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DEVELOPMENT CENTRE STUDIES

MICRO ECONOMY-WIDE MODELS FOR MIGRATION AND POLICY ANALYSIS:

AN APPLICATION TO RURAL MEXICO

by
J. Edward Taylor

PARIS

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Foreword

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Preface

Rising concern about international migration is increasingly expressed in international discussion of development issues. Concern stems both from the perception of migration as a threat to social stability in some migrant-receiving countries and from the sense that migratory pressures are more likely to increase than to decrease in the coming years. The latter reflects a view that persistent migratory outflows from some developing countries result in part from the sense of insecurity brought about by the lack of productive employment opportunities and low, sometimes declining, incomes in many types of employment.

What can be done to improve employment prospects? And what can migrant-receiving countries do to help this process, particularly in the countries where migrant outflows are heavy? How quickly can migrant behaviour be modified as a result of such efforts? These and related questions are much debated and the answers are far from conclusive. Among other issues, we need to understand much more about the impact of migration on the families from which migrants are drawn and on the communities of origin more generally. As a part of this process we also need to sharpen our analytical tools and improve and extend the data needed for their application.

Professor Taylor's book is addressed to this problem. He uses data from rural household and farm surveys to estimate a micro economy-wide model of a typical migrant-sending village and then uses the model to examine the economic impacts of migration. The surveys were undertaken in Mexico, one of the most important countries of high international out-migration, both temporary and long term. The micro-model used in the estimations is a form of aggregate computable general equilibrium (CGE) model, a modelling structure which is able to capture complex linkages and feedbacks of village production and expenditure. Simulations based on such models are likely to offer a more realistic view of the impacts of policy and market-induced change on village economies.

Applied to migration, the approach permits estimation of the effects on household village incomes and expenditures in a much more complete way than is possible ıg conventional methods. In structuring his enquiries and in deriving his empirical ılts, Professor Taylor also draws on new insights into migrants' behaviour based approaches which explicitly link migration to family decision making, where ittances are used to reduce the risk of large fluctuations in income and to overcome ket failures that constrain household investment and production. Since the changes ıigrant households' spending levels and patterns also influence demand for goods services in village and regional markets, there are spill-over effects on the village regional economy.

Using this approach, a variety of potentially policy-relevant results are obtained, ıe of which are significantly different from conventional approaches based on less ıplete modelling and estimation. Such results can provide some help to policy kers, notably in uncovering and illustrating the complexities of the issues to be lt with. However, to provide policy guidance, it would be necessary to move beyond comparatively modest scope of empirical work as it has been thus far carried out he author and others, to much broader enquiry based on a wide variety of conditions l including regional centres as well as villages. Professor Taylor argues that such rk is now well within the power of modern data processing methods and would resent a more purposeful and perhaps useful application of the considerable ources that countries such as Mexico expend through their national statistical offices the collection of data obtained through farm and household surveys. In brief, the ge is set for a new and exciting marriage — a marriage between data that is reasingly less costly to collect and more and more powerful analytical methods, ıable of generating more complete and coherent answers to a wide range of policy-evant questions.

Jean Bonvin
President
OECD Development Centre
November 1995

Executive Summary

The impact of international migration on the local economy of the migrant-sending areas is not well understood and is often misrepresented. Problems arise both from the lack of data and from inappropriate uses made of the data that are available, principally remittance data. This study is mainly directed at showing how data generated from purpose-specific surveys, in combination with the use of improved, more sophisticated methods of analysis, lead to a better grasp of the impacts of migration on the local economy. The application is to rural Mexico.

What motivates families to send family members to other countries as migrants? The opportunity to increase family income is clearly one factor, as is the opportunity to diversify the sources of income. In part reflecting the large role played by remittances, rural Mexico has a highly diversified structure of incomes with (in comparison to other developing countries) a small share derived from crops. Remittances are even more important as a source of cash income, enabling higher family consumption levels in general, but especially greater outlays on higher value foods and non-agricultural products.

In developing countries, especially in rural areas, markets are frequently imperfect and may be entirely lacking (often the case with respect to credit or insurance). Such market deficiencies prevent households from making best use of the production and income-generating possibilities open to them. Migration can be important as a means of enabling households to overcome or at least to weaken the impact of such constraints. Thus far, little research effort has gone into measuring such effects, but what evidence there is, including that gathered in Mexico, suggests that they can be quite powerful. New investments made possible by remittances may induce a strong positive effect on output. For this to happen, factors such as technology, market connections and prices must be sufficiently favourable for new investment to be worthwhile. Thus positive impacts of migration on local investment may be thwarted or dampened by combinations of adverse policies and lack of infrastructure or farm technology.

Since economic linkages among households transmit the impacts of migration from migrant households to others both inside and outside the local village or regional economy, measuring the impact of migration requires an accounting of many household

is and activities including labour activity, income, investment and consumption. ch early work aimed at measuring the wider impact of migration on villages mmunities was undertaken using Social Accounting Matrix (SAM) techniques. Such niques have often been used to estimate so-called expenditure multipliers defining final impact on expenditures due to an injection of new spending from remittances. sures indicate quite large impacts — double or sometimes more than double the al expenditure injection. However, in the case of Mexico, the village expenditure tiplier tends to be relatively low because of the large leakage into non-village enditures. These leakages convert local income linkages into regional and rural-an growth linkages.

With disaggregation of the village community into large holders of land, llholders and landless people, further insights into the impact of spending from ittances can be obtained. In the case of Mexico, results suggest that the landless d either to undertake little migration or to move the entire family unit. Thus the ct benefit of remittances to the landless remaining in the village appears to be ll. This group also gains little indirectly, from the stimulus to village production ught about by remittances, because remittance-induced additional production seems n to be concentrated on less labour-intensive activities such as cattle raising. In trast, small-holder families are proportionately the biggest beneficiaries both from ct effects as remittance receivers and from the indirect effects.

In its simple and most widely used forms, the SAM technique can produce urate estimates of total effects on the village economy only where supply elasticities very high — in conditions of surplus labour locally and readily available remental supplies of other resources such as land and transport. While these nditions are sometimes found, it is much more likely that imperfect markets and ource constraints would bring about significant price effects as demands for locally-oduced outputs change. These price effects will influence both the scale and the tribution of benefits, perhaps substantially modifying the effects measured from AM-based multiplier estimates.

Dealing with this problem requires the use of a (computable) general equilibrium GE) model of the village (or perhaps regional) micro-economy. Application of the GE technique requires all the data needed for the SAM approach, plus specification d estimation of the major types and forms of economic relationship within the icro-economy. This includes production functions for each type of village productive tivity, migration-response functions for each household and migration type .e. domestic and international) and expenditures functions. Local general equilibrium nstraints are imposed on markets for goods and factors, with prices determined ogenously in the case of tradables and endogenously in the case of non-tradables.

Once the basic model is constructed, it is possible to quantify the effect of varying e assumptions relating to market imperfections, the degree of openness to the outside orld, etc. These elements may at least partially be influenced by policies so that the nsitivity of the results to varying assumptions can be used to indicate order-of-magnitude impacts of changing policies (e.g. affecting returns to migratory labour, access to markets for crops, rural infrastructure). A variety of policy-relevant cases are illustrated in the study.

There are likely to be important trade-offs to be tackled as part of the process of policy reform since the policies are likely to have different — in some cases very different — effects among types of rural family. In the long term, policies which enable rural communities to become better integrated with regional and international markets are critical to increasing the supply response of the household farms. On the other hand, by transforming some non-tradables into tradables, market integration adversely affects some producers (of the previously non-traded goods) and it may adversely affect village incomes in the short term. The study also illustrates how migrant remittances enable rural households to grapple with problems due to the lack of institutions and markets for credit; in the absence of better credit facilities, improved production opportunities could lead to more migration in the short run to support the financing of new investments.

Micro economy-wide modelling using CGE techniques has been developing rapidly in recent years, although the technique is still relatively young, with potential for more applications. For example, thus far the results for Mexico have been based on sampling undertaken in a very small number of villages. More work could readily be justified: *(a)* to extend the scope of the model to include effects on the regional economy and specifically on rural market towns and *(b)* through a more precise sampling of different types of village where migration plays a different role and the farm systems display different features. However, because of data deficiencies, there are limits to what can be done through purely scholarly studies of the sort that has been undertaken for this book. The data collection capabilities of the public statistical services need to be brought into play in carrying out such purpose-specific surveys. For this to happen will require that the policy-making authorities themselves be much more active in insisting that data collection be tailored to the specific requirements of policy.

Chapter 1

Introduction

The relationship between international migration and economic development in migrant-sending areas is one of the most important and misunderstood in development theory and practice. The findings of development experts in a range of fields often are pessimistic with regard to the effect of international migration on development[1]. The central theme of this book is that past studies provide an incomplete and probably misleading picture of the interaction between migration and development. A new modelling approach is needed to explore this interaction and, more generally, to understand impacts of policy, market and other changes on rural economies in less developed countries. The present research examines migration-development interactions and their policy implications utilising micro economy-wide modelling techniques.

Micro economy-wide models occupy a middle ground between household farm models and aggregate, computable general equilibrium (CGE) models for policy analysis. Like aggregate CGEs, they capture complex linkages and general-equilibrium feedbacks of production and expenditures in the economy. Like household farm models, micro economy-wide models are rooted in the micro economy and are constructed "from the bottom up", using household farm survey data. Simulations using micro economy-wide models offer a ground-level view of the likely impacts of exogenous policy and market changes on local economies. Such a perspective is critical for understanding the interactions between international migration and economic development in migrant-sending economies, yet it is generally unavailable from existing studies.

Migration and the Household Farm

With few exceptions, pessimistic findings with regard to the effects of migration on development in migrant-sending economies are based on surveys of remittance use by household farms. These offer a limited and potentially distorted picture of the influence of migration on income, investment and employment.

Observed remittances (net of migration costs) exaggerate migration's contribu-ı to household finances if the migrant contributed positively to household income ıome; that is, if the marginal product of the migrant's labour prior to migration, net subsistence costs to the household, is positive (Taylor, 1987). The migrant's ıtribution to household income in migrant-sending areas is the difference between nittances, net of migration costs, and the income the migrant would have contributed the household by staying at home.

The New Economics of Labour Migration

The effect of *migration* on household income may not be the same as the *migrant's ntribution* to household income, however. This is because migration and remittances ay influence household income from other sources, as posited by the new economics labour migration (hereafter NELM), pioneered by Stark (1982) and documented the few micro-econometric studies that have attempted to test it (Lucas, 1985; ıylor, 1992; Taylor and Wyatt, 1994).

In the NELM, migration is hypothesised to be an effort by households to vercome market failures that constrain local production. Market failures include issing or imperfect credit and insurance markets, which force household farms to lf-finance their production and to self-insure against income risk. Migrants provide ıeir households with liquidity, in the form of remittances, which may be used to nance new production technologies, inputs and activities. They also offer income ısurance, by providing households with access to an income source (migrant mittances) that is uncorrelated — or perhaps negatively correlated — with farm ıcome. If credit and risk constraints are binding and migration enables families with ıigrants to overcome them, migration should have a positive effect on local production.

The NELM represents a fundamental change in the way the connection between ıigration and development is conceptualised and modelled. Previous research ecoupled the determinants of migration from the impacts of migration on sending reas. In the new economics of migration, the origins of migration (e.g., households' lesire to overcome market failures that constrain local production) imply migration's ıutcomes for development (e.g., a positive effect on local production, as remittances ınd implicit risk contracts with family migrants enable households to overcome market ailures). This view leads to migration and development hypotheses that are beyond he purview of traditional neoclassical models, and it has provided the inspiration for ıew surveys to collect data to test these hypotheses. NELM-inspired surveys gather lata on all aspects of household farm production and income, because potential correlations between migration and other income sources generally make it impossible o model migration and other aspects of household farm economies separately. That is, they are whole household farm surveys (Adelman and Taylor, 1994; Taylor, 1992).

Once one ascertains the net impact of migration on household income, which few researchers have attempted to do, relying on remittance use to estimate the impact of remittances on expenditures, including investments, poses a conceptual problem. The response to the survey question "How did you utilise the remittances you received last year?" may provide no information about the marginal impact of these remittances on household expenditures. The appropriate question is "How do remittances alter your expenditure patterns?"

Few respondents can provide a quantitatively useful answer to this question. The availability of remittances may make possible relatively large expenditures — a team of oxen, a refrigerator, a plot of land. Remittances may be earmarked for these uses, in which case responses to a remittance-use survey may, indeed, be useful. However, remittances are likely to change all household expenditures at the margin, in ways that cannot be revealed by a remittance-use survey. Economic theory predicts that a net increase in household income through migration stimulates the demand for all normal goods while reducing the demand for inferior goods. It increases savings if the marginal savings propensity is positive. Savings assume many forms, from physical capital investments (a plough, livestock) to transfers (land) to housing to human capital investments (schooling of family members who do not migrate). All of these activities represent investments, although they may differ in the degree to which they stimulate incomes and employment in the migrant's household.

Migration may produce income-source effects independent of its contribution to households' total income. The presence of migrants may influence household income risk, remittances may be perceived as more or less permanent than other sources of income, or migrants may represent links to markets for goods that are unavailable locally. An anthropologist might contend that there are shifting identities and preferences in the context of international migration. A household receiving part of its income from migrants working abroad may display expenditure patterns that are different from a household with the same income level, but exclusively from local sources (Fletcher and Taylor, 1992).

In short, the marginal impact of migration on household income and expenditures must be estimated, using complete household (or household farm) income and expenditure data. A remittance-use approach is certain to be partial and likely to yield misleading findings. The household needs to be treated as a whole economy if there is any hope of understanding the complex impacts of migration on the household economy.

A Micro Economy-wide Approach

A micro household (or household farm) approach ignores interactions among households. Because of this, even an analysis that treats individual households as whole economies is partial. If economic linkages among households are important,

o household (or household farm) models may produce misleading findings about mpacts of migration on migrant-sending economies. At the very least, they will to underestimate these impacts.

A simple example illustrates the shortcomings of a micro household farm oach to modelling migration-development interactions. Suppose that a village sehold (Household A) with a total income of 100 units increases its income to 150 ending a family member abroad. That is, (a) the remittances the migrant sends ıe, net of (b) migration costs, minus (c) the income the migrant would have tributed to the household by staying home, plus (d) the migrant's consumption at home, equals 50 income units. (Note that a survey that elicited (a) without ing out (b) *and* (c) would overstate the direct impact of migration on household ɔme, possibly by a significant margin. Ignoring (d) would have the opposite effect.) econometric estimate of the effect of this income increase on household enditures finds that all of the 50-unit income increase is allocated to consumption. ıe is allocated to what most researchers would consider to be productive investment. :h a finding would appear to support the pessimistic view that income from migration quandered on consumption.

