other government employees, industrial and construction workers. The one exception worked in an orchard on the Cap Bon.

5/See page 67.

and detailed than that from the second source, the 1966 population census.

Age and Education:

The migrants from Testour were substantially younger as a group than the male labor force in Tunis. Table 4.2 shows that 59 percent of the migrants were less than 25 years old compared to 22 percent of the labor force.

Table 4.3 compares educational attainment of the two groups. The data do not give very detailed information; distinction between those with limited secondary school and those with university training, for example. Nonetheless, they suggest that among men under 30, the migrants tended to be better educated with a substantially larger proportion having some secondary or post-secondary education. Among older men, educational levels were generally lower for the migrants than the labor force. In both groups the younger men had considerably more schooling than those in the older age categories. However, there is good reason to suspect that the INS data understate educational levels of the

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5/ République Tunisienne, Institut National de la Statistique, Enquête migration et emploi, Tunis 1972-73; Résultats-série emploi et ménage, Fascicule 2 (Tunis: Janvier, 1973). Hereafter referred to as Enquête migration et emploi.

The INS employment data is broken down by male and female but does not distinguish between migrants and native-born within the sex categories. Most of the data are also available for migrants and native-born but here do not distinguish between sexes. Migrants are divided into those whose households moved to Tunis between 1962 and the survey in 1972, and those moving before 1962.

Table 4.2. Distribution of the male labor force in Tunis and Testour migrants by age group

Age	Tunis male labor force[a] (n=2015)	Testour migrants[b] (n=117)
	%	%
≤ 19	9.3	21.4
20-24	12.9	37.6
25-29	12.9	16.2
30-34	12.6	6.0
35-39	11.7	6.8
40-44	11.7	6.0
45-49	9.3	5.1
≥ 50	19.7	0.9
TOTAL	100.1	100.0

a/ Enquête migration et emploi, p. 55.

b/ Age at time of migration.

Table 4.3. Distribution of the male labor force in Tunis and Testour migrants by education and age[a/]

Age	Tunis male labor force[b/] (n=1945)			Testour migrants (n=117)		
	percent			percent		
	None	Primary	Secondary or more	None	Primary	Secondary or more
15-19	10.7	82.5	6.8	12.0	72.0	16.0
20-29	53.9	36.8	9.3	42.9	31.7	25.4
30-39	69.8	27.1	3.2	66.7	33.0	0.0
40-49	71.8	25.1	3.1	81.8	18.2	0.0
≥ 50	80.3	17.9	1.9	100.0	0.0	0.0
TOTAL	62.7	32.4	4.8	44.4	38.5	17.1

[a/]Occupational and religious training not included.

[b/]Enquête migration et emploi, p. 121.

labor force. Census and other data sources indicate that the percentage of men with secondary schooling should be considerably higher. The discrepancies may be the result of different definitions of having reached the secondary level, but the criterion used in the INS survey is not clearly stated.

Employment:

The INS data allow comparison of the occupations of the male labor force in Tunis with the first jobs of the migrants after leaving Testour, in some cases after an initial period of unemployment. Table 4.4 gives the distribution of the two groups by type of economic activity.

The significantly larger percentage of migrants in construction indicates that construction serves as a point of entry for migrants into the urban economy. Relatively more migrants also worked in agriculture and miscellaneous services, but the differences are not as great. It is interesting that 28 percent of both groups worked for the government, a larger percentage than in any of the other categories.

In the INS male labor force data discussed above, distinction is not made between migrants and native-born workers. The INS data do allow comparisons of occupations between migrants and natives, but here both groups include women as well as men; 18 percent of the total INS sample are women. The migrants are those who moved to Tunis in 1962 and after. Table 4.5 shows that the distributions of migrants and natives by activity group are quite similar. Relatively more migrants worked in miscellaneous

Table 4.4. Distribution by economic activity group of Tunis male labor force and Testour migrants' first jobs[a/]

	Male labor force (n=1840)[b/]	Testour migrants' first jobs (n=117)
	%	%
Agriculture	2.3	3.6
Industry (manufacturing, utilities, etc.)	22.8	17.9
Construction	7.7	24.1
Commerce	20.7	9.8
Transportation, Communication	7.8	3.6
Government	27.7	27.7
Miscellaneous services	10.9	13.4[c/]
TOTAL	99.9	100.1

a/Excludes those looking for their first jobs.

b/Enquête migration et emploi, p. 45.

c/Includes 6.1 percent of the sample who worked as casual laborers in no particular activity group.

Table 4.5. Distribution of migrant and native-born workers of both sexes by activity group[a]

	Natives (n=913) %	Migrants, 1962 and after (n=477) %
Agriculture	2.2	1.5
Industry (manufacturing utilities, etc.)	25.8	19.9
Construction	5.0	6.5
Commerce	15.8	17.2
Transportation, communication	4.8	3.6
Government	33.2	33.1
Miscellaneous service	13.1	18.2
TOTAL	99.9	100.0

[a]*Enquête migration et emploi*, p. 45. Excludes those looking for their first jobs.

service occupations, commerce, and construction, but the differences are not very great. While the comparisons are limited because they do not take into account possible differences in sex composition between the two groups, the data indicate that there do not seem to be any major occupational differences between natives and migrants who have had time to adjust to the urban labor market.

Unfortunately, neither the INS survey or the census make distinctions within categories that can be used to identify modern and traditional activities.[6] For example, manufacturing includes employees of large industrial firms as well as small-shop craftsmen, and commerce combines employees of large banks with self-employed street vendors. It is the division of the urban economy into traditional and modern sectors that is central to the migration model proposed by Todaro and applied in this study. The identifying characteristic of the modern sector is wage rates higher than those that would prevail competitively as a result of labor unions and minimum wage legislation. A workable definition of the modern sector is government employment and those employers in the private sector which observe the legal minimum wages.

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[6] The INS survey does show that incomes in 1972 were higher for migrants in the labor force as a group than for native-born workers. The average monthly income among migrants of both sexes who moved since 1962 was 41 dinars compared with a 36 dinar average among natives. The median monthly incomes were 26 and 23 dinars, respectively, indicating highly skewed distributions for the two groups with concentrations of workers in the lower income range. /Enquête migration et emploi, pp. 28, 29/

Tunisia has legislation governing working conditions and minimum wage rates that dates from before independence. These standards are intended to apply to all employees including agricultural laborers, but enforcement by the governments' Inspection du Travail is apparently only in response to specific allegations of violation.[7/]

In the absence of data on the extent of application of the minimum wages in the private sector, a good proxy measure is adherance to the social security or other employee insurance programs. In addition to providing some check on the wages firms pay, these programs substantially increase earnings in the form of health and retirement benefits and family allowances. Government employees also have an insurance program, and presumably are paid at least the legal minimum wage rates. Thus, an approximation of the modern sector can be made by including government employees and those covered by insurance programs. The rest of the urban labor force is assumed to be in the traditional sector.

Table 4.6 shows the number of enrolled employees as a percentage of the 1966 total active labor force in Tunisia in each activity group from the census classification. Based on a number

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7/ There is some evidence that the minimum wage standards maintain wages above competitive levels for some occupational categories. A special survey of 50 firms in 1971 found that the minimum wage was the effective wage for unskilled workers but that actual wages exceeded the minimums for those in various skilled occupations. /République Tunisienne, Ministère du Plan, "Premier rapport de la sous-commission des salaires au conseil interministériel," Avril, 1971 (mimeo.), p. 3./

Table 4.6. Proportion of active labor force enrolled in insurance programs

	Percent
Agriculture, forestry, fishing	.2
Industry (manufacturing, extractive industries, utilities)	51.0
Construction	61.5
Wholesale-retail trade, banking, insurance	32.7
Transportation, communication, storage	69.9
Public services	- a/
Private services	11.8
Total non-agricultural labor force (including government)	45.5

Source: Active labor force figures from Recensement générale de la population, 3 mai 1966: Caractéristiques économiques, pp. 87-89. Enrolled employees from unpublished data: Social Security (1966); Insurance programs of Régie du Tabac, Impremerie Official, CNCFT, SNT, SONEDE, STEG, all for 1970.

a/Government employees are covered by a separate program, presumably all of them.

of sources and covering the whole country, the figures are only rough approximations but do give an idea of the importance of the modern sector in the different categories.

The percentage of the labor force in the modern sector as defined here varies sharply between activity groups. The largest percentages are in construction and transport with 61.5 percent and 69.9 percent, respectively. Only half of the employees in industry are in the modern sector. The relatively low percentage in trade and especially private services confirm the importance of traditional sector occupations in these categories. Of the total non-agricultural labor force including government employees, 45.5 percent were in the modern sector. Less than one percent of the agricultural labor force was covered by insurance programs.

The model proposed in Chapter II suggests that migrants do not obtain a modern sector job when they first arrive in the urban area. Instead, it is hypothesized that they first spend a period of time unemployed or underemployed in the traditional sector.

The Testour survey results can be used to see if, in fact, the sample migrants experienced this kind of two-stage process. For this purpose questions were posed to determine the type of activity of the migrants since leaving Testour. On the basis of the responses to these questions, the employment of the migrants was classified as modern or traditional. Modern includes those cases where the type of employer and the reported wage rate appeared to qualify under the social security-minimum wage definition of the modern sector. The modern category was further classified as construction,

office workers-teachers, and "other modern". The traditional sector includes the unemployed, agricultural laborers, and all others where the reported earnings and type of employer did not appear to fall within the modern sector.[8/] The results of this classification of the initial activities and at the time of the survey are reported in Table 4.7 for 91 migrants to Tunis and other parts of Tunisia for whom complete responses were obtained.

Considering the initial employment status 33.0 percent of the migrants were unemployed while 11.0 percent began working in a variety of jobs such as casual labor, porters, store clerks, gardeners, cafe waiters, and peddlers which were grouped as "other traditional." Agricultural laborers accounted for 5.5 percent of the migrants. In all, 49.5 percent of the migrants were initially in the traditional sector.

In contrast, 50.6 percent of the migrants apparently began work right away in the modern sector. Of these 14.3 percent worked in construction and 15.4 percent as office worker-teachers. The 20.9 percent grouped as "other modern" include government laborers, industrial workers, truck drivers, technicians, and others.

At the time of the survey all but 4.7 percent had jobs and others had changed jobs, so that 29.4 percent were then in the

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[8/] This kind of detail is of questionable accuracy given the rural orientation of the survey in which most of the respondents were not the migrants themselves. If the quality of the responses were rated, the most accurate would be about the kind of job obtained, while whether or not the migrant was initially unemployed before beginning work would be less accurate. The least accurate information is probably the length of time unemployed.

Table 4.7. Distribution of Testour migrants by initial employment status and at the time of the survey

	Initial n=91		At time of Survey n=85	
		%		%
Traditional sector	49.5		29.4	
unemployed		33.0		4.7
other traditional		11.0		18.8
agriculture		5.5		5.9
Modern sector	50.6		70.6	
construction		14.3		22.4
office workers-teachers, etc.		15.4		12.9
other modern		20.9		35.3
TOTAL	100.1		100.0	

traditional and 70.6 percent in the modern sectors. In addition, 2.2 percent of the migrants had subsequently moved to foreign countries and 4.4 percent had returned to Testour.

Comparing these figures with the extent of modern sector employment of the non-agricultural labor force, both the initial employment of the migrants and at the time of the survey compare favorably in terms of modern versus traditional sector occupations, although the division of both groups into the two sectors is admittedly imprecise.

On the basis of the model it would be expected that a lower proportion of migrants would have had modern sector occupations when they first arrived than did the urban labor force. This was not the case among the sample migrants. However, the higher percentage of modern sector occupations at the time of the survey is consistent with the increasing probability of modern sector employment proposed by the model.

Among the 33.0 percent of the migrants from Testour who were initially unemployed, the length of unemployment ranged from one week to more than a year with an average of 14 weeks including the four relatively recent arrivals who were still unemployed at the time of the survey.

In spite of the theoretical interest in unemployment among recent migrants in LDC's, there is little empirical data. Hutchinson provides some evidence of the extent of unemployment among migrants in six Brazilian cities. He found that 85 percent of male migrants seeking work found a job within one month, and seven percent

searched for more than three months.[9] The comparable figures for this study are 83 percent and nine percent, respectively.

In his study of migrants in Santiago, Chile, Herrick reports a higher rate as well as longer periods of initial unemployment; 63 percent found a job within a month and 22 percent searched for more than three months. However, his figures are not exactly comparable to those of Hutchinson or this study.[10]

In terms of migrants in general, rather than just recent arrivals, Turnham cites several sources and observes that unemployment rates among migrants in LDC's tend to be lower than for native-born workers, especially in the younger age groups.[11] Lower unemployment rates among migrants are reported in several other studies as well.[12]

The INS data in Table 4.8 show a basically similar pattern of unemployment rates for migrants and natives of both sexes in Tunis in 1972. The overall unemployment rate of 5.3 percent for migrants since 1962 is significantly less than the 14.9 percent

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[9] Bertram Hutchinson, "The Migrant Population of Urban Brazil," America Latina, Vol. 6, No. 2 (April-June, 1963), p. 68.

[10] Bruce Herrick, Urban Migration and Economic Development in Chile (Cambridge: M.I.T. Press, 1965), p. 86. Herrick's figures refer to migrants of both sexes and the delay they experienced in finding a permanent, rather than any job.

[11] David Turnham, The Employment Problem in Less Developed Countries (Paris: OECD, 1970), pp. 67-68.

[12] See Joan Nelson, "The Urban Poor: Disruption or Political Integration in Third World Cities," World Politics, Vol. 22, No. 1 (October, 1969), p. 398; and Kalman Teske, Internal Migration in Jamaica, Jamaica: Department of Statistics, 1967, p. 31.

Table 4.8. Rates of unemployment of migrants and natives of both sexes by age group[a] Percent of age group unemployed.

Age	Native-born (n=1057)	Migrants 1962 and after (n=480)
15-19	46.1	17.6
20-29	16.7	4.7
30-39	4.9	3.5
40-49	2.4	3.4
50-59	1.9	6.5
60+	0.0	7.7
ALL	14.9	5.8

[a]Enquête migration et emploi, p. 96. The unemployed are those looking for work who had not worked during the week before the survey in April, 1972.

rate for natives. Among those less than 40 years old, migrants are less likely to be unemployed than natives. However, in the older age categories, unemployment rates among migrants are higher.

To examine the relationship between education, age, and the type of employment among migrants from Testour, the initial employment of the sample was classified by age and education as shown in Table 4.9, although this resulted in small number of observations in some groups.

In all three schooling groups the initial rates of unemployment are higher for younger than for older migrants.[13/] Between schooling groups, those with seven or more years were less likely to be initially unemployed and more likely to begin working right away in a modern sector job, primarily as office workers-teachers.

The type of employment of those who had not returned to Testour or gone abroad at the time of the survey is shown in Table 4.10. The proportion having modern sector occupations increased for all age-education groups with the smallest percentage of modern sector occupations among young men with one to six years of school. In all three schooling categories, fewer young than older migrants had modern sector jobs. Among the young migrants, those with one to six years of primary school apparently had more difficulty finding modern sector jobs than did those with

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13/There were not enough migrants in the sample age 40 and over to see if unemployment rates increase in the older age groups as in the INS data discussed previously.

Table 4.9. Initial employment of Testour migrants by age and education[a/] n=91

	No formal schooling		1-6 years		7 years	
age:	15-24	≥25	15-24	≥25	15-24	≥25
	%	%	%	%	%	%
Traditional sector	70.0	48.4	80.0	50.0	29.2	0.0
unemployed	60.0	22.6	53.3	25.0	29.2	0.0
other traditional	0.0	12.9	26.7	25.0	0.0	0.0
agriculture	10.0	12.9	0.0	0.0	0.0	0.0
Modern sector	30.0	51.6	20.0	50.0	70.8	100.0
construction	20.0	29.0	0.0	0.0	8.3	0.0
office-workers, teachers	0.0	0.0	0.0	12.5	45.8	66.7
other modern	10.0	22.6	20.0	37.5	16.7	33.3
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0
(number of observations)	(10)	(31)	(15)	(8)	(24)	(3)

[a/] Includes occupational training.

Table 4.10. Employment of Testour migrants at the time of the survey by age and education[a/]
n = 85

	No formal schooling		1-6 years		7 years	
age:	15-24	25 +	15-24	25 +	15-24	25 +
	%	%	%	%	%	%
Traditional sector	40.0	31.0	53.4	14.3	13.0	0.0
unemployed	10.0	0.0	6.7	0.0	8.7	0.0
other traditional	20.0	17.2	46.7	14.3	4.3	0.0
agriculture	10.0	13.8	0.0	0.0	0.0	0.0
Modern sector	60.0	68.9	46.7	85.7	86.9	100.0
construction	40.0	37.9	0.0	14.3	13.0	0.0
office-workers, teachers	0.0	0.0	0.0	14.3	39.1	100.0
other modern	20.0	31.0	46.7	57.1	34.8	0.0
TOTAL	100.0	99.9	100.1	100.0	99.9	100.0
(number of observations)	(10)	(29)	(15)	(7)	(23)	(1)

[a/]Includes occupational training.

no schooling and those with seven or more years, with the largest percentage of the group (47 percent) employed in occupations grouped as "other traditional."

Foreign Migration:

The migrants from Testour who went directly to foreign countries tended to be better educated than those who remained in Tunisia. Of the 27 migrants to foreign countries, 67 percent had some secondary schooling, vocational training, or a job skill, and 29 percent had primary schooling. Only one migrant had no schooling or skill.

Eleven of the migrants went to jobs arranged through the Employment Office, while the other 16 went outside of the organized programs. The kinds of jobs found by 22 of the migrants and the occupational distribution of all Tunisians sent in organized programs in 1971 are shown in Table 4.11. No particular significance should be attached to the differences between the two groups because of the small number of sample migrants and the fact that the official programs account for only part of total foreign migration, as noted previously. It is interesting, however, that a substantially larger percentage of sample foreign migrants worked in agriculture than did all foreign migrants and the migrants from Testour who remained in Tunisia.

Return Migration and Remittances:

The 6.3 percent of the migrants who had returned to Testour are a diverse group. Two of these were able to find office jobs

Table 4.11. Employment of Testour migrants abroad and all Tunisian emigrants in official programs (1971)

	% Testour Migrants Abroad	% Emigrants - Official Programs (1971)[a]
Agriculture	36	13
Construction	18	29
Industrial	27	18
Miscellaneous	18	40
Total	100	100

[a] Republique Tunisienne, Office de la Formation Professionnelle et de l'Emploi, Rapport annuel de l'émigration 1971, n.d., p. 28.

in Testour which they said they preferred to similar jobs they had had in the urban areas. Three others were masons who returned to live more or less permanently in Testour but still go to Tunis to work for short periods. Three returnees indicated they had been unable to find satisfactory urban jobs.

Although the rate of return so far is low, the period covered by the survey is relatively short. A common response was that the migrants intended to return to Testour either to retire or after accumulating enough money to buy land and livestock or set up a small business, but it is difficult to predict how many of these migrants will eventually return.

Some idea of the importance of return migration is seen in the census results. Thus, while 20,697 male migrants from the gouvernorat of Beja were enumerated in Tunis, the number moving from Tunis to Beja was only 1663, or eight percent of the flow to Tunis.[14/] Other evidence of low rates of return migration is the small number of other returnees encountered in the various stages of the survey in Testour who were not included in the sample.

Although few migrants returned permanently, there are others who alternate between Testour and other areas. One migrant in the sample goes to France each summer to work as an agricultural laborer and returns to work in Testour in the winter. Several others live in Tunis and return to Testour several times each year to help with soil preparation and harvest on the family farm.

14/ Recensement générale de la population, 3 mai 1966: Migration, p. 29.

There are other less direct kinds of ties maintained by the migrants. Those migrants with claims to land generally rented it out on a share or fixed-rent basis, or left it to a brother or other family member with the migrant receiving part of the production. Only one migrant sold his land when he moved. Similarly, nearly all of the migrants had wives and children (11 percent) or other close relatives (76 percent) who remained in Testour.

Remittances from migrants can serve as an important source of income and capital for the sending area.[15] A question was asked in the survey if the migrants sent money back to the household in Testour. Of those responding, 47 percent of the migrants sent money on a regular basis ranging from two to 20 dinars or more per month. It was apparent, however, that money sent constituted only part of the flow with substantial amounts brought back by visiting migrants in cash and consumption goods from the city. It was also apparent that in most cases the remittances were used to support family members left in Testour.[16] Thus, it would be difficult to estimate the total amount of remittances and that part that could be considered as investable capital.

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[15] See, for example, Caldwell, pp. 152-167.

[16] In some cases respondents indicated that remittances were intended as repayment of a loan used to finance the migration. Of those responding, 38 percent of the migrants financed their move with funds obtained from their father or other relatives, while 49 percent relied on their own sources. The remaining 13 percent had travel expenses paid by the Employment Office or obtained money from other sources.

CHAPTER V

URBAN AND RURAL INCOMES

This chapter is devoted to further consideration of those factors proposed in Chapter II as being determinants of migration, particularly as they relate to urban and rural incomes.

The Determinants of Urban Earnings

Part of the evaluation of the model consists of an analysis of the urban earnings of the migrants in the sample. One objective of this analysis is to see if those factors proposed as determinants of expected urban earnings do, in fact, account for earnings differences among those who had moved. A second objective is to determine if the time-path of urban earnings is consistent with Todaro's migration model.

The survey interviews attempted to establish the urban earnings of the sample migrants. This proved to be a limited success as evidenced by a particularly high rate of non-response to these questions (about 45 percent). The following analysis is based on the monthly earnings at the time of the survey of 75 migrants who had moved to Tunis and other areas of Tunisia for whom earnings data were obtained. At the time of the survey they had spent periods ranging from a month to six years in the destination areas.

The analysis of these earnings data is based on an human capital earnings function suggested by Mincer in which the log of

earnings is a function of previous investment in education and on-the-job training.[1] Two additional variables expected to influence the urban earnings of migrants are also included, length of time since migration and quality of urban labor market information.

The function to be estimated and the expected signs of the coefficients are:

$$(1)\quad \ln Y = \underset{}{B_o} + \underset{>o}{B_1 S} + \underset{>o}{B_2 E} + \underset{<o}{B_3 E^2} + \underset{>o}{B_4 SK} + \underset{>o}{B_5 T} + \underset{>o}{B_6 INF} + v$$

ln Y = the natural log of current earnings in dinars per month.[2]

S = years of schooling and formal occupational training.

E = experience, measured as the number of years of labor market participation. This is proposed by Mincer as a measure of overall on-the-job training.[3]

SK = a dummy variable equal to 1 if pre-migration job experience resulted in a specific occupational skill considered transferable to the urban economy and equal to 0 otherwise. The skilled migrants include masons, electricians, mechanics, and machinery operators. This variable is a measure of on-the-job learning in addition to the general experience measure above.

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[1] Jacob Mincer, "Schooling, Experience, and Earnings." Forthcoming publication, National Bureau of Economic Research, pp. 3-14.

[2] Four of the migrants were unemployed. To avoid the problem of taking the log of zero, .1 dinar was added to the earnings of all migrants.

[3] This is approximated by E = (Age-SS-15) where SS is the number of years of secondary and occupational schooling and 15 is the age at which men not then in school are assumed to begin accumulating work experience (15 is the age used by the Tunisian census to define potential labor market participants).

Using this expression assumes that post-primary schooling and occupational training begins at 15. Data on the age of primary school students suggests that this assumption is reasonable. In 1966-67 the average age of male 6th grade students in rural areas was 13.9 years. [République Tunisienne, Secrétariat d'Etat au Plan et a l'Economie Nationale, Statistique de l'enseignement: année scholaire 1966-1967, n.d., p. 73.]

T = time, measured in months since migrating from Testour.

INF = a dummy variable equal to 1 if the migrant had an urban job contact who helped him find a job and equal to 0 otherwise.

v = an error term.

The ordinary least-squares estimate of the earnings function is equation (1) in Table 5.1. The coefficients all have the expected sign and, with the exception of the information dummy, are significant at at least the 10 percent level.[4] The information variable is retained in the estimates in spite of its low t value because the coefficient of S decreases appreciably when INF is dropped from the equation (the simple correlation coefficient between the two is -.392).

The linear relation between ln Y and S in the function implies a constant proportional increase in earnings for each additional year of school.[5] To allow for a non-linear relation, the earnings function was also estimated with years of schooling divided into primary and postprimary by defining slope and intercept dummy variables for $S \geq 7$ [equation (2)].

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[4] The insignificance of the information coefficient will be considered again in the following chapter. A schooling-experience interaction variable added to the equation was not significant.

In this and the following chapter, one-tailed t tests are used when the estimated coefficients have the expected signs. In all the estimates there are sufficient degrees of freedom so that $t \geq 1.28$ is significant at the 10 percent level, $t \geq 1.65$ is significant at the five percent level and $t \geq 2.33$ is significant at the one percent level.

[5] S combines primary and secondary schooling with occupational training in the CFPA and other training programs. An equation was also estimated with years of regular schooling and of occupational training represented by separate variable. Using an F test, the hypothesis that the coefficients were the same could not be rejected at the 10 percent level.

Table 5.1. Estimated urban earnings functions. Dependent variable is the log of monthly earnings (t values in parentheses). n=75

(1) $\widehat{\ln Y} = .2889 + \underset{(3.07)}{.1619}S + \underset{(1.97)}{.1408}E - \underset{(1.49)}{.0027}E^2 + \underset{(1.75)}{.8285}SK + \underset{(0.94)}{.3185}INF + \underset{(2.53)}{.0195}T$

$\bar{R}^2 = .197$

(2) $\widehat{\ln Y} = .3438 - \underset{(1.14)}{1.7275}D + \underset{(1.56)}{.1271}S + \underset{(1.23)}{.1990}DS + \underset{(2.09)}{.1512}E - \underset{(1.63)}{.0030}E^2 + \underset{(1.59)}{.7624}SK + \underset{(0.83)}{.2950}INF + \underset{(2.38)}{.0187}T$

$D = 1$ if $S \geq 7$

$= 0$ otherwise

$\bar{R}^2 = .191$

The coefficient of S in (2) is positive and significant at the 10 percent level indicating that additional years of primary school increased earnings in the sample. The coefficients of D and DS are not significant at the 10 percent level indicating that the intercept and the coefficient of schooling are the same for S = 1-6 and S ≥ 7. Comparing equations (1) and (2) using an F test, the hypothesis of linearity between ln Y and S could not be rejected at the 10 percent level.

The positive and negative coefficients of E and E^2 respectively indicate a parabolic relationship between experience and urban earnings. The maximum effect of experience is reached at E = 26 years, or at age 41 for a migrant with no post-primary schooling. The initial positive effect of experience on urban earnings supports the hypothesized parabolic relationship between age and the probability of migration when rural income and other factors are held constant, as discussed in Chapter II.

The significant positive coefficient of the time variable indicates that migrants' earnings increase with the length of time since migrating from Testour. This finding is consistent with Todaro's model in which the level of expected urban income rises over time as the probability of having a modern sector job increases.[6/]

[6/] The coefficient of T indicates that earnings increase considerably over time; 1.95 percent per month. However, because of the relatively short period covered by the data, it is not possible to determine what the time-path of earnings would be over a longer period, precluding the use of the estimate to establish working-life urban earnings profiles for different levels of schooling and experience.

The positive effect of schooling and skills on urban earnings supports the inclusion of these variables in the probability function as determinants of expected urban earnings and, therefore, of the probability of migration.

Measuring Rural Income:

Arriving at measures of rural income for the individual potential migrants in the sample poses several problems. The original intent of this study was to obtain farm income data and use a single income measure for each individual that combined farm income with cash income from wages and non-farm self-employment. For this purpose a short farm management type questionnaire was included in the interview schedule for households that operated farms. As described in Appendix A, the results of that section were judged too incomplete in a substantial number of cases to provide valid estimates of farm incomes.

As an alternative, rural income was divided into two components. The first measures cash income from wages and non-farm self-employment in dinars per year.[7/] The second is a proxy measure of the individual's share of income from the household's operated farm represented by the number of hectares of operated farm land per active man in the household.[8/]

[7/] Wages received in kind were converted to cash equivalents using survey responses.

[8/] The only land quality difference that is considered is that between irrigated and unirrigated. In calculating the hectares per man measure, irrigated land was weighted by the factor 5 to account for its greater productivity. This factor is based on

-continued on p. 95-

For a given individual, rural income may be from both the household farm and from cash earnings, or it may be from only one or the other source. In those cases where the individual was completely unemployed during the year, measured income is zero.

It is important to consider what the hectares per man measure of farm income implies about the nature of the migration decision. Knight outlines several combinations of family situations and cultural practices which can give rise to different supply curves of family farm labor; i.e., the price at which labor is offered to alternative uses in the urban economy.9/ The supply price depends on the size and type of farm and the number of family workers, and also on the decision unit for which income is maximized. For example, if family income is maximized and shared equally among the members, the supply price for a migrant would equal his contribution to farm production. Alternatively, as in this study, it can be assumed that the appropriate decision unit is the individual and that "... a migrant is concerned simply to maximize his own income, (so) his supply price is equal to the share of income he would receive if he stayed on the farm, irrespective of his contribution to production."10/

8/(continued from p. 94) relative production norms for irrigated and unirrigated land in Testour used in Tunisian regional development plans. See, République Tunisienne, Secrétariat d'Etat au Plan et aux Finances, Unités régionales de développement du gouvernorat de Beja, Deuxième Partie, Tome II (Juin, 1963), pp. 15-17.

9/Knight, pp. 204-206.

10/Ibid., p. 205.

Using hectares per man as a proxy measure of the share of farm income foregone assumes that farm income is shared equally among the men in the household, and that a migrant loses his share when he leaves. It is difficult to assess the validity of these assumptions. The division of farm income and the assignment of rights to income shares appear to differ from one household to another; there is apparently no unique set of cultural practices.

A second problem in measuring rural income concerns the comparability of incomes between migrants and non-migrants. The migration model hypothesizes that rural incomes are lower for migrants than for non-migrants when other factors are held constant. Testing this hypothesis is complicated by the fact that the migrants left at various times during the period 1966-1972. The incomes of migrants who were economically active before leaving Testour are based on the year prior to migration, while the incomes of the non-migrants refer to the year preceding the survey, 1971-1972. If general levels of rural income were higher in 1971-1972 than in previous years, any difference that existed between the two groups at the time the earlier migrants left would be exaggerated. This would result in an overestimate of the negative effect of higher rural incomes on the probability of migration.

There is no problem with the hectares per man measure of farm income. The relative incomes from a five and a 10 hectare farm, for example, can safely be assumed to be the same from year to year

even though each may differ between years because of variation in yields.[11]

This is not the case for cash income as the earnings of non-migrants in some occupations were considerably higher in 1971-1972 than in previous years because of recent wage increases. Basing the earnings of the migrants on the lower wage rates, and those of the non-migrants on the higher, would overestimate what the non-migrants' earnings had been when the migrants left. To account for these changes the cash earnings of each migrant were adjusted to 1971-1972 wage levels when it was known what wage changes had occurred for his occupation since he left. Thus, the farm labor earnings of migrants who left before the 71 percent increase in the minimum agricultural wage were increased by that same proportion irrespective of whether or not they had received the minimum wage that prevailed at that time.[12]

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[11] In Chapter III it was suggested that some of the migrants who had been farmers may have moved because of the disruptions caused by changes in co-op policy. While that may be the case, there is no evidence that the migrants were more adversely affected than were the non-migrants. Thus, it is assumed that any farm income differences between the two groups at that time were due to farm size.

[12] The minimum wage was increased in 1969 and again in 1971. Farm labor earnings of migrants who left between the two increases were adjusted accordingly.

As noted in Chapter III the legal minimum is paid co-op laborers and employees of the largest private farms. Limited survey information indicates that the wages of other farm laborers, while less than the minimum, also increased during the period, but it is impossible to determine the size of that change. Increasing the earnings of all migrants by the full change in the minimum wage is justified by the fact that, if anything, it overestimates their incomes relative to the non-migrants.

Similarly, the earnings of three migrants who had worked on the LCSD program were increased by 25 percent to account for a wage change in 1967.

Fifteen migrants had miscellaneous non-farm occupations before leaving. It was not known what wage changes, if any, had occurred in these occupations. The earnings of these migrants were not adjusted.[13/]

A third problem in measuring rural incomes was caused by missing income information for some of the migrants in the sample. This problem arose in two forms.

For 13 of the migrants who had been active before leaving, no cash earnings data were obtained, although their former occupations were known. Ten of these were assigned the incomes of non-migrants with similar occupations.[14/] Three migrants were dropped from the sample as no close matching of occupations with non-migrants could be made.[15/] Four others who were dismissed from their jobs as co-op laborers shortly before leaving were assigned

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13/Only two of these migrants left more than three years before the survey. Thus, for most of these cases it can be assumed that only minor wage changes had occurred since they left.

14/Five migrants were assigned the average earnings of privately employed farm laborers, and two were assigned the average earnings of LCSD workers. One migrant who had worked as a bakery laborer was assigned the income of a non-migrant with that same occupation, and similarly for a bookkeeper on a co-op and an agricultural agent.

15/Assignment of missing incomes was not done for the larger sample of non-migrants from which 23 observations were dropped.

the average earnings of privately employed farm laborers as what their earnings alternatives would have been had they remained in Testour.

The second form of missing income information concerns the 48 migrants who were not active labor market participants before migrating. These were nearly all school-leavers who migrated without ever working or looking for work in Testour. In this case the appropriate measure of income foregone is what their incomes would have been had they remained to work in Testour. Arriving at these estimates required evaluation of each individual's rural income opportunities.