Suppose, however, that the consumption goods whose demand increases are ıduced by another household within the village (Household B), using 40 units of nily labour and 10 units of intermediate inputs "imported" from outside the village. rthermore, suppose that the investment propensity of Household B is large, say, on order of .20. The second-round effect of the 50-unit increase in Household A's ɔme from migration will be a 50-unit increase in production, a 40-unit increase in ɔusehold B's income and an 8-unit (.20 times 40) increase in village investment. At end of the second round of the village "remittance multiplier", the total increase village income will be 90, of which only 50 units are in the migrant household. timating the total impact of Household A's gains from migration on income and vestment in the village requires carrying this calculation to its limit[2].

SAM Multipliers

Village remittance multipliers, estimated using social accounting matrix (SAM) chniques, suggest that economic linkages among households are important in shaping igration's impact on migrant-sending areas. For example, remittance multipliers on illage income are on the order of 1.87 for a Mexican village studied by Adelman, aylor and Vogel (1988). Subsequent SAM multiplier studies confirm the importance f inter-household linkages in villages in India (Subramanian and Sadoulet, 1990; ubramanian, 1995), Java (Ralston, 1995), Senegal (Golan, 1995) and a Kenyan illage-town economy (Lewis and Thorbecke, 1992 and 1995). SAM multiplier models ave been an important advance in village and regional modelling, because they ighlight the economic linkages among households that transmit exogenous changes n policies or markets through the local economy. SAM remittance multipliers for Mexico reveal an important finding: *Many of the benefits of remittances accrue to households other than the ones that receive remittances.* That is because income linkages between migrant and non-migrant households transfer the benefits of migration beyond the remittance-receiving household. They also may be manifested largely outside the traditional farm sectors, a result of strong linkages between the farm and non-farm economies (e.g., see Adelman, *et al.*; Turnham, 1993, pages 114-118). The sheer magnitude of remittances and their effect on household incomes and expenditures make it likely that international migration is a major stimulus to less developed country (LDC) economies[3].

Limitations of SAM-Based Village Models

The limitations of input-output models, of which the SAM is a highly evolved example, are well known[4]. SAM multiplier models are constructed on the assumption that production and expenditure functions are linear, described by fixed input-output coefficients. They are demand-driven models, in which supply is perfectly elastic. That is, any increase in demand translates, by assumption, into an identical increase in supply. There are no resource constraints on the ability of production sectors to respond to increases in the demand for their goods or services. As a result, exogenous increases in income (e.g., remittances) produce only quantity effects; prices are unchanged. In fact, price effects of market or policy changes are ruled out by assumption. Because of these limitations, the relevance of SAM multiplier models for policy analysis depends critically on the context in which they are used. These models are most useful in economies characterised by excess capacity, where increases in demand are likely to exert little upward pressure on prices. They are least applicable in economies where non-linearities and resource constraints have an important influence on expenditure patterns and on supply response. In the latter cases, non-linear models capable of capturing the effects of policy changes on both quantities and prices are needed.

Imperfect or missing markets for some factors and commodities, a pervasive feature of rural economies in LDCs, also limit the usefulness of regional SAM-based models for policy analysis. Where high transactions costs cut off local economies or individual households from outside markets, shadow prices within local economies or households become critical in determining how resources are allocated. One salient example at the level of the household economy is family labour. If hired labour is not available or is not a perfect substitute for family labour in household farm production, then the family's (endogenous) subjective value of time, not an (exogenous) market wage, guides the allocation of scarce family resources in production and also in consumption activities. Similarly, if high transactions costs (of marketing grain surplus or of accessing consumer markets) encourage households to be self-sufficient in grain, production and consumption decisions will be influenced by the family's subjective value of grain, not by a market price exogenous to the household. Some implications

of missing markets for modelling microeconomic behaviour in individual household farms are examined elsewhere (Singh, Squire and Strauss (SSS), 1986; De Janvry, Fafchamps and Sadoulet (DFS), 1991).

More often than not, exchange relations exist among households within local economies; that is, it is unusual to find a household that is entirely isolated from markets in the sense assumed by SSS and DFS. Nevertheless, local economies in LDCs often are cut off from regional and national economies by high transactions costs for some factors and goods. In many instances, goods that economists generally would consider to be tradable are, in practice, non-tradable as a result of poor access to markets caused by marketing and transportation infrastructure that are backward and inefficient. In Mexico, for example, despite a government guaranteed price for corn that was more than double the world price in the early 1990s, most corn farmers did not market their crop. Isolated by high transactions costs, many local corn economies groped for their own equilibrium prices and quantities, influenced tangentially, if at all, by the policy price. At the same time, Mexico's *ejido* (land reform) laws inhibited the functioning of land markets and converted what would have been market rental rates on land into household-specific shadow rents.

Given the potentially critical importance of endogenous prices and resource constraints in local economies, the scope for using fixed-price models for policy and market analysis probably is limited. Ingenious efforts have been made to incorporate inelastic supply response into village SAM multipliers and to avoid the assumption that marginal and average budget shares are identical (Lewis and Thorbecke, 1992; Subramanian and Sadoulet, 1990; Parikh and Thorbecke, 1995). These, however, are not able to account for price effects and thus do not provide a window into the interactions among policy and market changes, price adjustments and quantity effects. Exploring these interactions requires a non-linear, endogenous-price modelling approach.

Micro Economy-wide Modelling

The analysis of migration and development in this book is based on computable general equilibrium (CGE) techniques developed to model the impacts of policy, market and environmental changes on village and village-town economies (Taylor and Adelman, 1995). A village SAM, constructed using household farm survey data, is the basic data input required to construct a village-wide economic model. However, village economy-wide models overcome the limitations both of micro, household farm models and of linear, fixed-price multipliers. They offer a "micro" complement to aggregate CGE models for policy analysis by highlighting local economy-wide impacts of policy changes. To date, village-wide models (and in one case, a village-town model) have been estimated and used to explore the impacts of policy, market and environmental changes on small regional economies in five different country settings. This modelling approach is increasingly being used to model economies that extend beyond the village; thus, it is now accurate to call it "micro economy-wide modelling."

Micro economy-wide models are distinguished by their micro, bottom-up approach to economy-wide modelling. This is in contrast to aggregate CGEs, which have their roots in the macro economy. "Macro" CGE models are built from the top down, using aggregate data supplied by government statistical bureaux. Estimation of microeconomic relationships using survey data is not central to those models. Often, required parameters cannot be estimated from available aggregate data; hence, there tends to be a reliance on guesswork and sensitivity analysis. High levels of aggregation tend to blur microeconomic interactions that are critical for policy analysis.

Micro economy-wide models of rural areas begin with a complete micro model of household farms and, in the case of non-agricultural activities, household firms. This modelling departs somewhat from the traditional household farm modelling approach in its focus on different groups of households, delineated, for example, by socioeconomic status or other variables of interest, instead of on a "representative" household farm. It also emphasizes the diversity of economic activities that typically characterises the economies of individual household farms in LDCs.

Once the production and expenditure sides of the household farm model have been estimated econometrically for each household farm group, a CGE framework is used to link together household farms (and household firms) within the economy of interest (for example, the village, village-town, county or region), highlighting interactions both among family production units and other institutions within the local economy and between the local economy and the outside world[5]. If some production is carried out separately from household units (e.g., a plantation, factory or other purely production enterprise), mixed models highlighting the interactions among households, household farms and firms are possible.

The integration of production and household units into a CGE framework is accomplished by imposing local general-equilibrium constraints on markets for goods and factors; by including local institutions besides households, firms and household production units; and by incorporating a model of trade. In the case of non-tradables, for which local economies (or some group of households within them) are cut off from outside markets, the general equilibrium constraints determine vectors of local prices and quantities. In the case of tradables, prices are exogenous, determined by outside markets. General-equilibrium constraints then determine net exports from the local economy to the rest of the world. These net exports are a local-economy analogue to the marketed surplus in neoclassical household farm models with perfect markets. They represent surplus production not demanded by other households within the local economy. Because of this, they are a more accurate representation of the supply of agricultural output available to non-agricultural households than the marketed surplus concept in household farm studies.

Migration in Micro Economy-wide Models

Changes in the environment of migration (for example, in remittances) affect local economies in different ways, depending upon how the costs and benefits of migration are distributed across households, on the structure of production and on expenditure patterns in the local economy, and on the extent to which local markets for goods and factors are linked with the outside world.

The impacts of migration are limited in a perfect neoclassical world, which is rare or nonexistent in practice. If the local economy is completely integrated with outside markets, it is a price taker with respect to the rest of the world. This is analogous to the small-country assumption in trade theory, and to the usual treatment of prices in micro, household farm models (e.g., Singh, Squire and Strauss, 1986, Ch. 1; for exceptions, see de Janvry, Fafchamps and Sadoulet, 1991 and Singh, Squire and Strauss, 1986, Ch. 2).

If all prices are determined outside the local economy, the effects of migration on local prices are ruled out. Because prices do not change, first-order conditions for profit maximisation are unaltered, and changes in the migration environment do not affect village production. They do, however, influence household incomes and change household expenditure patterns. With production in the local economy unaltered, changes in household expenditures influence trade patterns between the local economy and the outside world. For example, net exports of normal goods decrease when local incomes increase, while exports of inferior goods rise. In short, migration affects income and marketed surplus but little else within a strictly neoclassical migrant-sending economy. Most of the indirect effects of migration on income are transmitted outside the local economy through trade.

The strictly neoclassical village produces only tradables. When there are non-tradables, changes in demand by households that receive remittances affect local prices, and through them, production. For example, a migrant household's increased demand for construction services (e.g., to build a house) both stimulates the local construction sector and exerts an upward pressure on construction prices. The existence of non-tradables creates local income linkages and keeps more of the short-run effects of migration within the village. In the longer run, however, a lack of access to outside markets may constrain the demand for local production and limit the extent to which migrants promote development by supplying households with investment capital.

The new economics of migration hypothesises migration effects on production in individual household farms because of missing or imperfect markets. If a local credit market does not exist and financial constraints on household farms' production are binding, a loosening of these financial constraints through migration should stimulate production. Without migration, liquidity constraints force household farms to produce (and to demand purchased inputs) at below the profit-maximising levels. Increased liquidity resulting from migration allows them to operate closer to their profit-maximising optimum, i.e., more like the neoclassical household farm (e.g., that envisioned by Singh, Squire and Strauss).

If a local credit market exists (e.g., in the form of informal money lending) but is cut off from outside (regional) credit markets, the savings-investment constraint is binding for the local economy but not for individual household farms. In this case, increases in savings generated by migration ease local economy-wide investment constraints, reducing the local shadow value of savings. This makes more financing available for lower-return local projects.

Migrants' contribution to investment in the migrant-sending economy can have both short-term and long-term impacts on production and incomes. In the short run, it increases the investment demand for goods and services supplied inside and outside the village. If some of this demand is for non-tradables, it will stimulate local production and create income linkages with other households, including non-migrant households. In the long run, investments by migrant households increase productivity in household farm production, e.g., by loosening capital constraints, thereby unleashing new rounds of income linkages in the economy.

Micro economy-wide models are easily designed to capture the investment effects of migration on local economies. When a local credit market is missing, a savings-investment constraint is imposed on each individual household farm. A marginal increase in income through migration loosens this constraint by increasing savings by an amount equal to the household's marginal propensity to save. The shadow value of savings, the effect of increased savings (and thus, of migrant remittances) on households' future utility of income, differs from one household to another. This, in itself, may help explain differences in migration propensities across households. It also implies different marginal impacts of migration on production, and thus on incomes, in different households. When a local credit market exists but the regional credit market is missing, rather than having a savings constraint on each household (or household-group) there is a single local economy-wide savings constraint. Increased savings by households with remittances can then increase the availability of savings for investment by other households.

Other kinds of market failure may militate against these positive effects of migration on local production. Foremost among these is the reliance of household farm production on family labour, for which perfect substitutes may not be available in a local labour market. Typically, there is a high cost of separating management from labour in family-farm production (Bardhan, 1988). Even if hired substitutes for family labour are available from a local labour market, financial constraints may force households to rely on family labour instead. (The value produced by hired workers, like other purchased inputs, is not available to the household until after it incurs the cost of using workers, i.e., until after the harvest.)

The loss of family labour to migration drives up the opportunity cost (i.e., shadow value) of family time in local production. This may lead the household to withdraw some of its labour from local production, reducing output in the short run. In the long run, if migrant remittances increase household farm incomes and loosen financial constraints on production, an initially negative effect of migration on production (due to the loss of labour force) may turn positive. This is consistent with the pattern revealed in econometric studies by Lucas (1985) and Taylor (1992).

Family time constraints are incorporated into micro economy-wide models in two ways: First, by including family labour as a separate input in household farm production functions; and second, by imposing a constraint on the total amount of family time allocated to production, migration and leisure activities. Separately or in combination with other general-equilibrium constraints (e.g., for savings and investment), family time constraints account for important factor-market linkages within local economies. They may dramatically alter the impact of migration on these economies.

The Organisation of this Book

This book is organised as follows. Chapter 2 presents a critical review of economic research on migration and household farms. Chapter 3 presents the basic micro economy-wide modelling approach, starting with the SAM-based model and building up to the CGE. In Chapter 4, micro economy-wide (CGE) models are used to explore the impacts of migration and remittances on three stylised village economies in Mexico.

Throughout the book, we draw heavily from the existing literature on migration and economic development to present theories and test them against the empirical economic record. The analysis, especially the policy experiments that are the foundation for Chapter 4, also draws from the more than 10 years of field research carried out in rural Mexico to explore migration and development interactions there. Naturally, the findings of our economy-wide modelling analysis are more applicable to this Mexican context than elsewhere. In light of a rather limited international data base to test the impacts of migration on rural development, we have to rely on economic theory, together with a small number of case studies, to advance our understanding and to inform policy design. There is a dire need for the generation of new data capable of supporting rigorous empirical tests of migration and development interactions in migrant-sending regions. It is our hope that the present research, and the micro economy-wide modelling approach upon which it is based, will aid in guiding such a data-collection effort.