For the 25 migrants in this group whose households did not have farms it was assumed that they could have earned the same cash income as did non-migrants with similar levels of schooling, experience, and skills. To assess the effects of these factors on rural incomes, an earnings function was estimated for the 111 non-migrants without farms. This is equation (1) in Table 5.2 where the dependent variable is the log of average monthly cash earnings for the year 1971-1972, and the independent variables are similar to the previous earnings function.16/

The coefficients are of the expected signs, but that of the skills dummy is significant at only the 12 percent level. The intercept is substantially lower than in the urban function because of the lower overall level of rural earnings ($\bar{Y}$ = 17.2 TD/month in the rural sample and 26.6 TD/month in the urban sample).

16/The sample includes those who reported no incomes, so .1 dinar was added to all observations. Skills are defined more broadly here to include skills not considered transferable to the urban economy (e.g., tree pruners, rural artisans).

Table 5.2. Estimated rural earnings functions. Dependent variable is the log of average monthly cash earnings for 1971-1972 (t values in parentheses).

Without farm: n=111

(1) $\widehat{\ln Y} = -.7284 + \underset{(2.62)}{.1481}S + \underset{(6.04)}{.2028}E - \underset{(-5.00)}{.0030}E^2 + \underset{(1.19)}{.5559}SK$ $\quad \bar{R}^2 = .278$

(2) $\widehat{\ln Y} = -.6038 - \underset{(5.15)}{6.2639}D_1 + \underset{(1.50)}{.1038}S + \underset{(5.82)}{1.6464}D_1S + \underset{(6.74)}{.2008}E - \underset{(-5.80)}{.0030}E^2 + \underset{(1.48)}{.6051}SK$ $\quad \bar{R}^2 = .452$

$D_1 = 1$ if $S \geq 7$
$= 0$ if $S < 7$

With farm: n=160

(3) $\widehat{\ln Y} = -2.5748 + \underset{(1.57)}{.1319}S + \underset{(3.28)}{.1443}E - \underset{(-3.12)}{.0024}E^2 - \underset{(-2.26)}{.0084}\,HAMAN$ $\quad \bar{R}^2 = .056$

(4) $\widehat{\ln Y} = -.6144 - \underset{(-5.31)}{2.7114}D_2 + \underset{(1.81)}{.1414}S + \underset{(4.05)}{.1658}E - \underset{(-3.88)}{.0028}E^2 - \underset{(-4.23)}{.5969}HAMAN + \underset{(4.19)}{.5912}\,D_2HAMAN$
$\bar{R}^2 = .193$

$D_2 = 1$ if HAMAN ≥ 5
0 if HAMAN < 5

Further evaluation of the effect of schooling on rural earnings was restricted by the low levels of schooling in the sample; 76 of the men had no schooling, and only 10 had seven or more years. In addition, examination of the data revealed that all five of those with 10 or more years of school had well-paid jobs as teachers and other government employees, and all five of those with seven to nine years of school were young school-leavers who reported zero incomes for the year. Thus, when the sample was divided into primary and post-primary groups with intercept and slope dummy variables for $S \geq 7$, the estimate resulted in unreasonably high returns to additional years of secondary schooling [equation (2)]. The coefficient of S in (2) is significant at the 10 percent level indicating a positive return to additional primary schooling in the sample. When equations (1) and (2) were compared using an F test, however, the hypothesis of linearity between ln Y and S was rejected at the one percent level.

Equation (2) was rejected as a basis for assigning missing income values for the migrants because of the peculiar nature of the sample. Using this estimate would have implied that all those with 10 or more years of school could have worked as government employees in Testour, while those with nine years or less would have been completely unemployed: both implications are clearly unreasonable. Assigning incomes on the basis of (1) was selected as a more plausible alternative incorporating, in effect, a probability of employment in Testour as a teacher, etc.. Thus, each of the 25 migrants without farms was assigned a rural cash income estimated from (1) for his level of schooling, experience, and skills.

For the 23 migrants whose households did operate farms, it was assumed that they could have obtained a share of the farm income had they remained in Testour. Accordingly, each was assigned the appropriate hectares per man farm income measure. It was also assumed that they could have earned an off-farm cash income equal to that of non-migrants with similar schooling, experience, and farm size. Thus, a second rural earnings function was estimated for the 160 non-migrants with farms. The dependent variable is the log of average monthly cash earnings for the year 1971-1972 (earnings from wages and non-farm self-employment). The earnings function is modified in this case by including hectares per man, HAMAN, as a measure of farm size to account for the allocation of an individual's time between farm and off-farm work.[17/]

Use of this earnings function assumes that individuals maximize their incomes by equating the marginal product of their labor used on the farm with earnings in off-farm rural alternatives.[18/] The off-farm wage rate is assumed to be determined by schooling

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17/The skills dummy is not included in this function. Skills, or their absence, were based on the indicated occupation; e.g., tree pruners were considered skilled. Presumably, some of those whose only occupations were as farmers may also have such skills that would increase potential off-farm earnings, but this was not determined by the survey.

18/Models of farm and off-farm labor allocation are developed in Robert M. Mabro, "Employment and Wages in Dual Agriculture," Oxford Economic Papers, Vol. 23, No. 3 (November, 1971), pp. 401-417; and Paul Pozlin and Peter MacDonald, "Off-farm Work: A Marginal Analysis," QJE, Vol. 85 (August, 1971), pp. 540-545.

and experience, and the marginal product of labor used on the farm is assumed to be an increasing function of the number of hectares per man. Hence, with S and E held constant, the amount of off-farm work and, therefore, earnings are expected to be inversely related to farm size.

Estimating this function is complicated by the small proportion of observations with cash earnings and the low levels of schooling in the sample.[19] In equation (3) in Table 5.2 the estimated coefficients have the expected signs and are significant at at least the 10 percent level.[20] However, the $\bar{R}^2$ is low and the small constant term results in predicted earnings near zero for all except those with substantial schooling and experience, while the small coefficient of HAMAN means that farm size has little effect on predicted earnings.[21]

The fit was improved considerably by using slope and intercept dummies to allow non-linear relationships between ln Y and HAMAN. The highest $\bar{R}^2$ and t values were obtained in equation (4) where farm size is divided into two categories at five hectares per man (about the median in the sample). Both the intercept and slope dummies are significant at the one percent level and indicate

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[19] Only 48 of the 160 non-migrants in this group had cash incomes including just one with any secondary schooling.

[20] Non-linear relationships between ln Y and S were not tried due to the small number of observations with secondary school in this sample.

[21] Using an alternative measure of labor per hectare that counted women in the household as one-half a man did not change the results.

markedly different effects of farm size on earnings for small and for large farms.[22] The coefficients and t values of the other variables also increased somewhat, and the $\bar{R}^2$ was substantially larger when equation (3) was used rather than (2).[23] In addition, predicted earnings were closer to those in the sample ($\bar{Y}$ = 2.9 TD/mo.). Equation (3) was used to assign cash incomes for the 23 migrants with farms.

Rural-Urban Earnings Differences :

Comparison of the estimated rural and urban earnings functions gives some idea of the relative returns to schooling and experience in the two labor markets. This can be illustrated by considering the rural-urban nominal earnings differential implied by the urban function and the rural function for those with no farms shown below [equations (1) in Tables 5.1 and 5.2].

$$\ln\hat{Y}_u - \ln\hat{Y}_R = 1.0713 + .0138\ S - .0620\ E + .0003\ E^2 + .2726\ SK + .3185\ INF + .0195\ T$$

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[22] $\partial \ln Y/\partial HAMAN = -.5969$ for less than five hectares and $-.0057$ for five hectares and above. The small partial derivative and the substantially smaller intercept indicate near zero earnings and little effect of changes in farm size for the large farms. This is consistent with a marginal product of labor used on the farm that is above what could be earned in off-farm work even when all of the individual's labor is used on the family farm. For the smaller farms the larger intercept and partial derivative indicate both more off-farm work and a larger effect of changes in farm size.

[23] The coefficients of E and E^2 indicate a smaller effect of experience on earnings and a maximum at a younger age than for those without farms; maximum at E = 30 compared with E = 34 for those without farms. There is no apparent reason for this difference. Experience-schooling interaction terms added to the two rural functions were not significant.

Thus, for an individual with no schooling, experience, skills, or job contact, the estimates indicate an initial nominal earnings gain (T = 0) of 2.9 dinars per month. This initial gain is increased by additional years of schooling (by 17 percent for S = 12) because of the larger coefficient of schooling in the urban earnings function. Conversely, it is decreased by experience (by 59 percent for E = 10), when other factors are held constant.

However, there are several reasons why these implicit earnings differences may be misleading as a measure of the earnings gain obtainable by migration. First, the estimates indicate that earnings increase considerably with the length of time since migration, but do not allow evaluation of the effect of time over a period longer than that covered by the survey. Second, the urban function was estimated for only part of the migrants who remained in Tunisia, and none of those who worked in what are certainly better paid jobs abroad. Third, the rural earnings functions were estimated for non-migrants only while the urban function was based on the urban earnings of those who had migrated. This may impart a selectivity bias resulting in an over- or underestimate in the rural function of what the migrants could earn in Testour, and similarly for the potential urban earnings of the non-migrants in the sample.[24/]

[24/] The effect of additional schooling on the implicit earnings gain, for instance, is probably underestimated for the migrants. As already noted, the return to schooling in the rural earnings function is largely the result of a relatively few well-paid government employees. To the extent that such jobs are limited, the prospective rural earnings of a school-leaver contemplating staying in Testour may be considerably less than those implied by the rural earnings estimates.

Nonetheless, the estimates provide some evidence that the largest relative nominal earnings gains are for those population groups hypothesized to be the most likely to migrate — the best educated, the young, and skilled laborers.[25/]

[25/] Since $\ln Y_u - \ln Y_R = \ln (Y_u/Y_R)$, it is the relative rather than the absolute earnings differential that is expressed above.

CHAPTER VI

ESTIMATING THE PROBABILITY OF MIGRATION

The probability of migration relationship to be estimated consists then of a binary dependent variable, either a migrant or not, as a function of a set of continuous and binary independent variables that are hypothesized to be determinants of migration. The sample consists of 412 observations, 141 migrants and 271 non-migrants. The function and the hypothesized signs of the coefficients are:

$$P = f(S, SK, INF, AGE, AGE^2, MAR, HAMAN, Y_C)$$
$$\quad\ >0\ >0\ \ >0\ \ >0\ \ <0\ \ \gtrless 0\ \ <0\ \ <0$$

S = Years of schooling and formal occupational training.

SK = A dummy variable equal 1 for those with job-learned transferable occupational skills and equal 0 otherwise.

INF = A dummy variable equal 1 for those who knew someone who could help in obtaining an urban job and equal 0 otherwise.[1/]

AGE = Age at the time of the survey for non-migrants and at the time of migration for migrants.

MAR = A dummy variable equal 1 for those who were married and equal 0 otherwise (at migration for the migrants). No hypothesis is made about the sign of this coefficient.

[1/] The questions concerning job contacts differed somewhat between the migrants and the non-migrants. In the case of a migrant the respondent was asked if he had known someone who had helped him get a job in the destination area. For non-migrants, the respondent was asked if he knew someone in Tunis who he thought could help him find a job. If there was more than one non-migrant in the household, the response was assumed to apply to him as well as the respondent.

HAMAN = The number of hectares per active man farmed by the individual's household; a proxy measure of farm income.

Y_C = Annual cash income in dinars from wages and non-farm self-employment.

Two methods of estimating the probability function are considered, a linear probability function and probit analysis. Although the linear probability function has been widely used in situations with dichotomous dependent variables, including migration studies, several objections to it have been raised in the literature.[2/] Probit analysis is an alternative procedure that has been suggested.

Linear Probability Function:

The linear probability function expresses the probability of migration as a linear function of the independent variables.

$$P_i = \beta_o + \beta_1 X_{i1} + \ldots + \beta_R X_{ik} + \epsilon_i$$

where

P_i = 1 if a migrant; 0 if not a migrant.

$X_1, \ldots, X_k$ = the independent variables.

ϵ_i = a disturbance term.

Estimates of $\beta_o, \ldots, \beta_k$ are obtained by ordinary least-squares (OLS) regression and $\hat{P}$ is interpreted as the conditional probability

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[2/] Applications of linear probability functions in migration studies include Speare; John B. Lansing and Eva Mueller, The Geographic Mobility of Labor (Ann Arbor: University of Michigan, Survey Research Center, 1967); and Donald Alan West, "Migration Among Low-Income People," (Unpublished Ph.D. dissertation, University of Wisconsin, 1970).

of migration for an individual with a given set of values for the variables $X_1, \ldots, X_k$.

One objection to the linear probability model is that it can yield predicted probabilities outside of the acceptable zero-one interval. A second is that the true probability relationship is more likely S-shaped than linear, approaching the limiting probability values of zero and one asymptotically. A hypothetical comparison of an OLS regression line and the true S-shaped function is shown in Figure 6.1.

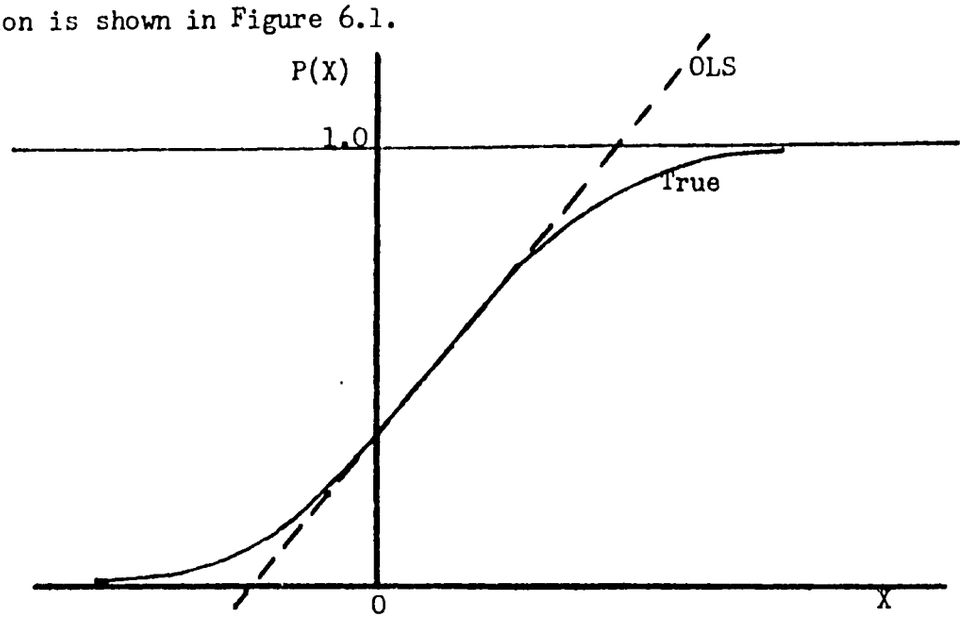

Figure 6.1. Linear and "true" probability functions

The figure shows that the OLS regression line can be at best a good approximation of the true function in the middle, and departs increasingly from the true function as P approaches zero and one. Furthermore, Nerlove and Press illustrate that the OLS estimate of the true function can be severely affected when the observations are bunched at P=0 or P=1 for small and large values of X,

respectively.[3] Thus, the location and slopes of the OLS estimates may be sensitive to the distribution of the sample observations. In the sample of potential migrants, 291 are non-migrants (P=0) and only 141 are migrants (P=1), suggesting that bunching of observations may affect the subsequent OLS estimates of the probability function.

A serious problem arises relating to the properties of the OLS estimators when the dependent variable is a dummy. Kmenta and others have shown that restricting P_i to 0 and 1 means that the error term ϵ_i is not normally distributed under the OLS assumption that $E(\epsilon_i)=0$. Thus, var (ϵ_i) is shown to be dependent on $X_{i1}, \ldots, X_{ik}$ and the assumption of homoskedasticity is violated.[4] The heteroskedastic errors imply that OLS estimates of the β's are linear and unbiased but not efficient; i.e., do not have the minimum variance of the class of linear unbiased estimators.[5]

A further result of the nature of the ϵ_i is that the OLS estimators, $\hat{\beta}$, are not normally distributed and var $(\hat{\beta})$ is

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[3]Marc Nerlove and S. James Press, Univariate and Multivariate Log-linear and Logistic Models, R-1306-EDA/NIH (Santa Monica, The Rand Corporation, December 1973), pp. 8-9.

[4]Jan Kmenta, Elements of Econometrics (New York: The MacMillan Company, 1971), p. 426.

[5]Nerlove and Press note a generalized least-squares solution to the heteroskedasticity problem suggested by Goldberger. They conclude, however, that the method suffers from problems created by the unbounded predictors and bunching of observations discussed above. [Nerlove and Press, p. 7.]

biased. Thus, the usual t tests of significance do not apply. In the case of "large" samples, tests of significance can be constructed using the asymptotic estimators of β and var (β).[6] The problem of the inefficiency of $\hat{\beta}$ remains, however, as the OLS estimators are not asymptotically efficient under heteroskedastic errors.

Probit Analysis:

In light of the statistical weaknesses of the linear probability function, probit analysis has been proposed as a preferable technique for estimating relationships with dichotomous dependent variables. Probit was developed primarily for application in bioassay research and is now being used in other disciplines including economics.[7]

Probit analysis considers decisions in binary choice as being made on the basis of a threshold level of stimulus perceived by the individual decision maker, in this case a potential migrant. Representing the stimulus as an index, I, the response of the i^{th} individual is:

$$M_i = \begin{matrix} 1 \text{ if } I_i \geq I_i^* \\ 0 \text{ if } I_i < I_i^* \end{matrix}$$

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[6] Kmenta, p. 427.

[7] See D. J. Finney, Probit Analysis, 3rd edition (Cambridge: Cambridge University Press, 1971). Two recent applications of probit are Lowell Hill and Paul Kau, "Applications of Multivariate Probit to a Threshold Model of Grain Dryer Purchasing Decisions," American Journal of Agricultural Economics, Vol. 55, No. 1 (February, 1973), pp. 19-27; and Reuben Gronau, "The Effect of Children on the Housewife's Value of Time," Journal of Political Economy, Vol. 81, Part II (March/April, 1973), pp. S168-S200.

Thus, the individual will migrate if the stimulus index is greater than or equal to his threshold level, I_i^*, and will not migrate if the stimulus is less than the threshold. The index I is determined as a linear function of explanatory variables, or

$$I = \delta_0 + \delta_1 X_1 + \ldots + \delta_k X_k$$

In this case the explanatory variables are those proposed as the determinants of migration. I* is assumed to be distributed N(0,1), and plays the role of the disturbance term in the probit model.[8/]

The conditional probability of migration for a given level of I is determined as:

$$\text{Prob}\,(M=1|I) = \text{Prob}\,(I^* \leq I|I) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{I=\delta_0+\delta_1 X_1+ \ldots +\delta_k X_k} \exp \frac{-u^2}{2}\, du$$

Hence, probit uses a normal distribution to transform the probability such that I, the probit, can range from $-\infty$ to $+\infty$, but the probability is restricted to the range 0 to 1.

Graphically, the probability of migration is seen as the level on a normal sigmoid curve that corresponds to a given value of I, as in Figure 6.2.

It is apparent that this form of probability function more closely approximates the likely true function than does the straight line of the linear probability function.

[8/] Arthur S. Goldberger, Econometric Theory (New York: John S. Wiley and Sons, Inc., 1964), p. 250.

Other means and variances can also be used. See Finney, pp. 23-24. N(0,1) is the distribution in the computer program used in this study.

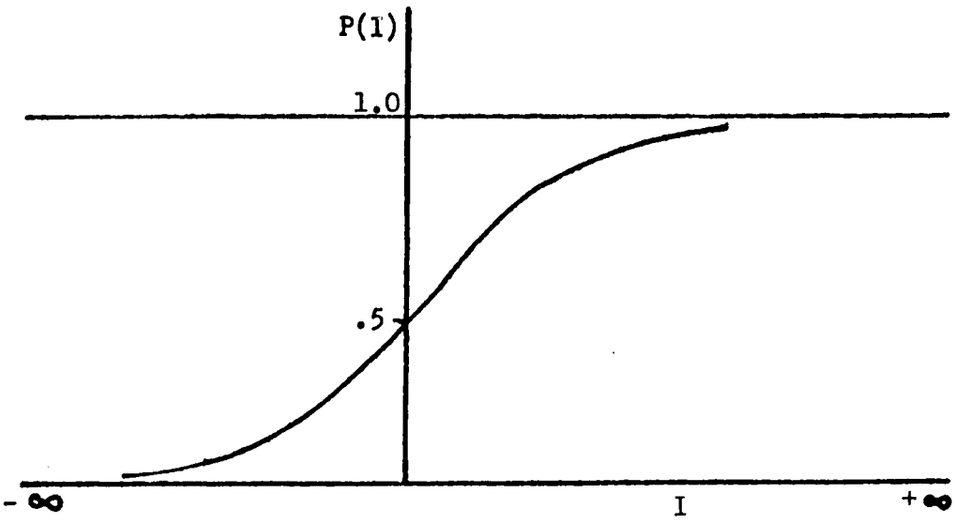

Figure 6.2. Probit transformation

The use of the probit transformation requires the important assumption that the threshold levels, I*, are normally distributed among the sample as a result of random differences in factors not included as explanatory variables. In other words, it is assumed that interpersonal differences not measured result in different responses to the same level of measured stimulus. Theil says that when there are many such independent factors acting on the threshold levels, the central limit theorem can be used to justify using a normal distribution for the I* in the sample.[10/] In the case of the decision to migrate, it is clear that many other factors may be considered in addition to those used here as explanatory variables.

The statistical method of probit uses observed values of the variables $X_1, \ldots, X_k$ and M to obtain maximum likelihood estimates

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[10/] Henri Theil, Principles of Econometrics (New York: John Wiley and Sons, Inc., 1971), p. 630.

of the parameters $\delta_0 \ldots \delta_k$. These estimates are asymptotically consistent, efficient, and normally distributed.[11] The t test is then a valid test of the significance of the estimated coefficients. These desirable properties, the shape of the estimated curve, and the fact that the resultant probability estimates are bounded by zero and one indicate the advantages of probit analysis over the linear probability functions.

Probit and OLS Estimates of the Probability Function:

The results of probit and OLS estimates of the probability function are presented in Table 6.1. In addition to the estimated coefficients and t values for both methods, the $\bar{R}^2$ and F statistics are reported for the OLS, and the -2 log likelihood ratio test statistic for the probit. This ratio has an χ^2 distribution for large samples and is used to test the hypothesis

$$H_0: \quad \delta_1 = \delta_2 = \ldots = \delta_k = 0$$

Direct comparison of the size of the coefficients for the two methods is not meaningful as the OLS coefficients are marginal probabilities while the probit coefficients are in terms of I. The probit estimate is converted to a probability by calculating $\bar{I}$ for a given set of the explanatory variables and the corresponding

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[11] Kmenta, pp. 181-182. The maximum likelihood technique is based on the assumption that the observations are independent. OLS also requires independence. The role of urban contacts suggests that in the case of migration this assumption may not be justified as the migration of a particular individual might be influenced by previous moves of others in his household who could help the new migrant find a job and housing.

Table 6.1. Probit and linear probability function estimates (t values in parentheses)
n = 412

	Constant	S	SK	AGE	AGE^2	INF	HAMAN	Y_c	MAR
(1a) Probit	-3.2705	.1259 (4.76)	.8752 (2.75)	.2084 (3.32)	-.0033 (-3.72)	1.0324 (5.83)	-.0771 (-3.84)	-.0027 (-3.69)	-.4040 (-1.49)
	-2 log likelihood ratio test statistic = 213.12 8 d.f.								
(1b) OLS	.0976	.0366 (5.58)	.2639 (3.32)	.0149 (1.50)	-.0002 (-2.19)	.3137 (7.36)	-.0026 (-4.01)	-.0004 (-2.98)	-.1232 (-1.80)
	$\bar{R}^2$ = .364 F(8, 403) = 34.60								
(2a) Probit	-2.7510	.1311 (5.01)	.8009 (2.56)	.1718 (2.99)	-.0029 (-3.46)	1.0313 (5.86)	-.0796 (-3.92)	-.0027 (-3.69)	
	-2 log likelihood ratio test statistic = 210.09 7 d.f.								
(2b) OLS	.2444	.0384 (5.92)	.2478 (3.12)	.0044 (0.55)	-.0001 (-1.48)	.3165 (7.40)	-.0025 (-3.83)	-.0004 (-3.05)	
	$\bar{R}^2$ = .362 F(7, 404)								

-continued-

Table 6.1. (continued)

	Constant	S	SK	AGE	AGE^2	INF	Y_R
(3a)	Probit						
	-2.7036	.1298	.7827	.1691	-.0029	1.0308	-.0026
		(5.14)	(2.62)	(3.08)	(-3.57)	(5.88)	(-4.74)
		-2 log likelihood ratio test statistic = 209.98 6 d.f.					
(3b)	OLS						
	.3333	.0342	.2066	-.0009	-.0001	.3181	-.00008
		(5.44)	(2.65)	(-0.11)	(-0.92)	(7.39)	(-3.83)
			$\bar{R}^2$ = .356		F(6,405) = 38.66		
(4a)	Probit; two stage						
	-2.2231	.1229	.7085	.1301	-.0023	1.0289	-.0019
		(5.03)	(2.41)	(2.53)	(-3.09)	(6.00)	(-3.20)
		-2 log likelihood ratio test statistic = 192.96 6 d.f.					
(4b)	TSLS						
	.3453	.0337	.2078	-.0016	-.0001	.3171	-.00007
		(5.35)	(2.66)	(-0.20)	(-0.84)	(7.37)	(-3.36)
			$\bar{R}^2$ = .354		F(6,405) = 38.62		

-continued-

Table 6.1. (continued)

	Constant	D1(S=1-6)	D2(S=7-9)	D3(S≥10)	SK	AGE	AGE^2	INF	Y_R
(5a) Two-stage Probit									
	-1.8530	.2391	1.0308	1.5462	.7595	.1104	-.0021	1.0922	-.0018
		(1.14)	(3.46)	(4.99)	(2.57)	(2.15)	(-2.80)	(6.30)	(-3.06)
		-2 log likelihood ratio test statistic = 199.91 8 d.f.							
(5b) TSLS									
	.4359	.0295	.2679	.4562	.2191	-.0051	-.00004	.3301	-.00008
		(0.55)	(3.42)	(5.88)	(2.83)	(-0.65)	(-0.47)	(7.72)	(-3.52)
		$\bar{R}^2$ = .367			F(8,403) = 30.78				

$\hat{P}$ is obtained through published probit-probability tables. Marginal probabilities giving the change in P for a unit change in an explanatory variable can be obtained by evaluating the partial derivatives of the estimated probit equation.

$$\frac{\partial P}{\partial X_j} = \left[\frac{1}{\sqrt{2\pi}} \exp \frac{-(I=\delta_0 + \delta_1 X_1 + \ldots + \delta_k X_k)^2}{2} \right] \frac{\partial I}{\partial X_j}$$

Thus, because of the non-linear relationship between P and the explanatory variables in probit, the derivatives are also non-linear. The effect of a unit change in an explanatory variable is then a function of the level of that variable and of the other explanatory variables. $\frac{\partial P}{\partial X_j}$ is largest at I=0 (when P=.50) and approaches zero as the absolute value of I approaches ∞ (when P approaches 0 or 1), as in the S-shaped curve of Figure 6.2.

In equations (1a) and (1b) the coefficients of S, SK, INF, HAMAN, and Y_c have the expected signs and are significant at the one percent level in both estimates. The coefficients of AGE and AGE^2 indicate the expected parabolic relationship between age and the probability of migration. They are both significant at the one percent level in the probit and at the 10 percent level in the OLS.

Both coefficients of MAR are negative. Using two-tailed t tests because no hypothesis was made about the sign of this coefficient, the OLS estimate is significant at the 10 percent level, but the probit estimate is not. Being married does not appear to have a significant influence on the probability of migration when other

factors are held constant.[13] This variable was dropped from subsequent estimates to reduce the possibility of simultaneous equations bias as discussed in Chapter II.

Equations (2a) and (2b) were estimated without the marriage dummy. Omitting MAR increased the intercepts in both estimates and changed the t values and coefficients of some of the other variables, particularly AGE and AGE^2.

The significant coefficients of HAMAN and Y_c in the estimates indicate negative relationships between rural cash income and the hectares per man proxy measure of farm income, when other factors are held constant. In subsequent estimates HAMAN and Y_c were combined as a single rural income variable, Y_R, measuring both farm and non-farm cash income.

HAMAN for each individual was converted to a cash value using an estimate of the annual average return per hectare in 1971 to a farm family's labor and capital (except land) for

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[13] To assess the possibility of different effects of marriage in different age groups, a χ^2 test was made of the relationship between migration and marriage for those less than 30 years old. The hypothesis of independence between the two events could not be rejected at the 10 percent level. A similar test for older men was precluded by an insufficient number of observations.

Two opposite effects of being married were originally proposed; a higher probability of migration because of an increase in unearned income and family allowances on one hand, and a lower probability because of greater costs of migration on the other. The offsetting nature of these two possible effects precludes any definite conclusions about them individually. However, the lack of significant relationships in the probability estimates and the χ^2 test suggest that any attraction that urban public services and family allowances might have on married potential migrants may be offset by their higher costs of migration.

unmechanized dry-land wheat in Testour.[14] This estimate of average return is admittedly imprecise and does not allow for differences in type of operation, but lacking an alternative it is the best means of obtaining an overall monetary income measure.

Equations (3a) and (3b) are similar to (2a) and (2b) except that Y_c and HAMAN are replaced by Y_R. The coefficients of Y_R in the two estimates are negative and significant at the one percent level.[15]

Simultaneous Estimation:

In Chapter V it was shown that Y_R, which appears as an

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[14] The derivation and empirical basis of this estimate (30.9 TD per hectare) are described in Appendix B. An implicit rent based on prevailing rental rates is deducted for those who own the land that they farm on the assumption that a migrant could rent his land when he leaves so that the return to owned land would not be a part of farm income foregone by migration.

As discussed in the appendix, the 30.9 TD estimate may overstate the average return per hectare because it does not allow for the cropping rotation practices of farmers in Testour. To evaluate the sensitivity of the results to the size of the return used to convert HAMAN to a cash value, the probability function was also estimated using a much smaller return of 13.2 TD per hectare per year as a probable lower bound. Using this smaller value increased the size of the coefficients in the probability estimates but did not appreciably change their levels of significance. The results using the 30.9 TD return are reported because it is considered to be a better approximation of farm income per hectare, and because the probability estimates were judged to be generally superior to the results obtained using the 13.2 TD value.

[15] The partial derivative of (3a) with respect to Y_R is -.00095 with the explanatory variables at their means. This is very similar to the partial derivative of (2a) with respect to Y_c (-.00010), indicating approximately the same effect of an additional dinar of annual income.

However, in the OLS estimates the derivative of Y_R in (3b) is -.00008 compared to the derivative of Y_c in (2b) of -.0004. Thus, not only do the two estimates differ, but they are both considerably smaller than the probit estimates. This is considered again below.

explanatory variable in the probability function, is endogenous being a function of schooling, skills, experience, and farm size. Expressed linearly the two equations are

$$\text{(i)} \quad P = a_0+a_1S+a_2SK+a_3AGE+a_4AGE^2+a_5INF+a_6Y_R+u_1$$

$$\text{(ii)} \quad Y_R = b_0+b_1S+b_2SK+b_3AGE+b_4AGE^2+b_5HAMAN+u_2$$ [16]

The variables S, SK, AGE, AGE^2, INF, and HAMAN are assumed to be exogenously determined, and u_1 and u_2 represent random disturbances.

If the error terms of the two equations are correlated, a single equation estimate of (i) will not produce consistent estimates of the parameters. Single equation estimates of (ii) will be consistent if the error terms are correlated but will not be efficient.[17] There are a number of factors omitted from the two functions, such as wealth, ability, and attitudes towards risk, which it is plausible to assume may affect both P and Y_R. This is particularly true because the error term of (i) includes the stochastic component of the expected urban earnings function that is implicit in the probability function. Since the same omitted factors may affect both rural and urban earnings, there is good reason to suspect that the error terms are correlated, and that

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[16] In this form AGE represents the effect of experience on Y_R rather than E as was the case in Chapter V. The large majority of the men in the sample have no secondary schooling so that E=AGE-15 with the approximation of years of experience used in the earnings function estimates. Including AGE and E as separate exogenous variables in the system produced inferior results in the two-stage estimates discussed below.

Y_R is expressed as a linear function rather than log-linear so that it corresponds to the form of Y_R in the probability function.

[17] Kmenta, p. 585.

simultaneous equations estimation techniques are needed to get consistent estimates of the probability function parameters.

In the following sections, simultaneous equations estimates of the probability function are presented first as one method of obtaining unbiased estimates. Then the reduced form of the probability function is considered as an alternative. The reduced form is of particular interest because it can be estimated directly without bias and because it avoids some of the problems associated with measuring rural incomes.

Equation (4b) is a Two-Stage Least-Squares (TSLS) estimate of the linear probability function. Comparing this estimate with OLS equation (3b), there is relatively little difference for most of the coefficients. The largest changes are the reduction in size of the coefficient of Y_R, and the different coefficients of the two AGE terms which continue to vary erratically between equations.