Notes

1. For example, a review of country studies in Papademetriou and Martin (1991) concludes that migration has not contributed to economic development in Africa, Southern Europe, Asia or Latin America. Martin (1991) argues that labour migration "rarely reduces the economic gaps which encouraged workers to emigrate" and tends to "increase the dependence of emigration countries on immigration countries." Although migrants often send back substantial income in the form of remittances, it is very difficult for countries to mobilise this capital to create employment and spur economic growth. A survey of research on the economic effects of emigration in Mexico by Durand and Massey (1992) concluded that "community studies are remarkably unanimous in condemning international migration as a palliative that improves the material well-being of particular families without leading to sustained economic growth within migrant communities." Reichert (1981) refers to a Mexico-to-US migration "illness" or "syndrome" that undermines local development; Weist (1979) calls it an "addiction", and Stuart and Kearney (1981) characterise it as a "dangerous dependence". These conclusions are based on findings that US earnings are spent mostly on a few "non-productive" ends: basic needs, home remodelling or construction, and the purchase of consumer goods.

2. This example — and SAM multipliers generally — assume a Keynesian world of underemployed resources; see next section and also Chapter 3.

3. Official IMF estimates place total international migrant remittances at $75 billion per year, an amount 50 per cent higher than official development assistance (Russell and Teitelbaum, 1992). Migrant remittances are the primary source of foreign exchange for a number of countries in the world today. Migrants were the leading export of the former Yugoslavia, of Morocco and of Lesotho, where they reach 44 to 46 per cent of total merchandise export earnings. In Mexico, a large, diversified semi-industrialised country, official migrant earnings of $2.3 billion equalled 10 per cent of total export earnings, making migrants the third largest source of foreign exchange earnings after oil and tourism. These figures understate actual international migrant remittances, because they do not include clandestine or in-kind remittances. They also distort the world distribution of remittances, because remittances are far more likely to flow through unofficial channels to some migrant-sending countries than to others.

4. For a critique in the context of village-wide modelling, see Taylor and Adelman (forthcoming).

5. In a project currently under way, micro economy-wide modelling is being used to model a transnational economy consisting of villages and towns in El Salvador and their community of migrants in the United States.

Chapter 2

Migration and the Household Farm

Policy makers frequently associate household farm economies in LDCs with crop production[1]. However, research over the past decade offers evidence from a diversity of country settings that household farms are highly diversified. Completely specialised household farms are rare. Typically, household farms obtain cash or, in the case of subsistence production, implicit income, from a combination of staple, cash crop, livestock, and non-agricultural production; wage labour; and migration by family members internally or abroad. The importance of migration and other non-crop sources in household farm "income portfolios" frequently is striking; surveys utilising a whole household farm perspective report large shares of non-crop income in total income.

Village studies in Mexico reveal a small (13 per cent) and decreasing share of net crop income (including the value of subsistence production) in total income in the 1980s (Taylor, 1995). Diversification is characteristic of the West African semi-arid tropics. For example, the shares of crop income in total income in three regions of Burkina Faso surveyed by ICRISAT ranged from 37 per cent to 60 per cent (Reardon, Delgado and Matlon, 1992). Village data from an ICRISAT survey in Western India reveal that crop production accounted for 43 per cent of total production value-added there (Subramanian, 1985). A study of economic linkages in a small regional economy in rural Kenya found that crop production accounted for less than 40 per cent of total income (Lewis and Thorbecke, 1992 and 1995). Non-crop income constituted 44.5 per cent of total income in a Javan village studied by Ralston (1995).

Migration and Household Farm Income Portfolios

Migration income represents an important share of total income in many household farms. For example, income remitted by rural-to-urban and international migrants accounted for 33 to 40 per cent of total household income in two Mexican villages (Stark, Taylor and Yitzhaki, 1986)[2], 11 per cent of rural household incomes in the Kenya study by Lewis and Thorbecke (1992 and 1995), 12 per cent in the Java

y (Ralston, 1995), 26 per cent in the West India study (Subramanian, 1995), 10 per in the Sahelian zone of Burkina Faso (Reardon *et al.*, 1992), and 12.5 per cent in ıdy of rural Egyptian households by Adams (1989).

Because household farm economies are diversified across an array of activities, uding migration, and because rural households operate under time and other ırce constraints, there are trade-offs between migration and other income activities d between these and leisure). Household farm income activities use various ıbinations of family and hired labour, land, physical capital and purchased ermediate inputs. In a risk-free neoclassical world of perfect information and rkets, the prices of these inputs are exogenous to the household. Given these prices, fit maximisation guides the efficient allocation of resources across production ivities. Land is allocated to different uses up to the point where the marginal product land is the same across activities (and equal to the market rental rate, if there is a d market). Family time is channelled into migration and non-migration activities til the value of the marginal product of family labour is identical across activities ıd equal to the market wage, if a labour market exists outside the household and if nily and hired labour are perfect substitutes in household farm production[3]).

If markets for one or more factors are missing, or if hired inputs are imperfect bstitutes for family inputs (e.g., labour), unobserved "virtual" or "shadow" prices ithin the household guide family resource allocations. These "virtual" or "shadow" ices represent the family's subjective valuation of goods and factors for which arkets do not exist (Singh, Squire and Strauss, 1986; de Janvry, Fafchamps and adoulet, 1991). For example, if lack of access to a well-functioning grain market rces a household to be self-sufficient in grain, the family allocates its time to grain roduction until the marginal utility value of family time in grain production equals ıe family wage. The family's increased utility from grain consumption represents ıe benefit from allocating more time to grain production. The family wage represents ıe utility cost, in the form of foregone earnings (or leisure).

In this general microeconomic household farm model, with or without market ailures, changes in returns to the household from migration potentially alter the entire amily income portfolio, and changes in returns to non-migration activities (e.g., due o a change in market prices for staples or other goods) have an impact on migration. Other things being the same, when there is an increase in the family's subjective valuation of the returns to an income activity, the family generally allocates more of its scarce resources to the affected activity and fewer resources to other activities.

Regrettably, there has been little effort to model how the returns to migration d local income activities shape household farm resource allocations. Taylor (1987) und that the Mexico-to-United States migration elasticity (the responsiveness of exico-to-United States migration to changes in the returns to Mexico-to-United ates migration relative to local work) is on the order of 2.0. That is, a 1 per cent crease in (expected) net remittances relative to income from local work is associated with a 2 per cent increase in migration. Either an increase in expected remittances (e.g., due to a devaluation of the peso) or a decrease in the returns to labour in the local economy triggers more migration.

The scarcity of estimates of migration elasticities at the micro level is not surprising. Obtaining such estimates is demanding, both methodologically and with respect to data. It requires estimating the returns to working locally and expected (net) remittances. One or another of these estimates is almost always hypothetical; returns to local work are observed only for non-migrants, and remittances are observed only for migrants. Because individuals are self-selected into migration or non-migration, special techniques are needed to correct for possible sample-selection bias (Heckman, 1976). Once consistent estimates of the net returns from migration for given individuals have been obtained, they can be used to estimate the effect of net returns from migration on the propensities for migration and local work.

Remittances and the New Economics of Labour Migration

Net returns from migration are a reasonable measure of the direct effect of migration on household farm incomes. Nevertheless, they may capture only part of the total (marginal) effect of migration on income. The NELM views migrants as financial intermediaries, providing their households of origin with capital to invest in other household farm production activities. Migrants also provide insurance to households. Income insurance depends on having access to an income source that is not positively correlated with local income. Incomes at migrant destinations generally are uncorrelated with incomes from local production, and they may be negatively correlated if the migrants assist village households in times of hardship; that is, if migrants act like income-insurance policies. In the context of missing or imperfect credit and insurance markets characteristic of LDC rural areas, migration by some family members may be a mechanism to self-finance local production and self-insure against family income risk. If this hypothesis holds, then migration and remittances should generate important indirect positive effects on household farm incomes, by loosening credit and risk constraints on local production activities.

The NELM was pioneered by Stark (1982). Stark and Katz (1986) formalise the argument that rural-to-urban migration, a labour-market phenomenon, is caused by imperfections in capital markets. Stark and Lucas (1988) and Lucas and Stark (1985) offer theoretical and empirical evidence (from Botswana) that remittances are part of a self-enforcing contractual arrangement between family and migrant, shifting the focus of migration theory from individual independence (as in the Todaro model) to mutual interdependence.

Stark and Levhari (1982) use a graphical presentation to argue that migration is a means to spread risk, rather than being a manifestation of risk-taking behaviour on the part of migrants. Stark's research with Rosenzweig (1989) and with Lucas (1985)

rovide some econometric evidence, using household farm data from India and Botswana, that families insure themselves against risk by placing members in labour markets outside the village, where their incomes are not likely to be positively correlated with local farm incomes.

The importance of indirect effects of migration on household farm income turns on the extent to which financial and risk constraints on local production are binding to begin with. If families do not face such constraints, then the indirect income effects of migration in a Stark-type model are minimal, and the family will have little incentive to engage in migration. If credit and risk constraints are binding, then families have a larger incentive to sponsor migrants, and the subsequent indirect effects of migration on family incomes will be large. The net direct plus indirect effect of migration on migrant-household incomes, therefore, is theoretically ambiguous.

Lucas (1985) uses aggregate, time-series data on migration from five southern African countries to South African mines to test the Stark hypothesis. His econometric analysis finds that the lost-labour effects of emigration are negative and large initially, as production in migrant-sending households falls because less labour is available for farm production. In the long run, however, agricultural productivity increases. The productivity increase may be due to the investment of migrant remittances in production activities at home — that is, a loosening of financial constraints on investments that enhance productivity. Alternatively, it may be due to risk spreading, made possible by the diversification of income through migration, which encourages risk-averse households to undertake new agricultural investments. Or it may be some combination of the two.

Adams (1991) finds that households of rural Egyptian migrants have higher marginal propensities to invest than do their non-migrant counterparts. That is, migration has a positive effect on investment that is independent of its contribution to total household income. However, policy biases against agriculture, in the form of depressed prices for farm output, discourage agricultural investments.

Taylor (1992) estimates marginal effects of migrant remittances on farm incomes and on asset accumulation over time, using matched longitudinal, micro data from farm households in one part of rural Mexico. The initial marginal effect of remittances on household farm incomes (measured in 1982) is less than unitary, that is, a $1 change in remittances produces a less-than-$1 change in total incomes of remittance-receiving households. This finding implies a negative effect of migrant remittances on non-remittance income. It is consistent with the hypothesis that the marginal product of migrant labour is positive prior to migration. Measured six years later, however, the marginal impact of remittances on total income is greater than unity: $1 change in remittances is associated with a $1.85 change in household farm total income. That is, remittances have a positive effect on non-remittance income. This finding is consistent with Stark's hypothesis that migration and remittances loosen constraints on local production, once migrants become established abroad. In the Mexican case, remittances between 1982 and 1988 have a significant positive effect on the accumulation of livestock, and households enjoy a significant positive return to their livestock investments. Subsequent research suggests that the marginal income effect of remittances is greatest in the most liquidity-constrained households, just as the NELM would predict (Taylor and Wyatt, 1994).

These studies, while offering micro-econometric evidence in support of the migration-and-development hypothesis, also suggest that this relationship is not invariant over time or across settings. There appears to be a pattern of initial negative and then positive effects of migration on non-remittance income in migrant-sending households. The positive effects clearly depend both on the magnitude of migrant remittances and on the profitability of investing in new production activities or techniques. In the Mexican case, poor crop potentials on marginal lands often limit families' incentives to invest their remittances in crop production. However, where livestock production is viable, grazing land is available, and transportation and marketing infrastructures are somewhat developed, the development potential of migration may be large. In other settings, profitable investment opportunities may be limited by environmental or market constraints, or else by government policies that turn the terms of trade against agriculture. A finding that migration negatively affects non-remittance incomes, therefore, could reflect the stage of the migration process at which the study is conducted, or it could be evidence against the migration-and-development hypothesis. In the latter case, policy biases against agriculture may break the migration-and-development link. For example, poor infrastructure or price, credit and technology policies that discriminate against small farmers may discourage migrant households from investing in new technologies or income-producing activities.

The NELM view leads to a markedly different set of policy prescriptions to reduce migration than the ones that flow from a Todaro model. According to the NELM, rather than intervening in labour markets, governments that wish to reduce out-migration should attempt to correct failures in local credit and risk markets, offering households financial and insurance alternatives to migration. These credit and risk market failures, in Stark's view, are the fundamental causes of migration. That is, a labour market outcome (migration) points the way toward policy interventions in other markets (e.g., credit and insurance). Of course, government intervention in credit markets may be less than successful, turning market failures into government failures. This raises the question of whether governments are as efficient as migrants at responding to credit and risk market failures constraining development.

Migration and Household Farm Expenditures

Household expenditures are critical in determining the impact of migration on migrant-sending economies, because they are the means by which income gains in migrant households are transmitted to others in the economy. Understanding the marginal (direct and indirect) impact of migration and remittances on migrant household incomes is a critical first step in estimating the effect of migration on

ousehold farm expenditures. In the NELM, the marginal effect of migration on income so *implies* an influence of migration on household farm expenditures, i.e., on ıvestment in local production activities.

Remittance use surveys (e.g., Oberai and Singh, 1980) focus on expenditures, ather than on marginal income effects of migration, as a vehicle to assess the impact of migration on economic development in sending areas. Migration is assumed to ıave a positive effect on economic development if respondents report spending a arge share of their remittance income on "productive investments". Those studies est on three shaky assumptions: (1) that observed remittances (net of migration costs) represent the true marginal contribution of migration to household farm income; (2) that the use of remittances, themselves, accurately reflects the marginal effect of remittances on household farm expenditure patterns; and (3) that the same families and, in some cases, the same individuals, must be both the source of migration and the agents for transforming migrant earnings into local income growth.

The arguments and evidence cited above cast serious doubt on the first assumption. The second assumption is not reasonable unless remittance checks are earmarked for specific uses and can be treated as separate from other family income sources. If households' marginal propensity to save is positive, income increases from migration should stimulate household farm savings. In the absence of regional credit markets that tap household farm savings and channel them outside the village, changes in village savings by definition must equal changes in village investments. This is an accounting identity. Often, the challenge in economic fieldwork is to uncover the specific forms that village investments assume.

If capital markets are missing within the local economy, each household farm will be bound by a savings-investment constraint. In this case, a positive impact of migration on savings necessarily results in increased investment *by the migrant's household*. Only in this case is the same household necessarily the agent in both migration and investment (assumption 3). If local capital markets exist, migrant households may function as creditors for other villagers who are primarily responsible for carrying out local investments. That is, migrants and investors in local production activities are not necessarily the same. Even if local credit markets are missing or marginal savings rates in migrant households are zero, there are other important channels through which income generated by migration may find its way into local investments. The most important of these channels, paradoxically, is migrant households' use of their income gains for consumption. We shall return to this point in Chapter 3.

The conclusion of many remittance-use studies that remittances are consumed instead of invested often rests on arbitrary definitions of "productive investments". For example, schooling, despite its demonstrated positive effect on household incomes (e.g., Taylor, 1986) often is absent from the list of productive investments. This probably is because expenditures on educating family members usually do not create direct, immediate employment and income linkages within migrant-sending economies. Housing expenditures also are absent from the list of productive investments in many studies, despite their direct stimulus to village construction activities. By contrast, expenditures on farm machinery generally are regarded as productive investments, in spite of the fact that machinery is not produced within the village economy and may even displace labour in village production, producing negative income linkages.

Income-source Effects on Household Farm Expenditures

The NELM hypothesises that migration generates effects on household farm expenditures that are independent of its contribution to total household farm income. Migration-induced increases in household income stimulate household farm production by loosening the budget constraint on investments. It also may independently promote investment by introducing a new income source into the household farm portfolio, providing the household with a form of insurance against income risk.

Because households' total expenditures are constrained by their budgets, independent source effects of migration on household *investments* imply effects on *consumption* that are independent of the contribution of migration to total income. Income from migration may be perceived as being more risky or less risky, more permanent or more transitory, than income from other sources. Migrants typically forge linkages between household farms and commodity as well as labour markets outside the village. Considerations such as these suggest an economic rationale to expect migration to have an independent, income-source effect on consumption as well as on production behaviour in migrant households.

Several empirical studies offer at least suggestive evidence that income-source effects of migration on local production and consumption expenditures exist and are important. A study of remittances and household farm expenditures in Mexico found that, controlling for total expenditures, migrant remittances had a significant effect on food-demand patterns (Fletcher, Orlove and Taylor, 1994). Families that received remittance income allocated a significantly larger share of their food budget to expensive nutrient sources (meat, dairy products) and a smaller share to beans, the traditional protein food. They also allocated a significantly smaller share of their food-production budget to firewood, the traditional fuel, in favour of gas. In the case of the latter findings, it is likely that, by enabling families to overcome financial constraints on purchasing a durable good (gas stoves), migration income stimulated the demand for a complementary non-durable (gas), in this case to the benefit of the local environment! Finally, a higher share of remittances in family income appears to be associated with a higher demand for non-agricultural goods. Non-agricultural production is limited within the village, but remittance income creates an important stimulus to regional and national non-farm economies in Mexico.

The Mexico study also revealed a reorganisation of traditional production ıctivities around migration. Neoclassical household farm models rule out impacts of 'emittances on production, on the assumption that income transfers do not alter first-ɔrder conditions for profit maximisation. Yet the Mexico study showed a negative ıssociation between migrant remittances and the demand for family labour in local ıousehold farm production, together with a positive association between remittances ınd the demand for tractor services and hired labour, both of which are family-labour substitutes. In contrast to the pessimistic predictions of many migration researchers, remittance income also was found to be positively related to acreage in crop production.

Summary

Household farm incomes typically are diversified across an array of activities. Migration frequently occupies an important place in household farm income portfolios. It also may influence non-migration income in a number of complex ways, as posited by the new economics of migration literature. The marginal contribution of migration to household incomes reshapes expenditure patterns, as posited by traditional consumer theory. Migration also may alter expenditure patterns directly, through various kinds of income-source effects. By changing production and expenditure patterns, migration generates economic linkages that extend outside the migrant household, into the local economy and beyond. These linkages potentially may alter the impacts of migration on migrant-sending economies, both quantitatively and qualitatively. Economic linkages among household farms are the primary motivation for micro economy-wide models of migration-development interactions, which are the subject of the next two chapters.

Notes

1. As a recent example, policy makers in Mexico and the United States fear that liberalisation of corn prices in Mexico will pull the rug out from under rural incomes and provoke an exodus of migration to the United States. Evidence from micro economy-wide models suggests that this will not happen. Largely because of the diversification of rural Mexico's household farm economies, large changes in corn prices translate into relatively small changes in household farm incomes (Taylor, 1994).

2. Based on a survey of two Michoacan villages in 1983. A follow-up survey in 1989 revealed a sharp drop in remittances from internal migrants during the economic crisis years of the 1980s, but a persistently large share of international migrant remittances, on the order of 20 per cent. Studies of villages in other regions of Mexico suggest typical international remittance shares on the order of 15 to 25 per cent; e.g., see Taylor and Yunez (1995).

3. The exception is when the household does not allocate any labour to local production or to a local labour market, that is, when the family's time is divided between migration work and leisure. In this case, the optimum occurs where the marginal utility of allocating more time to migration (the change in remittances weighted by the marginal utility of income) equals the marginal utility of leisure.

Chapter 3

Migration in Micro Economy-wide Models

Economic linkages among households transmit the impacts of migration from migrant households to others both inside and outside the local economy. The importance of economic linkages among households in shaping the impacts of policy changes on rural economies has been recognised by development economists for some time. The migration literature, in contrast, has largely ignored these linkages.

Consumption expenditures by rural households create a demand stimulus for production inside and outside of agriculture (Mellor, 1976; Adelman, 1985). The importance of consumption linkages in generating downstream growth and promoting agricultural-development-led industrialisation has been documented using household expenditure data from a number of different countries (e.g., Mellor, 1976; Hazell and Roell, 1983; Rangarajan, 1982). In general, rural households' demand patterns favour locally produced goods, goods whose production is relatively labour-intensive, and goods containing few imported intermediate inputs.

Village social accounting matrices (SAMs) reveal complex demand linkages among households even in small economies where production linkages are relatively small. The first village SAM (based on 1982 data) was constructed by Adelman, Taylor and Vogel (ATV, 1988) to examine the impacts of migrant remittances on a Mexican village economy. Initially, migrant remittances increase the incomes of migrant households in the village. Those households, in turn, allocate part of their increased income to the purchase of goods and services supplied within the village. These goods and services range from food to labour (e.g., in agricultural production) and investment goods (e.g., livestock). The ATV study estimated a total village-income multiplier of remittances equal to $1.78, that is, each dollar of remittances generates an additional $.78 increase in village value-added through income linkages.

Subsequent village SAM models, although not designed explicitly to explore migration impacts, confirm that income growth linkages within villages are significant in a diversity of economic, social and cultural settings (Subramanian and Sadoulet, 1991; Lewis and Thorbecke, 1992; Ralston, 1995; Golan, 1995), even when output supplies in some sectors are less than perfectly elastic (Subramanian and Sadoulet, 1990; Lewis and Thorbecke, 1992; Parikh and Thorbecke, 1995).

Village SAM for Mexico

SAM multipliers provide a window into the structure of migrant-sending :onomies and a basis for estimating the different income linkages that are created by igrant remittances. A 1988 SAM multiplier analysis, based on the Mexican village AM estimated by Taylor (1995), illustrates the economic linkages through which ıe impacts of migration travel through the local economy. The 1988 SAM is for the ıme village modelled by ATV in 1982. By comparing 1982 and 1988 remittance ıultipliers, we can use the SAM as a laboratory to explore changes in migration npacts on local economies over time, as well.

Village SAM Accounts

The Mexican village model is designed around household farms engaged in 'arious income-producing activities. These activities are grouped into five categories: rop production, livestock, renewable-resource extraction (primarily wood gathering ınd reed and fish harvesting in nearby Lake Patzcuaro), non-agricultural production primarily housing construction) and retail. The retail sector is comprised of mom-ınd-pop stores selling mostly goods from outside the village. It therefore serves as a 'village-import" sector.

These five activities are carried out using different combinations of four factors: :amily labour, hired labour, physical capital (e.g., tractor and animal services) and land.

Value-added produced by these four factors is channelled into the household side of the household farm economy. There are three groups of household farms in this SAM, defined by land holdings: landless households (less than one hectare of land); small-holder households (1 to 8 hectares, the latter being the standard *ejido* holding in this village); and large-holder households (more than 8 hectares, which include some private holdings). These household groups receive value-added in proportion to their control of the four factors used in village production.

The village production sectors, factors of production, household groups, and other institutions in the SAM are summarised in the left-hand column of Table 3.1.

In addition to receiving value-added income from their involvement in village production, households obtain remittance income from migrants in Mexican urban areas and in the United States. They allocate their income to consumption of goods and services supplied by the five village production sectors (including their own pr oduction); to savings, government (i.e., taxes and mandatory contributions to cc ımmunity projects) and imports. There is no formal credit market in the village, and th e nearest bank is 20 miles away in the city of Patzcuaro. A few households had sa vings accounts at this bank in 1982. Because of high inflation and negative real in terest rates in the 1980s, however, none of these households had savings accounts in 1988. As one farmer explained, "The animals are our bank now." Households generally invest their savings in local production activities, primarily livestock and housing. This results in significant investment-growth linkages in the village.

Table 3.1. **Village Remittance Multipliers**

Sector	International Migration Remittance Multiplier		Internal Migration Remittance Multiplier	
	(A) 1988	(B) 1982	(C) 1988	(D) 1982
Production:				
Basic Grains	0.15	0.42	0.20	0.44
Livestock	0.35	0.23	0.51	0.23
Resource Extraction	0.07	0.12	0.09	0.12
Non-Agricultural	0.05	0.12	0.02	0.13
Retail	1.02	0.98	0.99	0.99
Value-Added:				
Family Labour	0.16	0.38	0.20	0.39
Hired Labour	0.02	0.04	0.03	0.04
Capital	0.19	0.35	0.24	0.36
Land	0.22	n.a.	0.31	n.a.
Gross Village Product	0.60	0.78	0.78	0.79
Household Incomes:				
Landless	0.07	0.43	0.17	0.60
	(0.04)	(0.33)	(0.13)	(0.49)
Small-holder	0.84	0.54	0.36	0.40
	(0.56)	(0.30)	(0.00)	(0.15)
Large-holder	0.67	0.80	1.22	0.79
	(0.39)	(0.38)	(0.87)	(0.36)
Investment:				
Physical Capital	0.17	0.13	0.31	0.13
Human Capital	0.03	0.13	0.05	0.12

* Numbers in the table represent the absolute effects of a $1 increase in migrant remittances on the corresponding account total. Numbers in parentheses are shares of the remittance change accruing to each household group.

Despite the importance of household expenditure linkages within the village, the village economy is very open. Village "imports" of goods and services exceeded "exports" of village production by nearly 50 per cent; the village trade deficit in 1988 was equivalent to nearly one third of total gross village product. This deficit was financed by migrant remittances. The major village exports were livestock products and labour. The major imports, by far, were consumer manufactures.

Migrant remittances are critical to household income as well as to village trade. They represent between 20 and 25 per cent of income in each of the three household groups. In 1982, this migration income was more or less equally divided between internal migration (mostly to Mexico City) and international (Mexico-to-United States) migration. In 1988, after six years of economic crisis in Mexico, few internal migrants remained, and Mexico-to-United States migration generated more than four times more income than internal migration.

Data and Estimation

A village social accounting matrix (SAM) provides a detailed snapshot of the structure of a village economy at a given point in time. Village SAMs are now relatively well known in the development literature, and the estimation of village SAMs and design of surveys to support this estimation are explained in detail elsewhere (Taylor and Adelman, 1995). Only a brief sketch will be given here.

The village SAM is an expanded input-output system of accounts for all production activities, factors, household groups, and capital (savings-and-investment), government and rest-of-the-world (village trade) accounts. A row of the SAM contains payments into the corresponding account (e.g., household) from all other accounts in the system (e.g., family and hired-labour, capital and land value-added from village production, government transfers to households, remittances from migrants in the rest of Mexico or the United States). The corresponding column of the SAM details all expenditures on goods and services inside and outside the village by the account. For example, households spend their income on consumption goods produced in the village (staples, animal products, housing construction), on goods imported into the village (primarily captured by the village retail sector), and on savings. By definition, each account in the SAM must balance, e.g., the household must exhaust its income (the household row total) on consumption and savings (the column total).

The Mexican village SAM was estimated using data from a survey of household farms in the Patzcuaro region of the state of Michoacan. This region is located in central Mexico, approximately 1 500 miles south of the Mexico-California border. It is on the fringes of the Tarascan highlands. Like most of central Mexico, it is at an altitude of more than 6 000 feet. The village is situated on the shore of Lake Patzcuaro. At the time of the survey, it was connected to the nearest town, Erongaricuaro, by a dirt road which became impassable to all but off-road vehicles during much of the rainy summer season.

The village boasts several *tienditas*, or small stores, in which goods brought into the village from the outside are sold through windows cut into the facades of adobe houses. These goods range from flour, lard and sugar to Coca Cola, toilet paper and chewing gum. A local butcher slaughters an animal and sells meat on the main cobbled road in the village once every one or two weeks. The rest of the time, villagers must travel the two kilometres to town to purchase meat. Stores in the town also sell a limited variety of consumer durables, and a weekly market dramatically expands the town's inventory. There is no central market within the village. Apart from the *tienditas*, an active trade in staples, dairy products and some fruits and vegetables is carried out on doorsteps of houses throughout the village. Villagers have excellent information about which families have maize surpluses, milk cows, chickens and eggs, firewood and other local commodities for sale in the village. Local prices for these commodities are held in check by the village's proximity to town. The interaction of village supply and demand determines the prices of other goods, including labour and tractor services, which are supplied locally.

High transaction costs insulate the village from much of the influence of government corn-price policy. Despite a high government-guaranteed price for maize, the cost of transporting harvests to the nearest CONASUPO purchase point prevented all but a few villagers from selling to the government. Relatively marginal agro-ecological conditions limited maize output in this area to around one metric ton per hectare, restricting the local maize supply. As a result, local corn prices were lower than the guaranteed price but nevertheless well above the world price during this period.

The household farm survey gathered complete data on the production, incomes and expenditures of 30 households in this village, equivalent to just under one fifth of the village household population. On the production side, village market prices (where available) and quantities of all intermediate and factor inputs and outputs were recorded for each activity. For subsistence households, production was valued at the going village price.

On the factor side, wages for hired labour and, except in the case of a few tractor owners, actual costs of tractor services were observed and used to calculate hired-labour and capital value-added. Ox-and-plough services were valued at their opportunity costs, that is, the village price for these inputs. The *ejido*, or agrarian reform, prohibited sale or renting of *ejido* lands, which made up nearly all of the land base controlled by villagers. Because of this, land rents had to be estimated econometrically. (See Taylor and Wyatt, 1994.) Family labour value-added was calculated as a residual, from the imputed value of production minus the observed or imputed costs of all intermediate and factor inputs, including imputed land rents. (Land rents were not separated out from family and other capital in the 1982 SAM.) All purchases of inputs and sales of output were recorded by origin and destination, respectively. Inputs purchased from outside the village represent "village imports," while output sold to outside markets represents "village exports". The difference between exports and imports yields village marketed surplus, which is a village analogue to the marketed-surplus concept in the household farm literature (e.g., Singh, Squire and Strauss, 1986).