Simultaneous estimation in terms of the probit model is complicated by the fact that the subject is not treated extensively in the literature.[18/] To attempt to evaluate the bias, a probit estimate analogous to TSLS was made by OLS regression of Y_R on the exogenous variables in the system and then using the predicted Y_R in a probit estimate of (i). Thus, as in TSLS the technique consists of purging Y_R of the disturbance term suspected of being

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[18/] See Nerlove and Press for a discussion of the problem in terms of jointly determined qualitative variables and estimation of logistic and log-linear models.

correlated with the disturbance in the probability function. This "Two-Stage Probit" (TSP) estimate is equation (4a).

Alternatively, estimates of the parameters of (i) can be obtained from the reduced form equations. Equation (ii) includes only one endogenous variable so that the structural equation is also the reduced form. The probability function is exactly identified and its reduced form is

(iii) $P=c_0+c_1S+c_2Sk+c_3AGE+c_4AGE^2+c_5INF+c_6HAMAN+u_3$

In terms of the coefficients of (i) and (ii), the reduced form coefficients are

$c_0 = a_0 + a_6b_0$

$c_1 = a_1 + a_6b_1$

$c_2 = a_2 + a_6b_2$

$c_3 = a_3 + a_6b_3$

$c_4 = a_4 + a_6b_4$

$c_5 = a_5$

$c_6 = a_6b_5$

In least-squares regression, consistent estimates of $a_0 \ldots a_6$ can be calculated from the OLS estimates of the two sets of reduced form coefficients, $c_0 \ldots c_6$ and $b_0 \ldots b_5$. These derived estimates are similar to TSLS estimates of the structural parameters.

Unfortunately, in probit the properties of the two-stage estimators and estimates derived from the reduced forms are not known, but if the two methods are applicable, they too should produce similar results.

Derived estimates of the coefficients of (i) calculated from

a probit estimate of the probability function reduced form, (iii), and an OLS estimate of (ii) are shown in column (3) of Table 6.2. Columns (1) and (2) are the probit and TSP estimates of the structural equation [equations (3a) and (4a)].

However, the probit estimates are in terms of I rather than P as in the structural and reduced form equations discussed above. Therefore, an appropriate comparison is in terms of the estimated and derived partial derivatives of the probability function. The derived derivatives are obtained by the same method as the derived coefficients. For example, $\frac{\partial P}{\partial Y_R} = \frac{\partial P}{\partial Y_R} \Big/ \frac{\partial Y_R}{\partial HAMAN}$, where the left-hand side is the derived derivative. The numerator of the right-hand side is the estimated partial derivative with respect to Y_R from the probit estimate of the reduced form, and the denominator is b_5 from the OLS estimate of (ii). This corresponds to $a_6 = c_6/b_5$ in terms of coefficients. The estimated and derived partial derivatives evaluated at the means of the explanatory variables are in columns (4) through (6).

Comparing coefficients, with one exception, the TSP and derived estimates are similar in size and smaller than those of the single equation probit. The exception is the coefficient of INF for which the reduced form and structural parameters are the same ($c_5 = a_5$).

In terms of the estimated partial derivatives, there are larger differences between the two sets of simultaneous equations estimates. Again, with the exception of INF, the TSP and derived partial derivatives are smaller than those of the single equation

Table 6.2. Estimated and derived coefficients and partial derivatives

	Coefficients			Partial Derivatives		
	Probit (1)	TSP (2)	Derived (3)	Probit (4)	TSP (5)	Derived (6)
S	.1298	.1229	.1230	.0475	.0454	.0442
SK	.7827	.7085	.7081	.2864	.2617	.2546
AGE	.1691	.1301	.1305	.0619-.0021AGE	.0481-.0017AGE	.0469-.0017AGE
AGE^2	-.0029	-.0023	-.0023			
INF	1.0308	1.0289	1.0328	.3772	.3801	.3712
Y_R	-.0026	-.0019	-.0019	-.00095	-.00069	-.00067
Constant	-2.7036	-2.2231	-2.2291			

probit. The largest proportional change is in the derivative with respect to Y_R which is about one-third smaller in the simultaneous estimates.

The patterns of change between the single equation and simultaneous probit estimates and the OLS and TSLS regression estimates are generally the same. An exception is the coefficient of SK which increased slightly in the TSLS and decreased in the two simultaneous probit estimates. In both sets of estimates, the simultaneous equations bias does not appear to be very important with the largest bias in terms of the negative effect of Y_R on the probability of migration. Although there is not much basis for choice, the simultaneous estimates seem to be preferable because they take into account the expected correlation between the disturbances as discussed above.

In all of the probit estimates, the coefficients of AGE and AGE^2 have the expected signs and are significant at the one percent level. Setting the partial derivative of (4a) with respect to AGE equal zero shows that the maximum effect of AGE on P occurs at about 28 years.

The regression estimates of the effect of AGE were highly sensitive to changes in the equation with considerable difference in size, sign, and significance of the coefficients. In equation (4b) neither coefficient is significant at the 10 percent level and the coefficient of AGE has an unexpected negative sign. An F test comparing (4b) with an estimate omitting AGE and AGE^2 resulted in rejection of the hypothesis that both coefficients

equal zero at the one percent level. The high simple correlation between AGE and AGE^2 ($r = .985$) and their joint significance when neither is significant individually suggest that the sensitivity of the coefficients and the low t values are the result of a high degree of multicolinearity in the regression estimates.

The high t values and large coefficients of INF in the estimates indicate that having an urban job contact is an important determinant of the probability of migration. This result is surprising as INF was not significant in the urban earnings function of the previous chapter. The apparent contradiction may reflect the different roles that job contacts play in the two functions, as a determinant of who moves in the probability function and of the urban earnings of those who had moved in the earnings function.[19/]

In the estimates discussed thus far, years of schooling has been entered as a continuous variable and shows a significant

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19/ Another possible explanation of the conflicting results is that the questions regarding job contacts refer to the first urban job of the migrants, while the earnings used in the earnings function refer to the time of the survey. Thus, the possible effect of a job contact on earnings during the initial period after arrival may not be picked up in the earnings function.

An alternative explanation is that the importance of urban contacts may lie in reducing the cost of migration by providing food and lodging for recently arrived migrants. To assess this possibility, an additional dummy variable was defined equal 1 if the individual knew someone in Tunis (in the destination area for migrants) irrespective of whether or not they could help in finding a job. When the probability function was estimated with this variable instead of the job contact variable, the coefficient was not significant at the 10 percent level.

positive relationship with the probability of migration. In equations (5a) and (5b) schooling is entered instead as three intercept dummy variables:

$D1 = 1$ if $0 < S \leq 6$

$= 0$ otherwise

$D2 = 1$ if $7 \leq S \leq 9$

$= 0$ otherwise

$D3 = 1$ if $S \geq 10$

$= 0$ otherwise.

In both the TSLS and PSP estimates the coefficients of D2 and D3 are positive and significant at the one percent level, indicating that schooling beyond primary school increases the probability of migration when other factors are held constant. Neither coefficient of D1 is significant at the 10 percent level, indicating that primary school only does not increase P. In addition, when primary schooling was divided into two groups for S = 1-5 and S = 6 using dummy variables, neither coefficient was significant at the 10 percent level. Thus, those who finish primary school but do not continue their education are not more likely to migrate than those with less than six years or those with no schooling when other factors are held constant.

Comparing the linear probability function and probit estimates, with the exception of AGE already noted, relying on the LPF would not be misleading in terms of identifying statistical relationships; those variables significant in the probit are also significant in the LPF.[20/]

[20/]The F test for the OLS and -2 log likelihood ratio test for the probit indicate overall significance of all the estimates at the one percent level.

As suggested previously, this is not the case for the estimated marginal effects of changes in the explanatory variables. The partial derivatives of the TSLS and two-stage probit are shown below.[21/]

	TSLS (4b)	Two-stage Probit (4a)
D1 (S=1-6)	.0295	.0852
D2 (S=7-9)	.2679	.3671
D3 (S=10+)	.4562	.5507
SK	.2191	.2705
INF	.3301	.3890
Y_R	-.00008	-.00064

The probit derivatives are evaluated at the means of the explanatory variables, and are all larger than those of the LPF.[22/] The derivatives of the dummy variables for schooling, INF, and SK are difficult to interpret, but the probit derivatives indicate larger effects on P of having these characteristics than is the case in the LPF.

The difference is most pronounced for the marginal effect of an additional dinar of annual rural income; the probit derivative with respect to Y_R is eight times larger than that of the

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21/The partial derivatives with respect to AGE are not compared because of the erratic behavior of AGE and AGE^2 in the LPF.

22/The value of I at the means of the explanatory variables is -.4678, corresponding to $\bar{P}$ = .320. The derivatives would be somewhat larger if $\bar{I}$ was closer to 0 and smaller if a larger absolute value of $\bar{I}$ were used. The TSLS partial derivatives are the estimated coefficients and do not change.

LPF. The two estimated relationships between P and Y_R are shown in Figure 6.3 with the other explanatory variables at their means [equations (4a) and (4b)].[23] The frequency distributions of Y_R among the migrants and non-migrants in the sample are also shown; each x represents approximately 10 observations. The slope of the probit is greater than the linear probability function except at the extremes when the probit curve approaches zero and one. The relatively flat LPF estimate may reflect a greater sensitivity to the unequal numbers of migrants and non-migrants in the sample, and the bunching of observations at the smaller values of Y_R.[24] The S-shape of the probit curve means that the effect of a change in Y_R is relatively small when P is close to zero or one, and largest in the middle. This has the plausible implication that a marginal change in rural income has relatively little effect if an individual is either very likely or very unlikely to migrate, whereas in the linear function the marginal effect is constant.

In light of their better statistical properties and the fact that they probably more closely approximate the true function, only probit estimates of the probability function are considered further.

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[23] The extension of the curves into the negative range of Y_R was necessary to illustrate the complete sigmoid curve. The curve could be shifted to the right or left by choosing different values of the other explanatory variables, but its shape would not be affected.

[24] A closer correspondence between the two estimates could perhaps be obtained by using non-linear forms of Y_R in the OLS, but this was not tried.

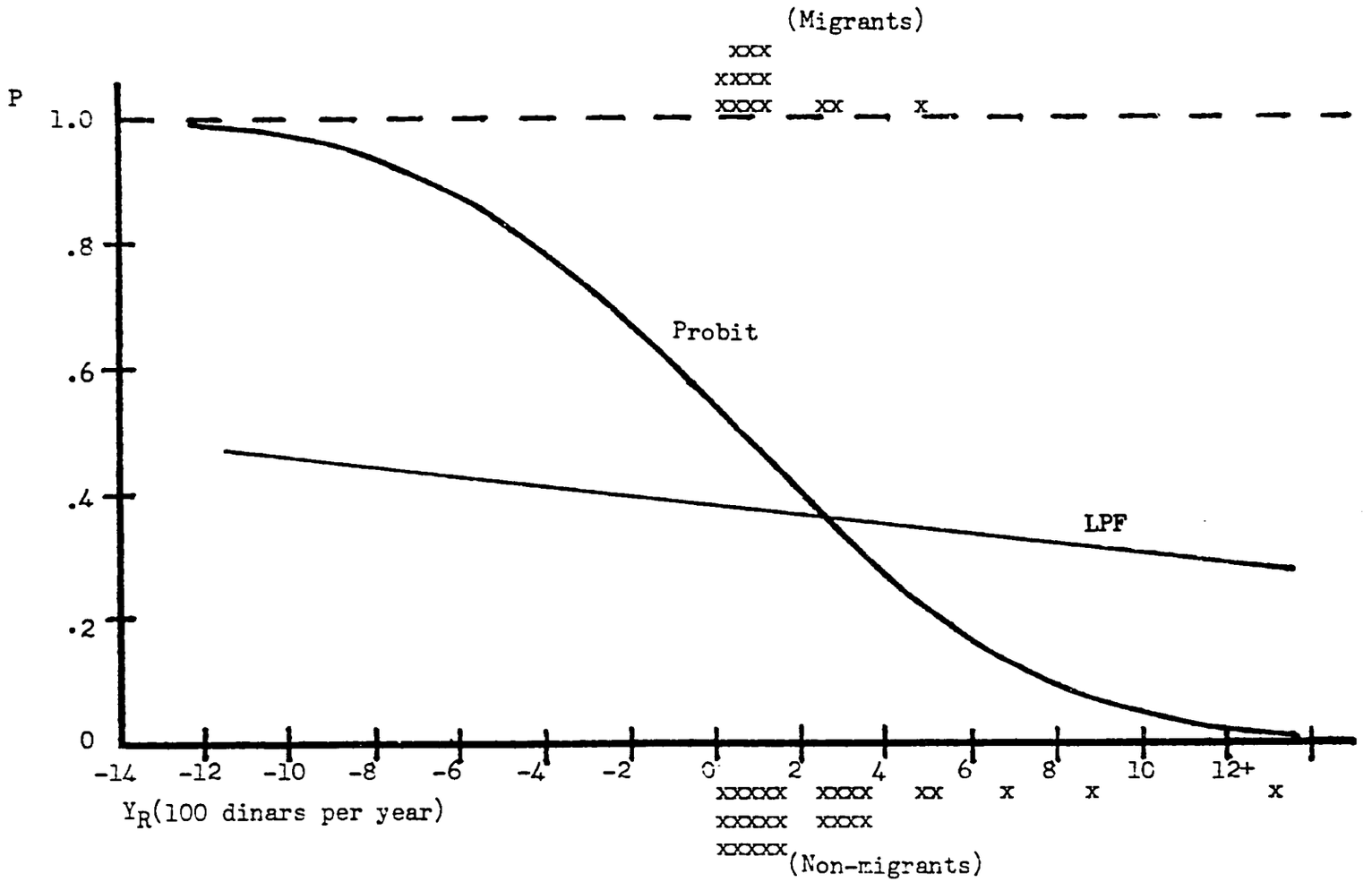

Figure 6.3. Estimated relationships between P and Y_R. Equation (4a) and (4b).

Rural Income and the Probability of Migration:

As noted previously, because of the non-linear nature of probit, the effect on P of a change in an explanatory variable depends on the level of that variable and the other variables in the equation. In the case of Y_R the interactions are illustrated in Figure 6.4 which shows the estimated relationship between P and Y_R for two hypothetical individuals, one with $S = 0$ and the other with $S \geq 10$ who are otherwise similar. At any given level of Y_R, $\bar{P}$ is higher when $S \geq 10$ and the slopes of the two curves will generally not be the same. More extreme differences could be illustrated by varying other factors; comparing young and old, skilled and unskilled, for example. But the important point is that the effect of changes in Y_R will probably differ between individuals or groups of individuals in the sample.

Interpretation of P as an individual probability of migration suggests an alternative interpretation as a migration rate: .342 of the sample had migrated during the six year period covered by the survey. The probit estimates can then be used to obtain a rural income elasticity of migration, $\eta = \frac{\partial P}{\partial Y_R} \frac{Y_R}{P}$. η represents the percent change in the migration rate due to a given percent change in Y_R, other things, including expected urban incomes, being equal. Evaluated at the sample means of Y_R and the other explanatory variables, $\eta = -.543$. Hence, a 10 percent increase in $\bar{Y}_R$ would reduce P by about five percent or a reduction in the proportion of migrants in the sample of .017.