The expenditure side of the survey gathered data, based on recall and a reconstruction of typical weekly food menus, on consumption expenditures, savings and investments. Expenditures on lumpy goods like furniture, ploughs, and house

construction were relatively easy to obtain, as was information on daily or weekly menus, e.g., the corn input into a family's *nixtamal* (dough) for *tortillas*. In the case of subsistence production, consumption, like output, was valued at village market prices. Expenditures on livestock, machinery and tools made up the majority of investments. These expenditures, together with limited reported savings in bank accounts, were counted as savings (payments by households into the capital account) and as investments (expenditures by the capital account on investment goods or savings sent to banks outside the village) in the village SAM. No formal savings were reported in the 1988 survey, which was for a period of high inflation and negative real interest rates. Schooling expenditures were counted both as human-capital savings (from households to the human capital account) and as human-capital expenditures (from the human capital account to the rest of Mexico). Children normally complete six years in a government school within the village. Because primary education is free and secondary schools are located outside the village, human capital investment represents a village import. Schooling costs include fees, supplies, lodging for live-away students (e.g., in the state capital of Morelia), and daily transportation for students commuting from the village to the government secondary school in the nearby *municipio* (county) seat of Erongaricuaro or to a post-secondary school in the city of Patzcuaro. All consumption and investment expenditures were recorded by place of origin to indicate whether they represent local goods or village imports.

The survey data were entered onto PCs, and spreadsheets were used to construct the village SAM. Once the discrepancy between row (income) and corresponding column (expenditure) totals for all production, factor, household and exogenous accounts in the SAM were within 5 per cent, a RAS procedure was used to adjust the SAM income flows and obtain consistency. A relatively simple General Algebraic Modelling System (GAMS) program was then written and used to calculate remittance multipliers using the village SAM.

Remittance multipliers

The methodology to estimate SAM income multipliers is well developed and available in detail elsewhere. (For the village case, see Adelman, Taylor and Vogel, 1988 and Taylor and Adelman, 1995). It entails creating a submatrix of endogenous accounts, dividing each entry in this submatrix by its corresponding column total in the SAM to obtain a SAM coefficient matrix, A, and then performing the matrix calculation

$$M\ (I - A)^{-1}$$

to obtain the SAM multiplier matrix M, where I is an identity matrix of dimension equal to that of the SAM coefficient matrix. In the Mexican village SAM multiplier experiment, the endogenous accounts include all of the accounts in the first column of Table 3.1. The exogenous accounts are government, the rest of Mexico and the rest of the world outside Mexico, which for this village is the United States.

The multiplier effects of both international and internal migrant remittances on production; village value-added, by factor, household incomes and investment for each of the two years appear in Table 3.1. The numbers in the table are the absolute estimated effects of a $1 change in total remittances on the corresponding row accounts. This $1 change in remittances is allocated to household groups according to their initial shares in total remittances. For example, small-holder households received 56 per cent of total remittances from Mexico-to-United States migrants in 1988. In the US remittance experiment, $.56 of the $1 increase in remittances is given to this group. (The corresponding shares for all household groups are given in parentheses in Table 3.1.) In effect, this is an income transfer experiment, in which the income transferred to each household group corresponds to the group's relative claim on total remittances in the base SAM. We begin with SAM multipliers from international and internal migrant remittances in 1988, and then compare multipliers for the two years covered by the village SAMs.

1988 Remittance Multipliers

The 1988 remittance multipliers reveal that village income linkages from remittances are large, but that the direct and indirect benefits of migration are unequally distributed across household groups. On the production side, the largest remittance multipliers are in basic grains, livestock, and especially the retail sectors. A $1 increase in US remittances in 1988 (Column A) stimulates a $.15 increase in basic grain production, a $.35 increase in livestock output, and a $1.02 increase in the demand for manufactured goods (retail). These numbers illustrate the importance of remittances in stimulating household demand for village goods. Because the retail sector is essentially a village import sector, the high retail multiplier indicates that remittances also create a significant rural-demand stimulus for industrial production.

Increased production generates value-added within the village. The total village value-added multiplier from international remittances in 1988 is $.60. It is relatively evenly distributed among family labour, physical capital and land. Hired labour valued changes little ($.02). These findings illustrate the family-input intensity of production in this village and a minimal use of hired labour as a substitute for family labour. That is, there is only slight evidence of a functioning labour market.

Table 3.1 reports total multiplier effects of a $1 increase in US remittances on the income of each household group. These household-income multipliers include the remittances themselves plus the second-round effects of remittances to all household groups on income from village production. The increases in remittances to each household group are presented in parentheses. The differences between the two numbers represent the second-round multiplier effects of the $1 of remittances on household incomes. Even if a household group does not receive remittances, it nevertheless may benefit from second-round effects if remittances stimulate village production activities in which households within the group are engaged.

Remittances from US migrants unquestionably favour small-holder households. They receive, on average, $.56 per dollar of US remittances, and they benefit handsomely from second-round effects. Their total income increases by 84 cents. In other words, while receiving 56 per cent of US remittances, small-holder households also capture 47 per cent ($.28) of the remittance multiplier on village value-added. Similarly, large-holder households receive $.39 of the average US remittance dollar, and the multiplier effect of one dollar of remittances on their total income is $.67.

In contrast, landless households receive, on average, only four cents per dollar of US remittances. They benefit only slightly from second-round multiplier effects of remittances on village production (3 cents, for a total increase of 7 cents in the table). In sum, the first and second-round effects of US remittances favour small-holder households and, to a lesser extent, large-holder households. Landless households cannot lose from US migration in this model, but they do not gain much, either. This finding reflects obstacles to relatively expensive and risky international migration for landless households[1]. It also reveals weak income linkages to spread the benefits of US migration to the village landless.

While small-holder households specialise in international migration, internal migrant remittances favour landless (13 per cent) and especially large-holder (87 per cent) households (Column C). As in the case of international migrant remittances, however, the second-round effects do not benefit the landless; only 4 cents of the $.78 multiplier of internal migrant remittances on village value added accrue to this group. By contrast, small-holder households, who do not receive remittances from internal migrants, nevertheless benefit indirectly by capturing $.36 (46 per cent) of the increased village value-added. The total multiplier effect of internal remittances on large-holder incomes is $1.22, including a direct effect of $.87 and an indirect multiplier effect of $.35.

Production multipliers from internal remittances reflect the relatively favourable impacts of landless households' expenditure patterns and of their investment demand on village production. Basic grains account for a large marginal share of landless-household budgets but not the budgets of the other two household groups. By favouring the landless, internal remittances create a larger stimulus to basic grain production than international remittances. (The internal-remittance multiplier on basic grains production is $.20.) Large-holder households, for which the income multiplier of internal remittances is largest, have by far the highest savings rates of all household groups. In the absence of a well-functioning credit market, these savings are channelled primarily into livestock demand. The livestock-production multiplier is nearly 50 per cent higher from internal remittances ($.51) than from Mexico-to-United States migrant remittances ($.35).

Changes in Remittance Multipliers Over Time

A comparison of village remittance multipliers between 1988 and 1982 provides insight into how the local impacts of migration have changed over time. Three trends during the mid-1980s substantially alter remittance multipliers. First, in the throes of Mexico's economic crisis and restructuring, internal migration nearly disappeared as a source of income to village households. Remittances from internal migrants, primarily in Mexico City, accounted for 20 per cent of total village income in 1982 and 5 per cent in 1988. Meanwhile, the international remittance share was stable, at 23 to 25 per cent. Second, despite the crisis, households with access to US income prospered. They benefited in the short run from massive peso devaluations, which increased the value of dollar-denominated remittances in local currency. As a result, total village income increased by 78 per cent in real terms. Third, landless households enjoyed a proportionate share of total US remittances in 1982 (33 per cent). But between 1982 and 1988 many of these households migrated completely, which explains their small stake in US remittances in 1988.

Higher total village income and a shift in the distribution of external remittances towards small-holder and large-holder households weakened remittance multipliers on village production and incomes. Impacts of remittances on individual factor incomes (with the exception of hired labour) cannot be meaningfully compared over time, because land value added was not separated out from family and physical capital value added in the 1982 SAM. The total value-added multiplier, however, falls from $.78 to $.60 over the six-year period. The decline in the hired-labour multiplier reflects a shift away from labour-intensive production. As a result of this local economic restructuring, the share of hired labour value-added in total village income falls, from 3 per cent to 2 per cent, between 1982 and 1988 (Taylor, 1995). Village production multipliers drop almost uniformly, with the exception of the livestock multiplier, which increases as a result of investment demand for animals. As the remittance multiplier on village output generally decreases, the "village-import" multiplier, represented by retail sales, increases slightly. An increasing openness of the village economy and a redistribution of remittances away from landless households results in smaller and more unequal remittance multipliers on household income over time. The US remittance multiplier plummets for landless households (from $.43 to $.07), and it also falls for large-holder households (from $.80 to $.67). It increases for the middle group, which nearly doubles its share in total US remittances, despite generally smaller second-round remittance effects.

A similar pattern on the production side is evident for internal migrant remittances. The village value-added multiplier from internal migrant remittances does not change appreciably over time, however. This is because, although internal remittances become more unequally distributed, they continue to favour large-holder and landless households, whose expenditure patterns favour village-produced goods (landless households on the consumption side, large-holder households on the

investment side). Because of this, the total multiplier effect of internal migrant remittances is stable over time, although the role of these remittances in the village economy (i.e., the share in total village income) decreases significantly.

Schooling multipliers drop during this decade of high Mexico-to-United States migration and economic crisis in Mexico. The multiplier effects of remittances on family investments in schooling (human capital; last row of Table 3.1) drop by more than 50 per cent, from $.12 to $.13 for the two remittance types in 1982 to $.05 to $.03 in 1988. Previous studies show that the returns to schooling are small within the village and in the undocumented labour markets in which most US migrants work (Taylor, 1987). By contrast, they were high for internal migrants in 1982, and schooling attainment had a significant positive effect on internal, but not international, migration in that year (Taylor, 1986). The decrease in the schooling investment multiplier reveals diminished returns to schooling in the wake of Mexico's economic crisis. Coupled with high returns to relatively unskilled US work, the incentives to invest in schooling of family members declined during the 1980s. The expansion of US migrant networks, strengthened by the legalisation of many migrants under the 1986 Immigration Reform and Control Act, probably intensified the downward trend in village schooling investment.

Beyond the SAM: Village CGE Models

Village SAM multipliers highlight the complex income linkages which transmit the impacts of migration and other exogenous changes throughout the local economy. However, they are likely to give a distorted picture of the likely impact of migration and policy changes on village economies. The SAM methodology does not capture resource constraints that impose production, migration and consumption trade-offs on household farms.

Limited land and capital introduce decreasing returns to labour in household farm production. As their incomes increase, families have to choose between leisure and work. They must allocate their scarce work time across income activities inside and outside the village in a local labour market that is not likely to offer them a perfect substitute for their own labour. Capital constraints, imposed by a lack of access to outside credit, force household farms to self-finance investments, limiting their ability to expand production over time. Indeed, income from migration is not exogenous and without difficult trade-offs for village households. Gaining access to remittances requires allocating family time to migration and away from other local production and leisure activities. Because of these constraints, exogenous changes in markets or policies alter the prices (or more generally, the opportunity costs) of scarce village resources. Prices, in turn, influence the allocation of resources across village activities, in ways that are beyond the purview of village SAMs.

Consider, for example, the case of an exogenous increase in remittances from US migrants, presented above. An increase in US. remittances might result from a devaluation of the Mexican peso, which raises the value of foreign-denominated income in local currency. It might also result from a strengthening of family migration assistance networks, which reduces migration costs.

In the SAM model, higher remittances increase incomes in households with migrants. Expenditure patterns in these households convert this higher income into increased demand for goods produced in the village and for imports. Higher demand for village products stimulates village production, creating a new round of income increases, this time for both migrant and non-migrant households. In each round, part of the income gain leaks out of the village in the form of village import demand. The process continues until it eventually converges on the village remittance multipliers presented in Table 3.1.

In real life, the peso devaluation has two initial effects: it increases the value in local currency of remittances from those who already have migrated, and it increases the returns to future migrants, inducing families to allocate more time to migration. As in the SAM case, higher family incomes increase the demand for village production. These effects create difficult trade-offs within village households, however. Time and other resource constraints in household farms result in a less-than-perfectly elastic supply response in village production. Unless new consumption and investment demands can be met easily through imports, or unless there is a surplus of village land, labour and other resources (i.e., a Lewis-type world; see Lewis, 1954), part of the impact of higher demand is manifested in increases in prices for goods and factors within the village. Household farm leisure demand creates additional trade-offs. If perfect substitutes for family labour in local production are not available at a fixed price, household farms cannot expand production without committing more of their scarce time to village work. However, leisure is generally a normal good; increases in household farm income increase the leisure demand on scarce family time. Meanwhile, higher returns to migration increase the migration demand on family time (and other resources).

The family time constraint makes it impossible for families simultaneously to increase their allocation of time to local production, migration and leisure. Instead, increased returns to migration (or to any other family income activity) drive up the opportunity cost of family time (that is, the family wage). This introduces a series of complex price effects into the remittance multiplier. The higher family wage dampens the impact of remittances on village production. It, together with increased opportunity costs for other resources, may even produce a contractive effect on production, a migration-induced village "Dutch-disease" syndrome. Village producers of non-tradables may benefit from an increased infusion of remittance income into the village. Production of tradables, however, may be crowded out by "migrant exports." On the other hand, remittances may loosen financial constraints on investments that increase the productivity and competitiveness of village producers over time, as predicted by the new economics of migration literature. The total impact of migration on the village

economy includes both quantity effects similar to those in the SAM and price effects, which are absent from SAM multipliers. These price effects are almost sure to change the predicted impacts of migration on the village economy quantitatively, and they may alter them qualitatively as well.

The Village CGE Framework

Constructing a village SAM is a prerequisite to creating a village CGE, because the SAM contains nearly all of the information needed to estimate most micro-CGE models. The first step in constructing a micro economy-wide, CGE model is to estimate models of household farm activity for each household group. This includes estimating production functions for each village production activity, migration-response functions for each household and migration type, and expenditure functions for each household group and expenditure category.