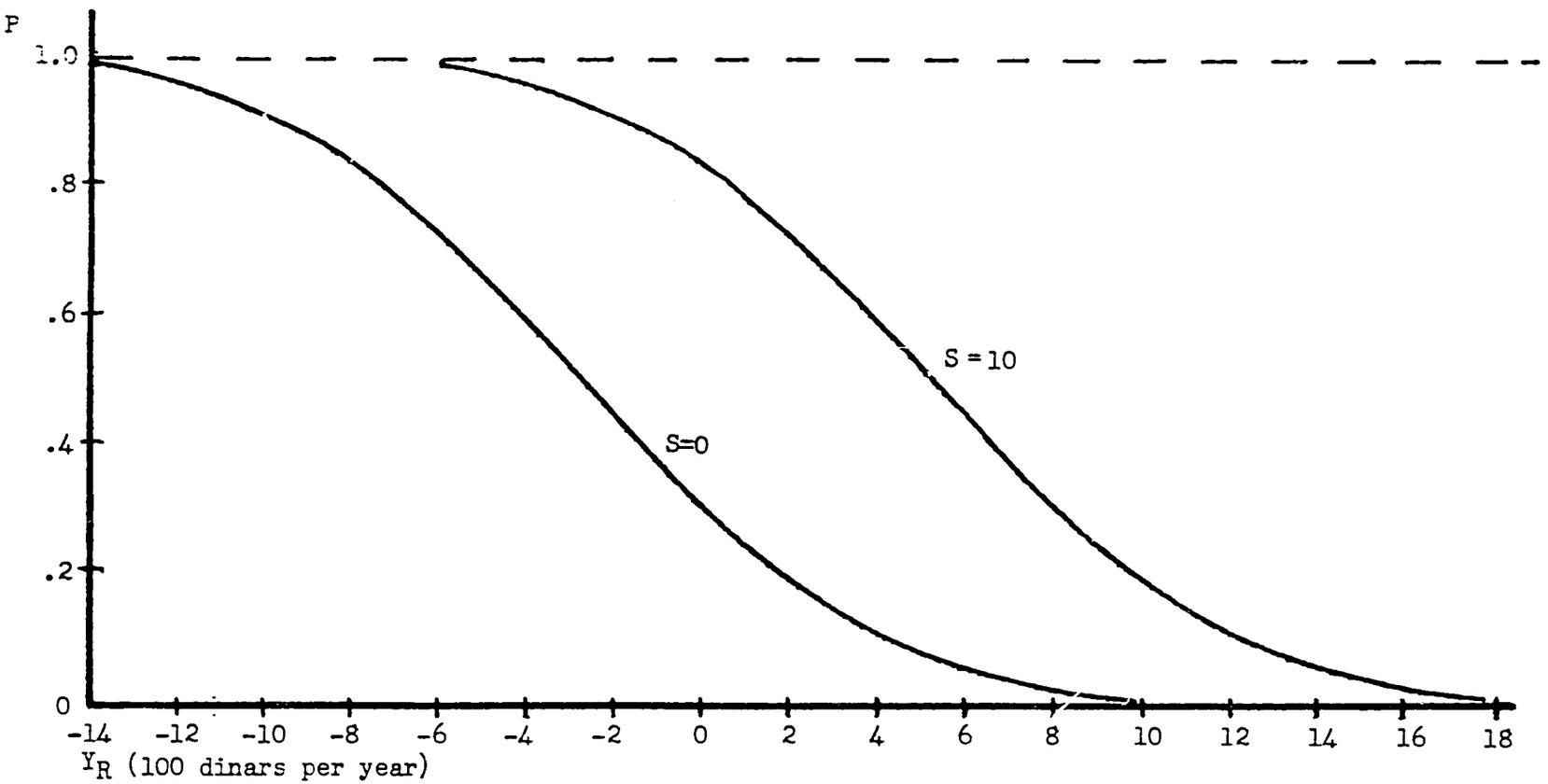

Figure 6.4. Estimated probit relationships between P and Y_R. S=0 and S = 10. (AGE = 20, INF = 0, SK = 0). Equation (5a).

As suggested above, however, η would be expected to differ between sub-groups of the sample. Elasticities calculated for schooling-age groups in which there were at least 15 observations are shown in Table 6.3. The η_i are evaluated at P_i, the group specific observed migration rate, at the mid-points of the age categories, and at the schooling-age group means of SK, INF, and Y_R.[25/]

There are considerable differences in η_i between groups caused in part by differences in P_i and $\bar{Y}_i$ which are also shown in the Table. The smallest η_i is for young men with $S \geq 10$. The elasticity for the oldest men with $S = 0$ is also relatively small representing the opposite end of the probability curve. The η_i are smaller for the youngest age category than the two middle-age groups and the sample as a whole.

Thus, it appears that a given percent reduction in migration rates among young men, particularly those with the most schooling, would require a considerably larger percentage increase in their average rural incomes than is the case for the older age categories or for the sample as a whole.

The elasticities discussed thus far have referred to the sample. The policy importance of the responsiveness of migration rates to changes in rural income suggests that the estimated elasticity be generalized to the rural labor force as a whole. However,

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[25/] $\eta_i = \left(\frac{\partial P}{\partial \bar{Y}_{Ri}}\right) \frac{\bar{Y}_{Ri}}{P_i} = \left(\frac{1}{\sqrt{2\pi}} \exp \frac{-(\tilde{\delta}_0 + \tilde{\delta}_1 \bar{SK}_1 + \cdots + \tilde{\delta}_6 \bar{Y}_{Ri})^2}{2}\right) (-.0018) \frac{\bar{Y}_{Ri}}{P_i}$

Table 6.3. Estimated rural income elasticities by schooling-age group [equation (5a)]

Age	Schooling	S=0	S=1-6	S=7-9	S=10+
15-24	η_i	-.180	-.219	-.279	-.109
	P_i	.45	.46	.67	.83
	$\bar{Y}_{Ri}$	119	147	290	202
25-34	η_i	-.368	-.371		
	P_i	.35	.50		
	$\bar{Y}_{Ri}$	191	261		
35-44	η_i	-.597			
	P_i	.30			
	$\bar{Y}_{Ri}$	464			
45+	η_i	-.213			
	P_i	.05			
	$\bar{Y}_{Ri}$	267			
		Total sample:	η = -.543		
			P = .34		
			$\bar{Y}_R$ = 290		

η is dependent on the levels of P and $\bar{Y}_R$ at which it is evaluated as well as on $\frac{\partial P}{\partial Y_R}$. The sampling method used in the survey was designed to result in a higher proportion of migrants than would a representative sample of migrants and non-migrants and, furthermore, the estimated P refer to the probability of migration during a six-year period. Estimating η for the labor force as a whole in terms of an annual migration rate requires calculation of η at a level of P corresponding to the "true" migration rate, P*.[26]

Census data indicate a net annual out-migration rate from Testour of about 1.1 percent for the male population between 1956 and 1966.[27] However, some observers feel that the gross out-migration rate of the labor force is currently considerably higher, so elasticities are calculated for two percent and three percent annual migration rates as well.

To evaluate η at these lower migration rates, P is replaced by P*, and $\frac{\partial P}{\partial Y_R}$ is replaced by $\left(\frac{\partial P}{\partial Y_R}\right)^*$. In this case $\left(\frac{\partial P}{\partial Y_R}\right)^*$ is the partial derivative of the probit estimate corresponding to

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[26] It is not possible to estimate this rate on the basis of the sampling ratios of migrant and non-migrant households in the original sample. See Appendix A.

[27] Census data for 1956 and 1966 show that the male population in Testour grew by about 1.5 percent per year during the period. Using 2.6 percent as the annual natural population growth rate leaves an annual net out-migration rate for males of 1.1 percent. /1956 population from Royaume de Tunisie, Service des Statistiques, Recensement de la population de la Tunisie du 1 fevrier 1956: Répartition géographique de la population (no date), pp. 18-19. 1966 population from unpublished census data, Institut National de la Statistique./

migration rate P*, in effect the slope of the estimated sigmoid curve at that point.

A second result of the overrepresentation of migrants in the sample is that the mean values of the explanatory variables may be different from those of a representative sample. In particular, the sample mean of rural income ($\bar{Y}_R$ = 290 TD per year) would be expected to be less than that of the rural labor force as a whole, other things being equal. This would tend to underestimate η. Other things may not be equal, of course, as the sample is also probably younger, better educated, and more skilled.

Two alternative methods were used to try to account for possible income differences. The first consists of evaluating η using an alternative estimate of average income. Data from a sample survey of household expenditures in the gouvernorat of Beja in 1965 indicate that average household expenditure in 1972 may have been 378 TD per year.[28] This figure is based on consumption of households that sometimes included more than one active man, however, so that it is not exactly comparable to the sample which measures farm and cash incomes of individual men.

Census data show that the sample is younger and better

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[28] Includes consumption of household produced goods and commodities. The annual average of 328 TD in 1965 was adjusted to 1972 price levels on the basis of the cost of living index for Tunis. No similar index for rural areas is available. /République Tunisienne, Institut National de la Statistique, La Consommation et les dépenses des ménages en Tunisie, 1965-1968 (Tunis, 1970), p. 38; idem., Annuaire statistique de la Tunisie, 1962, p. 332; idem., Bulletin Mensuel de la Statistique, various issues./

educated as a group than was the rural labor force in 1966, but do not allow comparisons within schooling-age groups. If it is assumed that any differences between sample and labor force incomes are due in part to the different age distributions, they may be reduced by weighting age-group specific $\bar{Y}_R$ in the sample by the true labor force age distribution.[29] This is the second method of accounting for income differences. The sample was divided into four age groups (15-24, 25-34, 35-44, 45+), and a $\bar{Y}_R$ calculated as:

$$\bar{Y}_R^* = \sum_{i=1}^{4} f_i \bar{Y}_{Ri}$$

f_i = proportion of labor force in age-group i.

$\bar{Y}_{Ri}$ = mean rural income in sample age-group i.

Elasticities calculated for the alternative migration rates and values of $\bar{Y}_R$ are shown below. The absolute change in the annual migration rate for a 10 percent change in $\bar{Y}_R$ is in parentheses.

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[29] The age distribution is for the rural labor force in all of Tunisia. (Caractéristiques économiques, p. 75.) Comparable data for Testour only is not available.

Weighting by age rather than schooling was chosen because of the manner in which education data is reported in the census, many non-responses, and broad and imprecise schooling categories.

At first glance it appears that the other explanatory variables should also be weighted by age to more closely approximate the true population values. However, this is not necessary as $(\partial P/\partial Y_R)^*$ used to calculate η is determined by P* as already mentioned. The value of the derivative is obtained by taking the level of I corresponding to the "true" migration rate from the probit-probability table. This I is then inserted in the formula for the probit derivative given above; for P* = .02, I = -2.0537, for example. With I determined in this manner, values of the explanatory variables other than Y_R are no longer needed to calculate the elasticity.

Average income (TD per year)	P*=.011	P*=.020	P*=.030
sample (290)	-1.36 (.0015)	-1.26 (.0025)	-1.16 (.0035)
age-weighted sample (335)	-1.58 (.0017)	-1.46 (.0029)	-1.34 (.0040)
expenditure survey (378)	-1.78 (.0020)	-1.64 (.0033)	-1.51 (.0045)

Comparing these values, both the elasticities and the change in the migration rate vary depending on which P* and $\bar{Y}_R$ are used. Given the imprecision of both estimates, it is difficult to speculate about which η is closest to the true parameter. However, if it is assumed that the true migration rate and average income lie within the ranges of the two values used above, the estimates indicate an η on the order of -1.4, and an absolute reduction of P* of about .003 for a 10 percent increase in average rural income. This change in P* applied to the 1966 labor force in Testour represents about 17 fewer migrants per year. If it is applied to the 1966 male labor force in the three gouvernorats of the Haut Tell (about 204,000 men), it represents approximately 600 fewer migrants annually.[30/]

These elasticities are point elasticities so speculation about the effects of large changes in $\bar{Y}_R$ is not appropriate. The estimates are also necessarily tentative, but they do indicate that

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[30/] Jendouba, Beja, and Le Kef. Labor force figures from Recensement générale de la population, 3 mai 1966: Caractéristiques économiques, pp. 90-91.

migration rates are reasonably responsive to changes in rural incomes if expected urban incomes are held constant. As noted previously, however, the response to income changes would probably differ between the various schooling-age-skill sub-groups of the population.

The Reduced Form:

The reduced form of the probability function, equation (iii), is of further interest for several reasons. First, because it includes only one endogenous variable, it can be estimated directly without simultaneous equations bias. Second, because Y_R is excluded, using the reduced form avoids some of the problems associated with measuring rural incomes by requiring only that farm size, HAMAN, be known. Third, the reduced form provides an alternative means of evaluating the influence of schooling, skills, and age on the probability of migration. In the structural estimates the effects of these factors were considered holding rural income constant. In the reduced form, the coefficients of S, SK, AGE, and AGE^2 represent the net effects of these factors on P; that is, their direct effects less their indirect effects acting through Y_R. Finally, the reduced form lends itself to prediction in terms of estimated probabilities of migration for different types of individuals.

Equation (6) in Table 6.4 is a probit estimate of the reduced form with schooling entered as a continuous variable, and equation (7) is the estimated reduced form using the three schooling dummies.

Table 6.4. Probit reduced form estimates (t values in parentheses). n = 412

Constant	S	SK	AGE	AGE^2	INF	HAMAN
(6)						
-1.6072	.0939 (4.06)	.4617 (1.58)	.0933 (1.85)	-.0019 (-2.60)	1.0328 (6.02)	-.0557 (-3.20)
	-2 log likelihood ratio test statistic = 192.94 6 d.f.					

	D1(S=1-6)	D2(S=7-9)	D3(S≥10)	SK	AGE	AGE^2	INF	HAMAN
(7)								
-1.2790	.1055 (0.52	.8180 (2.84)	1.2354 (4.10)	.5184 (1.77)	.0761 (1.52)	-.0017 (-2.34)	1.0902 (6.29)	-.0537 (-3.05)
	-2 log likelihood ratio test statistic = 199.77 8 d.f.							

The two coefficients of INF are quite similar in size and significance to the corresponding structural estimates, which is expected because the structural and reduced form coefficients of INF are the same.[31]

The coefficients of S, SK, AGE, and AGE^2 are considerably smaller in size and the t values are lower than in the two-stage structural estimates [equations (4a) and (5a)]. Recalling the previous discussion of the reduced form, the coefficient of S, for example, is $c_1 = a_1 + a_6 b_1$. Thus, a_1 is the structural parameter and represents the direct effect of S on P. The term $a_6 b_1$ is negative and represents the indirect effect caused by the positive effect of schooling on Y_R, ($b_1 > 0$), which reduces the probability by an amount determined by the size of the negative coefficient a_6. The reduced form coefficient c_1 represents, then, the net effect of schooling, taking into account that schooling increases Y_R, and can be estimated directly without knowing the underlying structural parameters; a_1, a_6, and b_1. Thus, while the reduced form does not allow analysis of the effect of Y_R on the probability, it permits evaluation of the unbiased effects of the other factors in the function.

In equation (7), the coefficient of D_1 is not significant indicating, as before, that primary schooling does not appear to

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[31] The partial derivatives with respect to INF are also quite similar: .3712 and .3815 in (6) and (7), and .3801 and .3890 in the corresponding two-stage probit structural estimates (4a and 5a).

increase the probability of migration. The coefficients of D_2 and D_3 are positive and significant at the one percent level. The coefficient of SK is significant at the 10 percent level in (6) and the five percent level in (7) indicating a statistically less significant positive effect than in the two-stage structural estimates. Thus, schooling beyond primary school and transferable skills increase the probability of migration in spite of the fact that they also increase rural incomes. It should be remembered, however, that these relationships are based on the (unknown) parameters of the urban and rural earnings functions that existed at the time of the study.[32/] If the relative returns to schooling and skills in the rural and urban sectors change, it would be expected that the relationships of schooling and skills to the probability of migration would also change.

The reduced form coefficients of AGE and AGE^2 can also be interpreted in terms of the net effect of age on the probability. Differentiating equations (6) and (7) with respect to AGE shows that the maximum effects of AGE on P occur at 24.6 and 22.4 years, respectively. These compare with maximums at 28.2 and 26.4 years in the corresponding two-stage structural estimates [equations (4a) and (5a)]. Thus, when the lower rural incomes of young inexperienced men are reflected as an indirect effect of AGE, the age at which the maximum occurs drops by about four years as compared

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32/ The parameters of the two earnings functions were estimated in Chapter V. They are "unknown" here in the sense that they are not needed to estimate the reduced form.

to the structural estimates where Y_R was held constant. These lower maximums also correspond more closely to the age distributions in Chapter II where Y_R was not controlled.

The interrelationships between the variables in the reduced form are illustrated in Table 6.5 which gives estimated probabilities of migration for hypothetical individuals with different combinations of schooling, skills, age, and job contacts. The probabilities are calculated from equation (7). The first three rows represent households with no farm (HAMAN = 0), and the last three a farm size of 10 hectares per man. These examples are only illustrative of the estimated probabilities. Some of the combinations did not exist in the sample; skills with secondary schooling, and older men with secondary schooling, for example. Nonetheless, they show the interactions of the variables in the non-linear probit model.

Comparing rows (a) and (c), for example, the effect of having an urban job contact, INF = 1, is larger for a 20-year-old with S = 0 than it is for either an older man with S= 0 or a 20-year-old with $S \geq 10$. The latter two are very unlikely and very likely to migrate, respectively, regardless of whether or not someone can help them find an urban job. Similarly, in row (a) the effect on $\bar{P}$ of having $S \geq 10$ rather than S = 0 is greater for a young man than an older man.

The important effect of secondary schooling on the probability of migration for young men is also apparent. In row (a), for example, a 20-year-old with $S \geq 10$ is twice as likely to migrate as

Table 6.5. Estimated probabilities of migration [equation (7)]

Schooling:	S = 0		S = 1-6		S = 7-9		S ≥ 10	
Age:	20	50	20	50	20	50	20	50
HAMAN = 0								
a) SK = 0 INF = 0	.330	.042	.369	.053	.648	.182	.787	.313
b) SK = 1 INF = 0	.532	.114	.573	.136	.815	.349	.906	.512
c) SK = 0 INF = 1	.743	.263	.775	.299	.929	.573	.970	.726
HAMAN = 10								
d) SK = 0 INF = 0	.165	.012	.192	.016	.437	.075	.603	.153
e) SK = 1 INF = 0	.324	.041	.363	.051	.641	.178	.782	.306
f) SK = 0 INF = 1	.546	.121	.587	.143	.825	.362	.912	.526

another with primary schooling only. The effect of limited secondary schooling (S = 7 - 9) is also substantial.