Once the household farm model is estimated, village general-equilibrium constraints are imposed to ensure that all village markets clear (or, in the case of, e.g., a Lewis-type labour surplus, the village price is fixed). Where the village is integrated with outside markets (i.e., tradables), the general-equilibrium constraint determines village marketed surplus, or exports. These equal total supply (village production plus imports) minus total village consumption, investment and government demand (absorption). In the case of non-tradables, for which the village is cut off from outside markets, the village-equilibrium constraint determines an equilibrium village quantity and price. The equilibrium price may be observable, as in the case of commodities for which market exchanges take place within the village. In other cases, however, it is an unobservable, "virtual" or "shadow" price representing the opportunity cost of the good or factor in the village or household group. An example of an unobservable village price is the family wage, which must be ascertained from family time-use decisions.

Parameters in Village Production and Expenditure Functions

Without going into the village CGE model in great detail, it is worthwhile to present some of the key parameters of the model, because they provide a "feel" for the structure of the production and expenditure functions underlying the migration and policy experiments presented in Chapter 4[2]. The key production and household parameters in the model are summarised in Tables 3.2 through 3.4. Table 3.2 reports production-function parameters, Table 3.3 summarises the distribution of village value-added across household groups and Table 3.4 presents household expenditure shares.

Table 3.2. **Factor Value-Added Shares**

Production Sector	Factor			
	Family Labour	Hired Labour	Capital	Land
Staples	0.34	0.07	0.19	0.40
Livestock	0.10		0.26	0.64
Resource Extraction	0.57	0.17	0.08	0.17
Non-Agricultural	0.61	0.12	0.27	
Retail	0.60		0.40	

The production parameters reported in Table 3.2 are the shares of the four factors in total value-added by village sector. In this village CGE model, a Cobb-Douglas specification was used for the sectoral production functions. Although more general specifications, including CES and multi-output production functions, may be used in micro economy-wide models, the Cobb-Douglas function is convenient, simple, and can easily be estimated from value-added data in village SAMs. Factor shares in sector value-added are equal to the exponents of the production function. They also represent output elasticities with respect to factor inputs.

Table 3.3. **Percentage Distribution of Migrant Remittances and Value Added Across Household Groups**

Household Group	Value Added				Remittances	
	Family Labour	Hired Labour	Capital	Land	US	Internal
Landless	2.1	8.1	6.4	5.7	4.4	11.6
Small-Holder	48.5	25.1	48.3	48.3	56.1	0.1
Large-Holder	49.4	66.7	45.3	46.0	39.5	88.3

Village production is intensive in the three family inputs: family labour, land and capital (primarily draught animals). Only resource extraction and non-agricultural production have hired-labour value-added shares in excess of 10 per cent, but these are minor activities, accounting for a combined total of 16 per cent of total village value-added. The least labour-intensive activity in the village is livestock production, which is also the largest generator of value-added in the village. It does not use hired labour, and family labour accounts for only 10 per cent of total value-added. Most of the capital value-added in this sector accrues from the animals themselves. Land, an

increasingly scarce commodity as local herds expand, accounts for the largest share of value-added in livestock production. Investment in livestock production makes good sense in this migrant economy, where migration and local production compete for scarce family time. In contrast to livestock production, labour accounts for over 40 per cent of value-added in staple production. This is in spite of an increasing reliance on capital substitutes for labour in crop production, which is reflected in a capital share in value-added of just under one fifth[3].

Village production technologies play an important role in shaping the impacts of migration on household farm incomes. For example, the minimal use of hired labour in village production limits the spread effects of migrant remittances to landless households, whose main asset is labour. Landless households benefit little directly from changes in remittances, and they are in a poor position to benefit from changes in production, especially the livestock boom, which has been promoted by the inflow of remittances. Small-holder households, on the other hand, receive large shares of foreign remittances as well as of family, capital and land value-added in the village. (See Table 3.3.)

Table 3.4. **Selected Household Parameters**

	Household Group		
	Landless	Small-Holder	Large-Holder
Expenditure Shares:			
Staples	0.03	0.01	0.00
Livestock	0.77	0.07	0.03
Resource Extraction	-0.18	0.00	0.00
Non-Agricultural	0.00	0.03	0.00
Retail	0.38	0.94	0.67
Savings:			
Physical Capital	0.00	0.00	0.27
Human Capital	0.00	0.01	0.03
Expected Daily Remittances per Migrant: ($ per day)			
Mexico-to-US	9.79	5.23	4.30
Internal	4.33	0.01	3.52

Although neither migration nor village production technologies favour landless-household incomes, the expenditure patterns of landless households favour village production. The top panel of Table 3.4 reports marginal budget shares for the three household groups. These were estimated from an extended linear-expenditure system (ELES) for the three household groups. The marginal propensity to consume village-produced goods is by far highest for landless households. They spend 3 per cent of their marginal income on staples and three-fourths of their marginal income on animal products. Only 38 per cent of their budget, at the margin, is allocated to village imports (retail). By contrast, small-holder households allocate only 1 per cent of their marginal budget to staples, 7 per cent to livestock, and a whopping 94 per cent to imports. Large-holder households have the smallest budget shares for consumption goods produced in the village. However, they have far and away the highest marginal propensity to save (middle panel of Table 3.4), and most savings in the village are allocated to livestock investment.

The economic benefits from sending family members abroad, like total remittances, are unequally distributed across households. The bottom panel of Table 3.4 compares the returns to migration (average remittances per migrant per day) among the three household groups. Average remittances from migrants abroad range from $4 to nearly $10 per day. They are highest ($9.79) for the landless group, which has the least access to US labour markets and presumably faces the greatest migration risks. They are $4 to $5 per day for small-holder and large-holder households, which have the greatest access to US labour markets and also contain the highest average number of migrants (nearly three US migrants each).

Expected remittances are shaped both by migrant earnings and remittance behaviour. A theory of remittance behaviour is beyond the scope of this chapter. (For an excellent analysis in a different context, see Lucas and Stark, 1985). Nevertheless, it is possible that the coordination of remittances among a larger number of family members and less need account for lower per-migrant remittances in small- and large-holder households. Differences in the shadow value of remittances across household groups also may influence remittance behaviour.

Expected remittances from internal migrants range from $3.50 to $4.20 for landless and large-holder households to zero for small-holder households. Small-holder households participated little in internal migration in 1988, and internal migrants in these households did not contribute significantly to household income in the village.

Model Solution and Closure

Production, expenditure and migration functions based on the parameters in Tables 3.2 to 3.4 form the core of the village CGE model. On the production side, the model assumes profit maximisation; that is, the demand for all factor inputs occurs where the marginal value product equals the factor price. The demand for intermediate inputs (e.g., seed or fertilizer for corn production, goods sold in village stores) is given by fixed, input-output coefficients calculated from the SAM production matrix. The supplies of land and physical capital are assumed to be fixed, at least in the short run. Labour supplies are constrained by family time endowments: labour available for village production equals total time minus time allocated to migration and leisure.

The migration elasticity with respect to expected remittances relative to the family wage in the village was estimated econometrically at 2.5. Family leisure demand is obtained maximising household farm utility, which is a function of leisure and real income from village production, wages and migration.

The closure rules for the model stipulate that the total demand for family time (village production plus migration plus leisure) equal the family time endowment, and that the sum of demands for land and capital across village activities equal total village endowments of these factors. They also require that all markets clear. Endogenous village prices and quantities ensure this for non-tradables. For tradables, the village is a price taker; excess supplies are exported and excess demand is satisfied by imports from markets outside the village. Finally, in the absence of well-functioning rural credit markets in Mexico, village investments are financed internally, by household savings. Consistent with the new economics of labour migration, migration may promote investment over time by loosening village savings constraints.

The village CGE model was solved using MINOS5, a non-linear programming algorithm in GAMS developed by Murtagh and Sanders (1987). The solution to the village CGE provides a vector of quantities and prices for all commodities and factors, incomes for all households, savings and (in the case of village tradables) net exports, and it reproduces the village SAM that is the basis for the multiplier experiments presented in the first part of this chapter. The village CGE model is the basis for the migration and policy experiments presented in Chapter 4.

Notes

1. International migration risks include risks of apprehension during or after illegal border crossings as well as employment risks in migrant labour markets. Family contacts in the United States can substantially reduce migration risks not only by providing job information and placement but also by matching new migrants up with trusted *coyotes*, or labour smugglers; financing the border crossing; and paying smugglers only after the new migrant is safely in the United States, thus shifting the financial risks of the border crossing from migrant to smuggler.

2. For a detailed discussion of the structure of village CGEs, see Taylor and Adelman (1995).

3. The availability of a non-labour intensive village activity to complement migration may make Mexico somewhat of a special case, although links between migration and livestock expansion have been documented elsewhere (e.g., Lucas, 1985). Research is currently under way to explore village-town income linkages, including non-farm production activities that may compete with migration for labour.

Chapter 4

Micro Economy-wide Policy Simulations

This chapter explores migration-development interactions in a series of three prototype village economic models. It also explores the sensitivity of migration to rural development policies. The three models are based on the micro economy-wide framework presented in the last chapter and are estimated and calibrated using the household farm survey data from rural Mexico. The production sectors, households and other institutions, as well as the parameters of the models, are those summarised in Tables 3.2 to 3.4. The models are differentiated by assumptions about the functioning of village markets, in particular, the degree of openness to the outside world. Markets are critical in determining the form and magnitude of migration, migration's impacts on village economic activity, and the effect of government policies on both.

The basic model (Model 1) is neoclassical in spirit. The village, like the household in most household farm models, is assumed to be perfectly integrated with outside markets. These markets exogenously determine the prices for all village outputs and labour inputs, with the exception of family labour. Family labour can be shifted across production activities in the village, between these and work activities outside the village (migration), and between work and leisure. The major departure from a strict neoclassical model is that family and hired labour are not assumed to be perfect substitutes in village production, and they cannot, of course, be substituted in migration, either. Nevertheless, as in the basic neoclassical household farm model (e.g., Singh, Squire and Strauss), hired labour is assumed to be available from outside the village (or alternatively, from a Lewis-type surplus within the village) at a fixed wage.

As in the basic neoclassical household farm model, land and capital are fixed across activities, at least in the short run. This assumption is reasonable given the activity specificity of capital and differences in land qualities, which limit the transferability of these factors across activities. In this region, flat, lakeside lands are allocated exclusively to crop production, while livestock is concentrated in hillside lands. Model 1, by assuming exogenous village prices for everything except family labour, allows for the most flexibility in village economic responses to exogenous shocks.

Two separate modifications of this model are used to explore the implications of various kinds of market failure on migration-development interactions and policy impacts. In this context, "market failure" refers to a lack of interaction between the village and outside markets. It does not imply the absence of market exchanges within the village, which are common here as in most villages. For example, marketed surplus represents more than 50 per cent of total staple production in the Mexico household farm sample, but only one-fourth of this surplus is "exported" from the village. That is, the village participates minimally in outside staple markets, but there is active trade in staples within the village.

Market failures occur whenever the costs of transacting with regional or national markets prevent households within the village from using these markets as outlets for their production, as sources of their inputs, or as suppliers of consumer goods. Market failure implies village self-sufficiency; the interaction of local supply and demand determines a local equilibrium price and quantity in the affected market. For example, if labour at a fixed wage is not available from a labour market outside the village, the interaction of total labour supply and demand within the village determines employment and the village wage. Failure in one market affects quantities in other markets, including markets that are integrated with the outside world. For example, changes in the (endogenous) village wage affect the demand for labour and other inputs as well as output in cash-crop production for outside markets.

The first modification (Model 2) imposes a village labour constraint on the basic model. Other things being the same, when the demand for hired labour increases (decreases), there is upward (downward) pressure on village wages. Higher wages, in turn, create labour-market feedbacks on village production, consumption and trade.

The second modification (Model 3) assumes high transactions costs in staple markets, which make village staples non-tradable. In the Mexican context, this case is exemplified by villages that are distant from staple marketing centres (e.g., from government (CONASUPO) grain purchase points), such that farmers must incur high transportation and other costs to obtain access to regional or national prices for their crop. On the consumption side, distance from urban markets, where subsidised staples are concentrated, and limits on the purchase of subsidised staples by individuals force consumers to rely on locally produced staples. In many cases, this implies subsistence production. Perhaps one-half of all rural Mexican household farms fall into the subsistence-production category.

Six migration and policy experiments were performed using these models. The first is a short-term migration experiment, which examines remittance and lost-labour effects of international (Mexico-to-United States) migration on the village economy. The second is a "new economics of migration" experiment. It is designed to capture migration's impacts on production over time through its contribution to village savings and investment and its loosening of physical capital constraints on production. These experiments are CGE analogues to the SAM remittance multipliers presented in Chapter 3.

The third and fourth experiments focus on actual agricultural price reforms (PROCAMPO) implemented during 1993-94 in the context of Mexico's economic liberalisation and restructuring program. Experiment 3 explores the local economy-wide impacts of eliminating price subsidies for staples. Experiment 4 combines this price reform with a compensating income transfer.

Experiment 5 explores the local economy-wide impacts of technological change in staple production. Experiment 6 is a cash-crop experiment. It examines the effects of increased returns to the production of livestock, the village's main non-labour export, as might result either from higher meat prices or from lower transactions costs of marketing livestock output.

As we shall see, the results of these experiments vary greatly across the three village models.

Experiment 1: Short-run Effects of International Migration

The first experiment explores the village-wide impacts of a 10 per cent increase in expected remittances from migrants abroad, as might result from a depreciation of the Mexican peso, an improvement in migrant labour market conditions, a reduction in migration costs, or generally improved access to US migrant labour markets. These experiments are germane in light of the increasing integration of villages around the world with outside labour markets through migration and the rapid expansion of formal and informal migrant-assistance and information networks that dramatically lower migration costs and risks.

In a village CGE model, an increase in expected remittances has two immediate effects in the short run. First, there is an income transfer effect, akin to the treatment of remittances as transfers in the SAM multiplier experiment in Chapter 3. That is, higher remittances increase income in households with migrants. Second, increased returns to migration create an incentive for families to allocate more time to migration work[1]. In combination, these two effects produce an income increase in migrant households and also an increased demand for family time in migration. Because leisure is a normal good, rising income, *ceteris paribus*, also increases the demand for leisure. The interaction of these transfer and migration effects results in quantitatively different outcomes in the three models.

Increased migration and leisure demand for family time drives up the opportunity cost of time (the family wage) in the village. This negatively affects local production, which competes with migration for scarce family labour. It also dampens, or even reverses, the positive leisure response to higher income, because the family wage represents the opportunity cost or price of leisure.

Table 4.1. **Village-wide Impacts of Migrant Remittances in the Short Run**

	Percentage Change From Base		
	Perfect Commodity Markets	Missing Labour Market	Missing Labour and Staples Market
Production (Prices):			
Staples	-2.19	-1.77	-0.26
			(1.83)
Livestock	-0.44	-0.47	-0.50
Resource Extraction	-8.34	-5.74	-5.85
Services	-8.32	-6.64	-6.79
Retail	6.52	6.23	6.99
Labour Demand:			
Family	-7.84	-7.26	-7.41
Total	-7.71	-6.70	-6.80
Shadow Prices:			
Family Labour	3.93	4.08	4.21
Hired Labour	0.00	-4.48	-4.70
Capital	-1.90	-1.73	-1.70
Land	-0.91	-0.79	-0.70
Household Farm Incomes:			
Total Nominal	2.98	3.13	3.33
Total Real	2.98	3.13	3.22
Real, By Household Group:			
Landless	1.88	1.98	1.79
Small-holder	4.41	4.54	4.73
Large-holder	1.69	1.86	1.91
Consumption:			
Leisure	-1.96	-1.99	-2.05
Staples	2.75	2.85	1.15
Manufactures	3.45	3.59	3.82
External Linkages:			
Migration	7.65	7.27	6.95
Marketed Surplus	-2.51	-2.06	n.a.
Net Imports:			
Intermediate	-4.66	-4.81	-4.91
Final	7.15	6.88	7.71
Total	1.13	0.92	1.09

The numbers in the table represent the effects of a 10 per cent increase in expected per-migrant remittances in the three models.

On the production side, the higher family wage induces households to reallocate their resources away from the most labour-intensive production activities and into migration. Migration increases in all three models (Table 4.1), with a remittance elasticity of around 0.7. Village production and migration are most responsive to higher remittances in the most neoclassical model. Here, all changes in family consumption and hired-labour demands can be met by transacting on outside markets at predetermined prices. For example, to the extent family and hired labour are substitutes, family members can allocate more time to migration and leisure while hiring workers to take their place in household farm production, as in a neoclassical household farm model. Because family and hired workers are not perfect substitutes, however, a reduction of family labour in production implies some loss in output. Given perfect commodity markets, increased consumption demand, e.g., for staples, is satisfied by purchasing ("importing") staples from outside the village. In a strictly neoclassical village model[2], these prices are exogenous to the village, determined by regional, national or perhaps world markets.

The 10 per cent increase in remittances raises the family wage by just under 8 per cent in the neoclassical model (Column 1). On the production side, higher returns to migrant "labour exports" produce a classic "Dutch disease" effect within the local economy. Production of village tradables falls across the board: output of livestock, the least labour-intensive activity in the village, falls by less than 0.5 per cent, but staple production decreases by more than 2 per cent, and output from the two non-agricultural sectors plunges by 8 per cent. Lower production results in a decrease in village value-added, and hence family incomes from local production. Migration, however, more than compensates households for these negative production effects. Total village income increases by just under 3 per cent (i.e., the remittance elasticity of income is 0.3). Predictably, income gains are unevenly distributed across households. The largest, by far, accrue to small-holder households, whose income increases by nearly 4.5 per cent. This group receives the largest direct benefits from migration. Incomes in the landless and large-holder groups increase by 1.9 and 1.7 per cent, respectively.

Higher incomes stimulate villagers' demand for consumer goods and, given the village's close integration with outside markets in Model 1, village trade. They also generate savings and investment. Unlike in the SAM multiplier (Chapter 3), increases in consumption and investment demand for goods produced in the village do not necessarily stimulate village production in this village CGE experiment. Production is determined by the conditions for profit maximisation. These conditions are functions of production technology, capital inputs, and input and output prices. Unless there are changes in one or more of these ingredients in household farm production decisions, village production levels remain the same as before the increase in returns to migration. In the case of tradables, prices are determined in markets outside the village. Changes in village consumption or investment demand, other things being equal, are satisfied through trade with these outside markets, not through higher production in the village. Increased demand is met through imports (or lower exports). Decreased demand is

accommodated through higher exports (lower imports). Household expenditures alter the village's net marketed surplus of goods, but not its production. In short, trade enables villages, like households and nations, to decouple their production from their demand patterns.

These predictions are borne out in the bottom part of Table 4.1. In Experiment 1, increased income from migration stimulates the demand for staples and manufactures. To meet this demand, imports of final goods increase (by 7 per cent), and marketed surplus of village-produced goods declines (by 2.5 per cent). Intermediate-goods imports fall as village production contracts, but the total effect on village imports is positive (1.1 per cent). That is, migration increases linkages in goods markets between the village and the outside world.

In general, one would expect an endogenous wage for hired labour to magnify the negative impact of labour exports on village production (Model 2). Upward pressure on hired-worker wages, one might think, would limit the extent to which households can profitably substitute hired workers for new family labour channelled into migration. Wages for hired workers, however, *decrease* as families in this village reallocate more resources to migration. This is because the production activities that are most adversely affected by the increase in migration in Model 1 are traditional, labour-intensive ones, and their contraction substantially reduces the demand for labour in the village (by 6.7 per cent in Model 2) as well as local wages (by 4.5 per cent). The decrease in the village wage softens the adverse impact of migration on production somewhat. For example, staple production in Model 2 falls by 1.8 per cent instead of 2.2 per cent, and the negative effect on non-agricultural production is now 5.7 to 6.6 per cent, instead of around 8.3 per cent in Model 1. In short, when the returns to migration increase the opportunity cost of resources in village production, the village economy undergoes a labour-saving economic restructuring. This finding is consistent with the observation, presented in Chapter 3, that the hired-labour intensity of production in this Mexican village decreased during the high-migration, economic crisis years of the 1980s.

When both labour and staple markets are missing (Model 3), the impact of migration on staple production is close to zero (-0.3 per cent), and the migration response drops slightly (to just under 7 per cent). Limited integration with outside staple markets restricts villagers' ability to meet their consumption and production (livestock) demand for grain through imports. On the one hand, higher incomes from migration increase the demand for staples. Given the village subsistence constraint that is implied by a missing staple market, this drives up the village price of staples (by 1.8 per cent). The higher local staple price helps arrest the movement of family resources out of staple production. It generally reduces the responsiveness of village production to increases in the returns to migration. This finding echoes a recurring theme in the experiments in this chapter: integration with outside markets facilitates local production adjustments to migration and policy changes. Isolation from outside markets restricts these adjustments.

While production response is lower the more isolated the village is from outside markets, village income multipliers from migration and policy changes are higher when markets are missing. The total income effect of the 10 per cent increase in remittances is highest in Model 3, in which the village is cut off from both staple and labour markets, and it is lowest in Model 1, the most neoclassical specification. Through changes in demand, part of the benefits from migration are passed on to producers of village non-tradables. This creates a positive income linkage within the local economy that is absent in the more neoclassical model. In the extreme case, when all goods and factors are tradable, the village income multiplier of remittances is unitary: higher remittances do not alter the conditions for household farm profit maximisation, and integration with outside markets converts village income linkages into growth linkages with the outside world. Multiplier effects of these linkages can be captured only by an analysis that goes beyond the village. That is, neoclassical efficiency would show up as positive income gains to Mexico as a whole relative to the isolated-markets case.

Experiment 2: Asset Accumulation and the NELM Approach

The second experiment tests the local economy-wide effects of the accumulation of productive assets made possible by migration. This is a new economics of labour migration (NELM) experiment. Lacking access to outside capital markets, the village must self-finance investments. That is, total village savings equal local investment demand. Given positive household savings propensities, higher income from migration generates increases in total village savings ranging from 1.7 per cent to 2 per cent in Table 4.1. The results of Experiment 1 reflect the impact of the associated increase in investment demand on village activity. Experiment 2 extends this analysis by simulating the impact of the new assets accumulated from these investments on village production and incomes. It uses the output of Experiment 1 as its starting point.

The results of the NELM experiment are reported in Table 4.2. All numbers in the table are percentage changes relative to the base model solution, i.e., the same base as in Table 4.1.

Asset accumulation spurred by higher returns to migration reduces, and in some sectors reverses, the negative "Dutch disease" effect of higher remittances on village production. The impacts of migration on livestock and, in Model 3, on staple production are now positive. The contraction in production of non-agricultural tradables is smaller than before. The total village income effect of higher remittances increases by about 10 per cent in all three models. For example, it increases from 3 to 3.3 in Model 1, and from 3.3 to 3.7 in Model 3. The asset-accumulation effects of migration on production, like the short-run remittance and lost-labour effects, are smallest in Model 3 and largest in Model 1. Conversely, the income effects are largest in Model 3. The positive NELM effects of migration on the village economy strengthen trade linkages between the village and the outside world. The impact of remittances on total imports

Table 4.2. **Village-wide Impacts of Migrant Remittances In the Long Run***

	Percentage Change From Base		
	Perfect Commodity Markets	Missing Labour Market	Missing Labour and Staples Market
Production (Prices):			
Staples	-1.74	-1.31	0.23 (1.80)
Livestock	0.02	0.05	0.06
Resource Extraction	-8.17	-5.78	-5.87
Services	-7.09	-5.41	-5.45
Retail	6.78	6.54	7.31
Labour Demand:			
Family	-3.56	-6.78	-6.86
Total	-7.23	-6.25	-6.29
Shadow Prices:			
Family Labour	4.10	4.26	4.39
Hired Labour	0.00	-4.11	-4.32
Capital	-2.95	-2.90	-2.95
Land	-0.45	-0.30	-0.16
Household Farm Incomes:			
Total Nominal	3.28	3.45	3.67
Total Real	3.28	3.45	3.57
Real, By Household Group:			
Landless	2.15	2.27	2.11
Small-holder	4.71	4.87	5.08
Large-holder	1.99	2.18	2.25
Consumption:			
Leisure	-1.87	-1.89	-1.94
Staples	2.97	3.08	1.42
Manufactures	3.75	3.92	4.17
External Linkages:			
Migration	7.21	6.82	6.48
Marketed Surplus	-2.04	-1.59	n.a.
Net Imports:			
Intermediate	-3.47	-3.49	-3.48
Final	7.26	7.02	7.83
Total	1.79	1.66	1.90

* The numbers in the table represent the effects of a 10 per cent increase in expected per-migrant remittances in the three models.

nearly doubles, from around 1 per cent to just under 2 per cent. Not only do imports of final consumption and investment goods into the village increase, but the smaller negative effect of migration on village production in Experiment 2 makes the drop in imported intermediate inputs smaller than before.

Village SAM and CGE Compared

Shifts in demand translate directly into output changes in the SAM multiplier experiment in Chapter 3. By contrast, demand changes are satisfied partly if not fully through trade with the outside world in the village CGE model. Also, in the CGE experiment, the supply response is not perfectly elastic (that is, supply curves are not horizontal). For non-tradables, an exogenous shift in demand has two effects: First, an increase in the equilibrium (village) price of the good, and second, an increase in equilibrium quantity. Because part of the demand shift is manifested in price changes, the quantity effect of migration or policy changes generally is smaller in magnitude in the CGE than in the SAM model. That is, SAM multipliers tend to exaggerate the effects of migration and policy changes on village production.

Table 4.3 illustrates this. It compares the results of the long-run migration experiments to those of the SAM multiplier experiment presented in Chapter 3. The extent to which quantity impacts may be exaggerated in SAM multipliers is evident. For example, while the SAM multipliers of a 10 per cent increase in remittances are positive for all village production sectors, the CGE production results usually are negative. The most notable and consistent exception is retail, the village import sector. That is, income changes from migration stimulate an increase in imports to the village, but migration competes for family resources with village production. The impact on livestock production is positive (but small) due to the asset-accumulation effect of remittances over time. It is negative in the short run, when this effect is ignored (see Table 4.1). Model 3 produces results most similar to the SAM multiplier model, because it includes the most non-tradables (family labour, hired labour and staples). There, the effects of the remittance change on livestock and staple production are positive, as in the SAM model, but they are small by comparison.

Remarkably, although the production impacts diverge sharply between the SAM and CGE approaches, the income effects are similar, both in sign and in magnitude. The difference between total income effects in the SAM experiment and Model 3 is negligible. The SAM multiplier overstates the effects of increased remittances on landless and large-holder household incomes. It understates the income effect on the small-holder group. This is because of the high migration response of this group relative to the other two, which is completely missed by the SAM approach. In short, the SAM multiplier comes close to the CGE models in predicting migration impacts on local incomes, but it gives a very different picture of the impact of migration on the structure of local production and on linkages between the local economy and the outside world. The limitations of the fixed-price, demand-driven SAM model emerge clearly from Table 4.3.

Table 4.3. **Comparison of Village SAM and CGE Remittance Experiment Results***

Sector	SAM	CGE		
		Perfect Commodity Markets	Missing Labour Market	Missing Labour and Staples Market
Production:				
Basic Grains	2.19	-1.74	-1.31	0.23 (1.80)
Livestock	1.31	0.02	0.05	0.06
Resource Extraction	2.76	-8.17	-5.78	-5.87
Services	1.91	-7.09	-5.41	-5.45
Retail	3.59	6.78	6.54	7.31
Value-Added:				
Family Labour	2.32	-3.56	-2.81	-2.77
Hired Labour	2.40	-5.67	-4.11	-4.32
Capital	1.96	-1.30	-1.08	-0.98
Land	1.47	-0.45	-0.30	-0.16
Gross Village Product	1.82	-1.57	-1.21	-1.09
Household Incomes:				
Total	3.71	3.28	3.45	3.67
Landless	3.89	2.15	2.27	2.11
Small-holder	3.65	4.71	4.87	5.08
Large-holder	3.74	1.99	2.18	2.25
Investment (Savings)	3.71	2.01	2.19	2.37

* The numbers in the table represent the effects of a 10 per cent increase in international migrant remittances in the SAM multiplier and Long-Run CGE models.

Despite this divergence between SAM and CGE findings, there is a place for linear, fixed-price SAM modelling. In economies characterised by unemployment, where resource constraints are non-binding, the assumption of an elastic supply response implicit in SAM multipliers is less problematic than in situations of full or near-full employment. The more marginal the policy change, the easier it is to view SAM multipliers as local approximations of income (although not necessarily compositional) impacts of policy changes. The linearity assumption of SAM models is less of a concern now that modifications of SAM multipliers are available to incorporate some non-linearity in household expenditure functions and to impose resource constraints on some sectors (Subramanian and Sadoulet, 1990; Lewis and Thorbecke, 1992; Parikh and Thorbecke, 1995). Finally, SAMs are useful to highlight the income linkages that are absent in micro household farm models, and they are the first step in building non-linear micro CGE models. Nevertheless, the results of the experiments indicate that, where price effects are important (as they usually are), SAM-based models which ignore these effects may overstate, sometimes dramatically, the local production effects of migration and policy changes.