The probabilities for HAMAN = 0 and HAMAN = 10 illustrate the differences in $\hat{P}$ between those with farms and those without. For example, in rows (a) and (d), a 20-year-old with no schooling or primary schooling only whose household has no farm is roughly twice as likely to migrate as a similar individual with a farm size of 10 hectares per man. As before, the difference in $\hat{P}$ depends on the other variables; for example, the proportional change for a 20-year-old with $S \geq 10$ and an urban job contact is very small. A 10-hectare-per-man farm is twice the median unirrigated farm size among the non-migrants in the sample. But the examples indicate that having a farm can have an important effect on the probability of migration.

CHAPTER VII

CONCLUSIONS

The objective of this study was to investigate several aspects of rural-urban migration that have received little attention in previous Tunisian migration research. This chapter will summarize and interpret the results of the study in terms of several policy areas related to migration. Although the study is based on data from a small area of the Haut Tell, some of the results may be instructive in consideration of migration over a larger area.

Migration from Testour appears to be selective of the young, the best educated, and those with job skills applicable in the urban economy; a selectivity generally similar to that observed in other LDC's. Thus, migration results in a loss of human capital for the rural area in the form of skilled and educated men.[1/]

Regarding the relationship between education and migration, the probability estimates showed that those with seven or more years of schooling or occupational training were significantly

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[1/] Caldwell found that while migration is likely for Ghanian men with skills, the loss to the rural areas tended to be compensated by a return flow of those with urban learned skills (Caldwell, pp. 143-145). In the case of Testour, the apparent low rate of return indicates that the gain to the area of urban learned skills is less important.

Gains and losses of human capital and other effects of migration on rural areas are discussed in Marvin P. Miracle and Sara S. Berry, "Migrant Labour and Economic Development," Oxford Economic Papers, Vol. 22 (March, 1970), pp. 86-108.

more likely to migrate than those with no schooling, but that having only primary school did not significantly increase the probability of migration when other factors were held constant. The estimated probabilities of migration based on the reduced form were as much as two or more times larger for a young man with four or more years of secondary school or occupational training than they were for a similar man with no school or primary school only. The effect of secondary schooling on the probability of migration for a particular individual would depend on other factors: job contacts, farm size, etc. However, in light of the expansion of educational opportunities in rural Tunisia whereby increasing numbers of students continue beyond primary school, the results suggest that future migration rates among young men may be considerably higher, other things remaining equal. Achieving universal education at the primary level, however, would probably not have a similar effect.

This conclusion should be tempered somewhat because the relationship between migration and education may change over time as general levels of education increase. Todaro cites research in Tanzania which found that the educational composition of the migration stream adjusted to changes in the probability of urban employment.[2/] In terms of Fields' "bumping" model, as educational

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2/Michael P. Todaro, "Rural-Urban Migration, Unemployment, and Job Probabilities: Recent Theoretical and Empirical Research," Paper delivered to the Conference on the Economic Aspects of Population Growth, Valescure, France (September, 1973), pp. 3, 12.

levels rise those with limited schooling may be in an increasingly less favorable position in the competition for urban jobs, resulting in a lower probability of modern sector employment and expected urban income for that group. Thus, limited post-primary schooling and training may not increase the probability of migration in the future as was true in the sample.

Reducing rural-urban migration is an important objective of Tunisian policy makers and development planners. In the 1960's migration to Tunis was restricted with migrants having no permanent residence or unable to show proof of employment returned to their areas of origin.[3] These restrictions were apparently not being widely enforced in 1972 with a greater reliance placed on other means of controlling migration.

The government has instituted or is considering a number of programs designed to increase agricultural production and improve incomes, employment, and the general standard of living in rural areas. These programs are evaluated in part on the basis of their probable effectiveness in reducing migration.[4]

The significant negative effect of rural income in the probability estimates indicates that migration is responsive to such

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[3] Picouet, "Aperçu des migrations intérieures en Tunisie," p. 146.

[4] See République Tunisienne, Secrétariat d'Etat au Plan et a l'Economie Nationale, Plan de développement économique et sociale, 1969-1972: Agriculture et pêche, Vol. 2, Troisième Partie, Section I (n.d.), pp. 8-14; and J. P. Chabert, La politique agricole du gouvernement Tunisien en 1971, I.N.R.A. (1972), pp. 9, 15, 23.

efforts to increase rural incomes. Although they are tentative, the elasticities estimated in the previous chapter indicate that a one percent increase in average rural income would reduce the migration rate by more than one percent.

However, as discussed in Chapter VI, it is plausible to assume that the true relationship between the probability of migration and rural income is S-shaped as in the probit model. In other words, for a given age-education-skill category it is expected that the effect on P of a change in Y_R depends on the level of Y_R. Moreover, the results indicate that the response of migration to changes in rural income probably differs between age-education-skill groups of the population.

The smaller estimated elasticities among young men, for example, indicate that reducing migration among such men will require a concentrated effort to improve their rural income opportunities.[5/] However, the large positive effect of secondary

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5/There are indications that agricultural policy was being evaluated in terms of opportunities available for school-leavers with limited secondary schooling and occupational training both as regards the positive effect on the agricultural sector and as a means of curbing migration among such men. (See Chabert, p. 15).

A related policy measure would be to increase the emphasis on agricultural curricula in the schools and training centers coupled with efforts to provide rural jobs for the graduates. It may be that agricultural training does not have the positive effect on the probability of migration observed in this study for secondary school in general. Unfortunately, there were too few men in the sample with agricultural occupational training to allow an assessment of their relative likelihood of migration as compared to those who were trained in mechanical or construction skills, or had attended the regular secondary schools.

schooling and the relatively small elasticity for the best educated young men suggest that the magnitude of increase in rural income necessary to significantly reduce their high rate of migration may not be feasible in the current context of Testour. Hence, it may not be possible or desirable to try to retain a significant proportion of well-educated youth in the rural area. In other words, a higher rate of out-migration may be an inevitable consequence of increasing educational levels, as noted above.

More generally, the negative relationship between rural income and the probability of migration when other factors are held constant, means that migration may be most effectively reduced by increasing the rural incomes of the poorest within the various schooling-age-skill groups. To the extent that this requires a redirection of development programs towards small farmers and employment creation in agriculture in general, reducing migration may conflict with other policy objectives. In particular, current policy emphasis on mechanization and the modern farm sector as a means of increasing agricultural production does not appear compatible with lower migration rates. For Testour such redirection might include increased credit for small farmers to allow expansion of the irrigated area and a concentrated effort to encourage the use of the high yield wheat varieties that are currently limited to the modern agricultural sector.[6/] However, much more

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[6/] Purvis concludes that existing high yield varieties require mechanical cultivation to be more productive than local soft wheats, and that the new varieties must be further refined if they are to be used widely in the traditional farm sector. Malcolm J. Purvis, "The New Varieties Under Dryland Conditions: Mexican Wheats in Tunisia," AJAE, Vol. 55, No. 1 (February, 1973), p. 56.

needs to be known about the size of the rural labor force, migration rates, and the economic and technical aspects of alternative technologies to properly assess the relationships between agricultural production, employment, and migration.7/

Once again the non-linear response to changes in rural income should also be considered in terms of the income increase necessary to significantly reduce the probability of migration of, say, an underemployed farm laborer or a farmer with very limited land holdings. Whether or not development programs should be directed towards the small farmers and a more labor intensive technology as a means of reducing migration depends on an evaluation of the trade-offs involved and the overall costs and benefits of alternative agricultural development strategies.

Agriculture is not, of course, the only source of higher rural incomes. A balanced rural development program would include expansion of the non-farm sector through decentralization of industry and the establishment of small-scale manufacturing.8/ Make-work

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7/For example, one of the reasons given for the necessity of reducing rural-urban migration in the 1969-1972 plan was an anticipated shortage of agricultural labor in the 1970's if migration continued at a rapid rate. This anticipated shortage was one justification for a faster mechanization of agriculture to reduce future labor requirements. However, as has been pointed out elsewhere, this was based on an unreasonably high migration rate (a diminution of the agricultural labor force by two percent per year). /See Plan de développement économique et sociale, 1969-1972: Agriculture et pêche, Troisième Partie, Section I, pp. 8-10; and The University of Minnesota Team in Tunisia, "Some Comments on the Tunisian Agricultural Plan," 1969, mimeo., p. 47/.

8/There are plans for the development of certain urban centers as regional growth poles designed to divert part of the migration

-continued on p. 153-

programs like the LCSD are another alternative, particularly as a seasonal complement to agricultural employment.9/ It is clear, however, that agriculture will remain the dominant sector of the economy in Testour and in most of rural Tunisia for some time to come, and that agricultural policy decisions will continue to have major impacts on migration for the forseeable future. In those parts of Tunisia with limited agricultural potential, notably the South, a different rural development strategy may be needed with less emphasis on agriculture.

However, the probability estimates indicate that the choice of development strategy and programs may have indirect effects tending to increase rather than retard migration. As suggested above, emphasis on increasing educational levels as a means of promoting rural development may result in higher rates of out-migration of young men. Similarly, programs that develop skills and work experience applicable in the urban economy may tend to increase migration, as indicated by the positive effect of such skills in the probability estimates. For example, it has been noted that LCSD workers gain experience in non-agricultural wage

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8/(Continued from p. 152) flow away from Tunis and promote a more uniform pattern of regional development. (See Les villes en Tunisie, pp. 392-422.) With a few limited exceptions, there are no indications of major efforts to develop the non-farm sector of rural areas.

9/This would seem to be an unlikely policy choice because, as noted in Chapter III, Tunisia's LCSD program has been reduced significantly in recent years due in part to the belief that past LCSD projects did not contribute to the development effort. (See L'expérience Tunisienne de mobilisation de la main d'oeuvre . . ., pp. 25-26.)

work that sometimes amounts to apprentice-type training in construction and other non-agricultural skill areas.[10] Thus, while education and manpower training can be important components of rural development, both may lead to higher rates of migration unless rural returns to schooling and skills are increased relative to those obtainable elsewhere.

This emphasizes the fact that the effects of schooling and skills on the probability of migration and the response to changes in rural income are based on the assumption that expected urban incomes, implicit in the probability function, remain constant. In other words, it is the differential in rural-urban expected incomes that is important rather than their absolute levels. Hence, attempting to reduce migration by increasing rural incomes requires a concurrent effort to reduce or restrain expected urban incomes. A number of policies relating to urban wages and unemployment must then be included to the extent that they determine the urban alternatives facing potential migrants.

In Chapter IV it was shown that while the construction industry appears to act as a point of entry for migrants into the urban economy, there are apparently no large differences between employment of migrants and the permanent urban labor force in Tunis. In fact, the data indicate that employment of migrants as a group compared favorably with that of native-born workers in terms of

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[10] U.S. Agency for International Development, "Task Force Report on the P.L. 480, Title II, Food for Work (LCSD) Program in Tunisia, 1966-1969," unpublished USAID document, 1969, p. 36.

unemployment, income, and modern versus traditional sector occupations after a relatively brief transitional period. Unemployment rates among older workers were higher for migrants; but for those less than 40 years old and for the two groups as a whole, migrants were less likely than native-born workers to be unemployed, a situation generally similar to that observed in other LDC's.

Most of the migrants from Testour found urban jobs quite quickly, reflecting the fact that many of them had apparently been able to arrange an urban job before they moved either through frequent, short job-hunting trips to Tunis, or with the help of a friend or relative already in the urban area. A number of the non-migrants indicated that they too were looking for urban jobs and would leave as soon as one was found.[11/] Testour is relatively close to Tunis, but because of Tunisia's small size and good transportation system, this same situation may exist in most rural areas with many men in the "urban" labor force to the extent that they are seeking jobs in Tunis or one of the other important urban centers.

This kind of overlapping of the labor markets emphasizes the importance of migration as a link between the rural and the urban sectors that is at the heart of the theoretical work of Todaro

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11/The Employment Office is another, although less important, means of obtaining an urban job before leaving. It is more important regarding migration abroad through the organized emigration program, for which many men in Testour are registered.

and others concerning the relationships between urban wages, unemployment, and migration.[12] The primary policy implication of these models is that efforts to reduce urban employment through urban job creation may be frustrated by an increased flow of migrants in response to the higher probability of urban employment. Thus, migration is hypothesized to be responsive to the availability of urban jobs as well as the level of urban wages.[13] A number of policies have been suggested as a means of reducing urban unemployment in this type of situation.

One of these, a variant of the restriction on migration discussed earlier, is being considered by Tunisian officials.[14]

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[12] Todaro, "A Model of Labor Migration ---;" John R. Harris and Michael P. Todaro, "Migration, Unemployment and Development: A Two-Sector Analysis," American Economic Review, Vol. 60, No. 1 (March, 1970), pp. 126-142; Jadish Bhagwati and T. N. Srinivasan, "On Reanalyzing the Harris-Todaro Model: Policy Rankings in the Case of Sector-Specific Sticky Wages," Working Paper No. 99, Department of Economics, Massachusetts Institute of Technology, 1973.

[13] The underlying behavioral assumption of the Todaro model - that a migrant's expected urban income depends on both the urban wage rate and the probability of obtaining a modern sector job - was included in the model in Chapter II. This study provides only limited evidence of the assumption's empirical validity.

In Chapter V the urban earnings of the sample migrants increased significantly with the length of time since migration, consistent with an increased probability of having a modern sector job. In addition, comparing initial employment of the migrants with employment at the time of the survey showed a considerable increase in the number of jobs classified as "modern". Neither of these findings is evidence that the probability of urban employment enters the decision to migrate, however.

As has been pointed out elsewhere, the Todaro model has not yet been rigorously tested in the context of LDC's, although there is some supporting evidence from research in developed as well as less-developed countries. See Byerlee, p. 9; and Todaro, "Rural-Urban Migration, Unemployment and Job Probabilities ...".

[14] Continued on p. 157.

This would require that all urban job vacancies be filled through the Employment Office, allowing the allocation of urban jobs first to the urban unemployed and a strict control of the number of migrants finding jobs in accord with urban labor requirements.15/ As Todaro points out, however, such a program would involve considerable administrative costs and possible inefficiencies, and may have undesirable economic and political consequences as a result of the restriction of individual choices of both migrants and employers.

Other than restrictions on migration, policy proposals include a variety of methods aimed at increasing urban employment without further widening the rural-urban expected income differential. Of these reduction of restraint of modern sector wages is perhaps the most important as it would have a two-fold effect on the expected

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14/(Continued from p. 156) Michael P. Todaro, "Income Expectations, Rural-Urban Migration and Employment in Africa," International Labor Review, Vol. 104, No. 5 (November, 1971), p. 401.

15/Conversation with the Director of the Bureau de l'Emploi in Testour. See also Gerald Crettenand, L'emploi dans de Grand-Tunis Evaluation 1956-1970, Analyse Statistique, Municipalite de Tunis, 1971, p. 26.

The necessary organizational framework already exists throughout Tunisia with the local offices of the Bureau de l'Emploi serving largely as administrators for the LCSD program and the emigration of Tunisian workers to foreign countries. As already mentioned, emigration abroad has an important place in the current development plan as a means of obtaining foreign exchange and reducing unemployment in rural and urban areas. The emphasis on emigration has disadvantages, however, namely that many of the migrant workers have skills and training necessary for domestic development, and that the program is subject to economic and political uncertainties in the destination countries. (See, for example, Hume, pp. 41-53.)

urban incomes of migrants on the one hand and urban labor demand on the other. More comprehensive schemes include wage and production taxes and subsidies in the rural and urban sectors or a combination of these, but more needs to be known about the empirical relationships involved to arrive at an optimal set of policies. The important point in terms of this study is that slowing rural-urban migration requires policies designed to narrow the difference between rural and urban expected incomes, and that a number of policy decisions affecting both sectors must then be considered in terms of their probable influence on migration.[16/]

The discussion in this chapter has been largely in terms of implications of this study for reducing rural-urban migration because that is a primary objective of Tunisian policy makers. However, reducing migration should be considered as a short-run goal. The transfer of the labor force from rural to urban areas and from agricultural to industrial activities has historically been part of the development process. The most basic conclusion of this study is that migration seems to be a response to economic incentives: the types of individuals most likely to migrate in

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16/Comprehensive and reliable data on past trends in urban and rural incomes are not available. However, rough estimates based on national accounts data indicate that while average income per worker in the non-agricultural sector more than doubled between 1960 and 1970, average income in the agricultural sector declined slightly. (See J. G. Kleve, "La répartition des revenus," mimeo, 1972, p. 7.)

It should be pointed out, however, that agriculture was adversely affected in the 1960's by floods, poor yields, and the decolonization and co-op movement noted earlier. There are indications of considerable improvement in the agricultural sector in recent years.

the probability estimates are those who would be expected to have the largest economic gain from migration, viz., the young, the best educated, skilled laborers, and the poor. This suggests that by restructuring the economic incentives of different population groups between sectors and geographic areas, policy makers can exert some control over the rates and destinations of migration to meet changing labor requirements as development progresses.

APPENDICES

Appendix A: The Survey

The basic objective of the survey in Testour was to identify recent migrant and non-migrant men, select samples of each group, and obtain information by interview. Two alternative sampling methods were considered.

The first method consists of random selection of clusters of houses in the *délégation* using aerial photographs. Each household in the selected clusters would then be interviewed and information obtained about each non-migrant and migrant man in the household. Preliminary calculations based on the 1966 census results showed that roughly one household in nine may have had at least one man migrate from Testour between 1966 and the time of the survey (1972). Hence, because migration is a relatively rare event, screening interviews of about 900 households would be required to find 100 households with migrants. This method was rejected as too costly in view of the limited resources available for the survey.

The second method, which was used, relies on local leaders who are familiar with the people in the area to identify recent migrants. This technique was suggested for rural-urban migration studies in LDC's, but there are no known previous applications.[1/] The method was facilitated in the case of Tunisia by the 1966 census which provided a base establishing the population in Testour in 1966 from which migrants who moved since then could be identified.

1/Louis Roussel, "Measuring Rural-Urban Drift in Developing Countries: A Suggested Method," International Labor Review, Vol. 101, No. 3 (March, 1970), pp. 229-246.

In addition to the individual household forms, the census documents included a listing of the names of all enumerated household heads as part of the census agents' workbooks (Les cahiers de travail des agents recenseurs). Within the *délégation* of Testour the locations of the households were identified by *cheikhat* and by smaller census subdivisions (*commune*, *îlot*, and *zone naturelle*). A sample of 1143 households was randomly selected from these lists, one-fourth of the total in the *délégation*.

In a second stage the sample of names was divided by *cheikhat* and formed the basis for interviews with the *cheikhs* of the four *cheikhats* in the *délégation*: Testour, Sloughia, Oued Zarga, and Mzourah.

The *cheikhs* are older local residents who serve as the lowest level administrative officials and are supposedly selected for their good standing in the community and knowledge of its people. Their administrative responsibilities include registration of births and deaths and a variety of other duties. It was felt that they would be in closest contact with the people of the area and most aware of migratory movements.

The interviews with each of the *cheikhs* were conducted in three or four sessions apiece because of the demands on their time and the repetitive nature of the interviews. Each name in the sample was considered individually. The *cheikh* was asked:

- if he knew that person.
- has the household head ever left Testour to live elsewhere.
- has any other man in the household (son or brother, etc.) ever left Testour to live elsewhere.

If either the head or another man in the household had left, the cheikh was asked:

- when did he leave. If the man had since returned, how long did he remain away.
- where did he go first.
- what was the reason for the move.

If it was other than the head who moved, additional questions were asked to determine if the man had really belonged to that household.[2/]

On the basis of the cheikhs' responses the households were classified as being either migrant or non-migrant. Migrant households were those with at least one man who:

- had moved out of the gouvernorat of Beja.[3/]
- had moved in 1966 or later.
- was at least 15 years old when he moved.
- was still absent or remained away for at least two months if returned.
- went to work or look for work. (Excluded were men inactive because of age or health who had moved. Students and draftees who moved were considered as migrants if they remained away to work or look for work after leaving school or the military.)

Non-migrant households were those without migrants but with economically active men (15 years old or older, working or looking for work). Students were excluded.

2/The definition of a household used was the same as that used by the census, viz., all people living under the same roof and usually taking their meals together.

3/Movement out of the gouvernorat of Beja, of which Testour is part, was specified so as not to include short moves across the boundaries of neighboring délégations.

The classification of the sample households is shown below:

220 migrant households

815 non-migrant households

95 households which were unknown to the cheikhs or could not be identified

10 households which were considered ineligible (no longer existed due to death, no active men, temporary residents of Testour at the time of the census, etc.)

Many of the households classified as unknown were the result of incomplete names on the census lists.[4/] In other cases where the names were complete, however, the cheikhs simply did not know the person. In the most populous cheikhat, Testour (1966 population about 8,000), there was a particularly large number of unknown names. In that case the lists were redone with groups of men in different parts of the cheikhat to try to resolve the unknown names. This was not done in the other cheikhats where it would have been more difficult to do without seeming to be questionning the cheikhs' credibility; the cooperation of the cheikhs was needed to successfully complete the survey.

Equal-sized samples of 120 migrant and non-migrant households were randomly selected from the classification of the households

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4/Complete Tunisian names generally consist of surname, father's surname, grandfather's surname, and family name; e.g., Salah Ben Mohamed Ben Habib Oueslati (Salah, son of Mohamed, son of Habib, family name Oueslati). The family names often belong to large lineages and can be very common in the area. Thus, if only the surname and family name are known there may be several men with that name. Similarly, if only the surname and father's surname are known, it was sometimes not possible to associate the name on the list with a particular individual.

by the cheikhs. The sample households were the subject of individual interviews to obtain information about each migrant and non-migrant man in the household and about the household itself. The total sample size was determined by estimates of the number of interviews that could be conducted with the available survey resources based on the survey experiences of other researchers in Tunisia. Soon after interviewing began, however, it became apparent that not all the interviews could be accomplished, and that many of the households classified as migrant by the cheikhs did not have any migrants according to the individual respondents. To ensure obtaining as many migrants as possible, the samples were redrawn with 220 migrant and 80 non-migrant households.

The extent of the mis-classification problem was not fully realized until the survey was complete. In all, 44 percent of the households classified as migrant that were interviewed did not have migrants who qualified under the definition of a migrant that was used. Conversely, 21 percent of the households classified as non-migrant did have migrants when interviewed. Thus, in terms of identifying migrant and non-migrant men, the method of relying on the cheikhs was not successful.

There are three primary reasons for this failure. One is that the definition of migration was too restrictive and required too much detailed information from the cheikhs. Many of the incorrectly classified migrant households did have migrants who left before 1966 or were not considered by the respondents to have been members of the pot and roof-sharing household and so did not

qualify under the definition of migration that was used. If the information from the individual respondents is accepted as more accurate, the cheikhs were often mistaken as to the timing and household membership details of the migration.

A second possible reason is that the cheikhs were correct but the individual respondents would not say that a member of the household, a son for example, had moved. In fact there was good reason for the suspicion on the part of the respondents that answering the questions truthfully would somehow cause trouble for the migrants. At the time of the survey there was considerable clandestine migration to Libya with illegal migrants being caught and returned in large numbers. Similarly, in previous years, migrants in Tunis who were not legal residents or could not show proof of employment were rounded-up and returned to their areas of origin, although this practice was apparently not widely used in 1972. In spite of efforts to disassociate the survey from official purposes, it was clear that most respondents viewed the survey as some sort of government activity.

The third and most likely reason for the discrepancy between the cheikhs' responses and the individual household interviews, and the large number of unknown household heads is that the cheikhs are not in a position to provide accurate migration information. Whether because of confusion over names or the relatively large populations involved, they simply did not know the population well enough to indicate who had migrated. Because of the mis-classification of households as migrant or non-migrant, the

samples are clearly not representative samples of the two populations which are, in fact, unknown.

Of the 300 migrant and non-migrant households in the sample, 254 interviews were completed. In most cases the respondent was the household head, but in his absence the information was obtained from another household member or close relative. Twenty-one households had left Testour with no family member remaining who could provide the necessary information. In 14 of these cases addresses of varying degrees of precision were obtained for households in and around Tunis. Only half of these were reached and interviewed in Tunis after considerable difficulty. It was clear that an alternative survey design which identified migrants in the rural area, but located and interviewed them in their urban destinations, would be extremely costly in terms of the time necessary to locate a particular migrant in the city.

Of the total sample, 13 interviews were refused outright and 19 other households no longer existed or could not be contacted in Testour. Some of the latter were apparently also refusals.

Nearly all of the interviews were conducted in Arabic with the responses recorded on the questionnaires in French by two bilingual interviewers. Both interviewers had secondary educations and one had previous survey experience as a research assistant at the Center for Economic and Social Studies and Research of the University of Tunis. The other interviewer was from Testour and had no previous survey experience. The questionnaires were checked for completeness and basic consistency in the field but

were not edited and coded immediately. The survey resulted in usable data for 295 non-migrant and 144 migrant men.

The Questionnaire:

The questionnaire used in the survey consisted of three principal sections and was developed and pre-tested in 26 interviews in two délégations bordering Testour, Bou Arada and Teboursouk.[5/]

The first section was the basic questionnaire used for all households interviewed and was designed to establish who belonged to the household at the time, and to obtain socio-economic characteristics of the adult members. A number of questions dealt with income sources and employment of the household members, and whether or not they had left Testour since 1966. It was also determined if other household members had left and were currently living elsewhere. In all cases of migration additional information was obtained to see if the definition of migration used in the study was fulfilled. Questions were also posed as to the respondent's future plans, his perception of urban employment opportunities, whether or not he would expect to have help obtaining an urban job, and the frequency and reason for travel to the cities of Beja and Tunis.

The second section of the questionnaire dealt with the migration of household members and was completed for each qualified

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5/Copies of the questionnaire are available from the author.

migrant. The first part established the characteristics of the migrant, when he left and where he went. Subsequent questions dealt with his income and employment before leaving Testour, the migrant's current and preceding locations, if any, and the kinds of employment he obtained after migrating. The final part of section two consisted of questions covering a number of aspects of the migration, the ties maintained with Testour, and future plans.

The third section of the questionnaire was completed for households that operated farms. The intent of this section was to measure farm income using a schedule derived from Yang and modified to allow calculation of "Net Farm Benefit," a measure suggested by Stevens as the most practical measure of subsistence farm income.6/

It is difficult to assess the overall accuracy of the survey data. The ability and willingness of the respondents to provide the information sought varied greatly between respondents and the type of question being asked.

In all three sections of the questionnaire simply asking the questions was frequently inadequate. Prolonged discussion was needed in many cases to ensure that the respondents understood what was being asked and that the response was as complete as possible. In these discussions all relevant data was recorded on

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6/W. Y. Yang, Methods of Farm Management Investigations (Rome: FAO, 1965); Robert D. Stevens, "A Review of Measures of Farm Income for International Use," Indian Journal of Agricultural Economics, Vol. 18, No. 4 (October-December, 1963), pp. 1-19.

the questionnaire. In particularly difficult subject areas such as migration sequence and timing, employment, and income, a number of different questions were asked to ensure a full discussion in each interview.

In spite of these efforts a substantial number of interviews resulted in incomplete or missing information. Non-responses and incomplete information were most common regarding the income and employment of the migrants after leaving Testour. When the questionnaires were coded this sometimes required interpretation and inferral from the information that was provided about those parts that were missing. For example, if the hourly wage rate and the fact that a migrant worked "full-time" were known, his monthly earnings were calculated on the basis of a full-time work week. Similarly, if the respondent indicated that a migrant obtained an urban job before leaving Testour, or otherwise began working "right away," he was considered as not having been initially unemployed after migrating. Missing and incomplete information arose less frequently in the first section of the questionnaire and the other parts of the second section dealing with the migration. Those cases judged too incomplete were dropped from the sample.

The questions relating to production in the farm survey section resulted in wide variations in apparent yields and a substantial number of non-responses. This was due in part to the rotation system in which some or all of the household's fields may have been left fallow in 1970-71, and the fact that subsistence farmers frequently do not measure their production in standard units.

Similar difficulties were encountered in obtaining complete data on costs. It was apparent that accurately measuring Net Farm Benefit for farmers in traditional agriculture would require familiarity with local farm methods and a survey effort that concentrated on farm income. In this study the survey team did not have sufficient knowledge of local methods and could not devote enough interview time to measuring farm income which was only part of an already relatively long interview. Because of the low quality of the information obtained in this section, farm income was not calculated for individual households but was instead represented in the analysis by farm size and an estimated value of average income per hectare for farms in Testour.

Appendix B: Estimated Farm Income Per Hectare

The farm income estimate used to convert hectares per man to a value measure is Stevens' Net Farm Benefit representing "... the return to family labour, all capital used (but excluding land rented in), and the operator's labour and management."[1/] The estimate is based on durum wheat production calculated for the average durum yield in Testour in 1971 and the price per quintal net of tax paid by the state Cereals Office.[2/] No data on average income from livestock production are available.

Stevens' measure is modified by deducting a one quintal per hectare rent from those who owned their land as well as those who farmed rented land. One quintal per hectare appears to be the standard in-kind rental rate for unirrigated land in Testour. Deducting rent from those who owned their land reflects the assumption that a migrant could rent his land out at the prevailing rate when he left so that the return to land would not be part of farm income foregone by migration.

Production expenses are those used by Kool in his estimate of costs per hectare for an unmechanized wheat operation in the Haut Tell, with the additional assumption that all labor is

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1/Stevens, pp. 5-7.

2/Durum is by far the most common crop in the area. The yield data is from République Tunisienne, Institut National de la Statistique, Enquête céréale: Beja, année 1971, n.d., p. 8. Prices were communicated by the director of the Office des Céréales in Testour, and represent the base price not including quality and cleanliness premiums that can amount to an additional .4 TD per quintal.

supplied by the household. Thus, the only current expenses deducted are seed (one quintal per hectare) and maintenance of draft animals (5.72 TD per hectare).[3] The return per hectare is:

average durum yield	10.0 qtl./ha
rent	-1.0 qtl./ha
seed	-1.0 qtl./ha
	8.0 qtl./ha.
	x4.58 TD/qtl
	36.64 TD/ha
draft animal maintenance	-5.72 TD/ha
Net Farm Benefit	30.92 TD/ha

For the large majority of the sample the assumptions are probably valid; i.e., all labor supplied by the household and no production costs other than animal maintenance and seed. Costs per hectare are undoubtedly higher for those with larger mechanized farms who may hire considerable amounts of labor and are more likely to use fertilizer and herbicides.[4] The greater costs would tend to be offset by the higher yields obtained on mechanized farms, but using this average return for all farms probably overestimates the return per hectare for the largest farms in the sample.[5] Only three percent of the sample belonged to households

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[3] R. G. A. Kool, L'agriculture Tunisienne: Analyse d'une économie en voie de développement (Wangeningen: H. Veenan & Zonen N. V., 1963), p. 55. The animal maintenance is based on 1959-1960 prices. No comparable data is available for 1971.

[4] Kool's per hectare cost estimate for a 200 hectare mechanized operation is nearly twice that of the traditional cost per hectare. Kool, pp. 55-57.

[5] For the gouvernorat of Beja the average durum yield on mechanically seeded land was 2.4 quintals per hectare greater than the overall average. (Enquête céréales: Beja, année 1971, p. 8.)

with operated farms of 50 hectares or more (40-50 hectares is considered by Kool to be the minimum size for a profitable "modern" operation), so the total effect of the bias may not be very great.[6/] However, a larger proportion of the sample belonged to households that used some paid labor and fertilizer, and/or hired machinery for soil preparation and harvest. To the extent that these result in increased per hectare costs not offset by above average yields, the bias from using the single average return will be more important.

In calculating farm income the 30.9 TD/hectare estimated return was multiplied by the hectares per man measure for each individual in which irrigated land is weighted by the factor 5. Thus, the assumption that the return per hectare of irrigated land is five times that of unirrigated land is maintained. There are no cost data available that are suitable to irrigated agriculture in Testour, precluding the calculation of a separate return for irrigated land.

A more important fault with this estimated return is that it does not take into account the cropping rotation patterns followed by farmers in Testour. Thus, the 30.9 TD annual return assumes that all unirrigated land in an individual's farm was planted in 1971-1972, whereas some would typically have been left fallow. This would tend to overestimate the average return per hectare for the farm as a whole.

6/Kool, p. 58.

According to an agricultural agent in Testour the most common rotation among traditional farms consists of two years of wheat followed by a year of fallow. Occasionally, traditional farmers with very limited land holdings plant wheat every year with no fallow period. Mechanized farms typically use a three-year rotation of wheat, barley or oats, and fallow; but there are other combinations, including a two-year wheat-fallow rotation, that are sometimes used on both traditional and mechanized farms. Thus, there is no unique system with the rotation differing between farms and also between parcels of land within individual farms. Data were not obtained for the rotation system used on the individual farms in the sample.

To evaluate the sensitivity of the results to using a different per hectare return, an alternative estimate was calculated for a two-year wheat-fallow rotation where the average durum yield would be obtained once every two years. The one quintal per hectare rent was deducted for both years, but the seed and draft animal costs were deducted only once when the land was planted, following Kool's method. This estimated average annual return based on a two-year rotation is 13.2 TD, less than half the estimated return for annual cropping.

Neither estimate is very satisfactory, but they seem to represent the extremes with the true value falling somewhere in between. Both estimates were used to convert hectares per man to a monetary farm income measure. In discussions with others familiar with agriculture in the Haut Tell, it appeared that the

higher estimate was probably closer to the true value of farm income per unirrigated hectare in 1971-72 if allowance is made for the value of fallowed land and straw for animal feed, and farm income from livestock and other sources. Hence, the probability estimates reported in the text are based on the higher estimate, although the effects of using the lower estimate of 13.2 TD per hectare as an alternative are also noted.

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