Experiments 3 and 4: Agricultural Prices Policy Reforms

Micro economy-wide models are ideally suited to exploring the impacts of agricultural policy reforms on local economies. Price-reform experiments cannot be carried out with SAM or Leontief multiplier models, because those models do not contain prices. They could be carried out with household farm models, but those models fail to capture important income linkages among household farms and general-equilibrium feedbacks of policy changes.

Two agricultural policy reform experiments were carried out using the Mexican village models. Both are modelled on Mexico's 1993 agricultural policy reforms, which are connected to NAFTA and to an ongoing liberalisation of domestic markets since the late 1980s. The first (Experiment 3) examines the impact of staple price reforms, namely, a 10 per cent decrease in staple prices, on the local economy under different market specifications. This simulated drop in staple prices may be quite modest in light of actual impacts of Mexico's new policy on staple prices. The price of maize, far and away Mexico's major staple crop and a mainstay of most farm families, has been supported at levels equal to nearly twice the world price in recent years. NAFTA calls for a 15-year phase-out of these grain price supports. Mexico's agricultural reforms, however, are more ambitious, calling for an immediate elimination of price supports.

In order to ease the adjustment to the new price regime, and in response to a concern that market liberalisation would dramatically reduce rural incomes and stimulate out-migration, the PROCAMPO program will compensate farmers through a direct income subsidy, calculated on the basis of local yields and baseline acreages. Experiment 4 combines the 10 per cent staple price reduction with a direct income transfer equal to 10 per cent of the value of maize production in the base model. That is, barring any adjustments in farmer behaviour, this experiment, like the PROCAMPO program itself, is designed to be a (nominal) income-neutral policy reform. In practice, we shall see, it is far from being income-neutral, particularly in real terms, because of an adjustment of household farm production plans, income linkages among household farms and general-equilibrium feedbacks.

Experiment 3: Price Reforms

The results of a 10 per cent decrease in staple prices are summarised in Table 4.4. This experiment is not possible in Model 3, in which the staple price is endogenous to the local economy. That is, when the local staple market is cut off from the outside market by high transactions costs, the village is entirely insulated from the price change. By contrast, in Models 1 and 2, staple prices are set by outside markets (or directly by policy), and the elimination of price supports is transmitted directly to the village. These scenarios bracket two extremes with regard to the transmission of price policy changes to local economies. Understanding the extent to which transactions

Table 4.4. **Agricultural Price-Policy Experiment***

Sector	Percentage Change From Base		
	Model 1: Perfect Commodity Markets	Model 2: Missing Labour Market	Model 3: Missing Labour and Staples Market
Production (Prices):			
Staples	-7.82	-7.45	
	(-10.0)	(-10.0)	(0.0)
Livestock	0.26	0.24	n.a.
Resource Extraction	1.19	3.84	n.a.
Services	1.19	2.89	n.a.
Retail	-1.45	-1.74	n.a.
Labour Demand:			
Family	-2.70	-2.11	n.a.
Total	-2.94	-1.95	n.a.
Shadow Prices:			
Family Labour	-0.52	-0.37	n.a.
Hired Labour	0.00	-4.21	n.a.
Capital	-0.88	-0.72	n.a.
Land	-0.82	-0.72	n.a.
Household Farm Incomes:			
Total Nominal	-0.89	-0.73	n.a.
Total Real	-0.09	0.06	n.a.
Real, By Household Group:			
Landless	1.67	1.76	n.a.
Small-holder	-0.25	-0.10	n.a.
Large-holder	-0.14	0.03	n.a.
Consumption:			
Leisure	0.57	0.54	n.a.
Staples	10.43	10.54	n.a.
Manufactures	-0.88	-0.73	n.a.
External Linkages:			
Migration	1.32	0.94	n.a.
Marketed Surplus	-8.98	-8.60	n.a.
Net Imports:			
Intermediate	-0.04	-0.13	n.a.
Final	-1.54	-1.81	n.a.
Total	-0.73	-0.95	n.a.

* The numbers in this table represent the effects of a 10-per cent decrease in corn prices. The price policy cannot be simulated in Model 3, in which the outside staple market is missing and village corn prices are endogenous.

costs in staple markets impede the transmission of policy impacts to the local level is critical to predicting the impacts of policy changes on local economies. It is also critical if one wishes to predict the global effects of these policy changes and inform policy design, because the total impact of policy changes on production and incomes is the sum of these local impacts.

The reduction in staple prices triggers a reallocation of household farm resources out of staple production and into other income activities, including migration. Staple production falls by 7.8 per cent in Model 1. This implies a supply elasticity of 0.78. It is important to bear in mind, however, that this is a total elasticity; it includes the general-equilibrium effects of changes in labour demand on the family wage, which influences production together with the change in the output price. As staple production falls, non-staple output increases. The price reform has a small positive effect on livestock production (0.3 per cent) and a larger positive effect on the two non-agricultural production sectors (1.2 per cent).

Lower demand for family labour in staple production reduces the family wage, or the opportunity cost of family time in the village (by 2.7 per cent). This, in turn, stimulates migration (by 1.3 per cent). These results illustrate neatly the ways in which changes in government policies influence migration. Most of this migration is international. That is, migrants transmit the impacts of Mexican agricultural policy changes to the United States.

Predictably, the total nominal-income effect of lower staple prices is negative. It is small relative to the change in the staple price, however. The 10 per cent reduction in staple price results in a 0.9 per cent fall in total village income. The real-income effect is smaller: 0.1 per cent. These results reflect the high degree of diversification of village incomes; there is far from a one-to-one correspondence between income from staple production and total village incomes. Both are also shaped by the responsiveness of household farm resource allocations to policy changes. By redirecting resources away from staples, household farms buffer themselves against the decreased profitability of staple production. They do this partly through migration, but also by increasing their exposure in other village production activities. The near-zero effect of the price fall on real incomes in Model 1 reflects the importance of staples in village consumption. As consumers, households benefit from lower staple prices.

The heterogeneity of household farms in the village creates an uneven distribution of the impacts of price-policy changes. Landless households *benefit* from lower staple prices. Their nominal incomes fall; increased income from non-staple production is unable to compensate for the decreased flow of value-added from staple production into this, as other, household groups. Nevertheless, as net purchasers of staples, this group benefits in real terms. Real incomes of small-holder and large-holder households fall by 0.3 and 0.1 per cent, respectively. They are more heavily engaged in staple production than are landless households, and staples constitute a relatively small share of their expenditures. Nevertheless, these two household groups gain from their

involvement in non-staple production, especially livestock. Livestock production benefits from lower staple prices in two ways: first, because new resources are channelled into livestock production, and second, because the cost of animal feed, which includes corn, decreases.

The price-policy reform weakens trade linkages between the village and the outside world. Lower staple prices stimulate local staple demand (by 10.4 per cent), reducing the village's marketed surplus of staples (by 9 per cent). Lower incomes, especially in the small-holder group which has the highest import propensity, reduce the village demand for imported manufactured goods (by 0.9 per cent). The staple price liberalisation has a negative effect on rural-urban growth linkages.

Qualitatively, the results of Models 1 and 2 are identical with the exception of large-holder incomes, which increase slightly in Model 2. By freeing up hired labour from staple production, the staple-price reform lowers the local wage for hired workers. This adverse wage effect is picked up in Model 2. Lower wages slightly dampen the negative effect of the lower staple price on staple production and magnify the positive cross effect on non-staple producing sectors. There is little difference between Models 1 and 2 with regard to the effects on livestock production, which does not employ hired labour. However, the effect on the two non-agricultural production sectors, which do use hired labour, is large. The elasticity of service-sector output with respect to the staple price more than doubles (from 1.2 to 2.9 per cent), and that of the resource extraction sector increases more than three-fold (from 1.2 to 3.8 per cent). Large-holder households in particular benefit from the increased value-added from these sectors. Because of this, their real incomes increase in Model 2 as a result of the staple price liberalisation. The effect of the lower staple price on total *real* village income is positive (although small: less than 0.1 per cent).

Experiment 4: PROCAMPO (Income Subsidy)

The PROCAMPO agricultural subsidy experiment combines the staple price decrease with a compensating income subsidy to staple producers. The subsidy component of the experiment was carried out by taking 10 per cent of the base value of staple production and allocating it as an income transfer to the three household groups, in proportion to each group's share in total (initial) family labour, land and capital value-added from staple production. Large-holder households capture most of the subsidy (64 per cent). Only 3 per cent reaches landless households.

Table 4.5 reports the results of the PROCAMPO experiment. As producers and recipients of value-added, all household groups lose as a result of lower staple prices, as in the previous experiment. However, the subsidy reduces and, in one case (large-holder households), reverses the negative effect of the price reform on household incomes. All groups now benefit from the policy reform in real terms. The income effects of the combined price reform/subsidy range from a low of 0.47 per cent in small-holder households to a high of 2.3 per cent in landless households. The

Table 4.5. **PROCAMPO (Price Reform and Income Subsidy) Experiment***

Sector	Percentage Change From Base		
	Perfect Commodity Markets	Missing Labour Market	Missing Labour and Staples Market
Production (Prices):			
Staples	-7.94	-7.55	0.02 (0.08)
Livestock	0.23	0.21	-0.01
Resource Extraction	0.69	3.50	-0.18
Services	0.69	2.49	-0.21
Retail	-0.04	-0.35	0.76
Labour Demand:			
Family	-3.16	-2.54	-0.22
Total	-3.39	-2.34	-0.20
Shadow Prices:			
Family Labour	-0.30	-0.15	0.12
Hired Labour	0.00	-4.47	-0.13
Capital	-0.98	-0.82	-0.05
Land	-0.87	-0.76	-0.02
Household Farm Incomes:			
Total Nominal	0.21	0.37	0.58
Total Real	1.01	1.18	0.57
Real, By Household Group:			
Landless	2.30	2.40	0.31
Small-holder	0.47	0.62	0.37
Large-holder	1.41	1.59	0.80
Consumption:			
Leisure	1.41	1.37	0.42
Staples	11.04	11.16	0.21
Manufactures	0.09	0.25	0.51
External Linkages:			
Migration	0.77	0.37	-0.30
Marketed Surplus	-9.15	-8.74	n.a.
Net Imports:			
Intermediate	-0.23	-0.41	-0.15
Final	-0.09	-0.37	0.78
Total	-0.16	-0.39	0.30

* The numbers in this table represent the effects of a 10-per cent decrease in corn prices plus a direct income subsidy equal to 10 per cent of the base value of corn production. Only the effect of the subsidy is simulated in Model 3, in which village staple prices are endogenous.

compensating subsidy is not income neutral. Because household farms in the village adjust their behaviour in response to the lower staple price, a subsidy equal to the change in base value of staple production overcompensates the village. Total village income increases in both nominal (0.2 per cent) and real (1 per cent) terms.

This positive income effect is striking given that the subsidy has a negative impact on village production in all sectors. By boosting household incomes, the subsidy increases leisure demand (by 1.4 per cent in Model 1) and drives up the opportunity cost of family time in production. This prompts households to withdraw both some of their own time and complementary inputs from village production. Total value-added (the gross village product) falls by 1 per cent, compared to 0.9 per cent in Experiment 3. The negative effect of the price reform on staple production increases only slightly (from 7.8 to 7.9 per cent). The positive cross-effects on non-staple sectors are much smaller, however; they are on the order of 0.2 to 0.7 per cent instead of 0.3 to 1.2 per cent in Model 1. When the impact on wages for hired workers is considered (Model 2), the cross-sector effects are still large, although they are dampened slightly.

Income subsidies help neutralise the effect of staple price reform on migration; the effect of the policy change on migration is still positive but smaller than before (0.8 per cent in Model 1, compared to 1.3 per cent previously). It also neutralises the negative trade-linkage effects of the price reform. Total village imports now decrease by only 0.2 per cent, compared to 0.7 per cent in Experiment 3. Higher demand for staples in combination with lower output results in a sharp decrease in marketed surplus from the village (by 9.2 per cent).

The impacts of PROCAMPO are different in Model 3, in which the village is insulated from the staple-price change. Here, the income transfer (which is based on production, not sales, of staples) represents a net infusion of income into the village. Total income increases by just under 0.6 per cent in both nominal and real terms. Because staples are a normal good and the village is constrained to be self-sufficient in staples, higher incomes create an increased demand for staples, which raises the local staple price slightly (by 0.1 per cent). Instead of falling, as in the other models, output increases, although only by a small amount (less than 0.1 per cent). The demand for leisure also increases with income (by 0.4 per cent). This increases the family wage by a small amount (by 0.1 per cent). The higher family wage dampens the positive effect of higher income on staple production and causes the other production sectors to contract, although always by less than 0.3 per cent. Migration decreases (by 0.3 per cent). In short, the impacts of the policy reform are almost reversed when the village is not integrated with outside staple markets to begin with. Perhaps one-half of all villages in Mexico are not net exporters of staples. Clearly, the impacts of Mexico's agricultural policy reforms on the rural economy turn on the extent to which policy price changes are manifested in changes in local prices. The price-transmission process is little understood and should be a research priority in the future.

Experiment 5: Technological Change

The importance of technological change to enhance staple-supply response and increase rural incomes is a basic tenet of development economics. The argument that technological change induces growth linkages inside and outside of the rural economy is a cornerstone of the new economics of growth (Mellor) and the case for agricultural development-led industrialisation (ADLI; Adelman, 1985). The migration and micro economy-wide impacts of increasing productivity in LDC agricultural systems are not well understood, however. In the Mexican context, policies to make small-scale agriculture more productive are likely to be critical to the competitiveness and sustainability of rural economies and communities, as well as to minimising the impacts of market reforms on migration. Experiment 5 explores the local economy-wide impacts of technological change in crop production.

Crop production is virtually synonymous with staple production in the base model, because of the preeminence of maize cultivation. The technological change experiment, therefore, is implemented by increasing the marginal productivity of all factors in staple production by 10 per cent. This is accomplished by raising the technological shift parameter by 10 per cent in the production function for staples. The results are displayed in Table 4.6.

Staple production is much more sensitive to changes in factor productivity than to a change in the staple price. The 10 per cent productivity increase leads to nearly a 17 per cent jump in staple output in Models 1 and 2. Family resources flow out of the other production sectors to support this large staple supply response. Livestock production falls slightly (by less than 0.1 per cent), but the two non-agricultural sectors contract by 1.8 per cent in Model 1 and by between 3 and 4 per cent in Model 2.

Integration with outside staple markets makes possible this large staple-supply response. In both Models 1 and 2, marketed surplus increases by approximately the same percentage amount as staple production[3]. Consumption of staples also increases, but by less than 1 per cent in both models.

The key to a large staple response is the ability to market surplus production outside the village. Where this possibility is not available (Model 3), the staple supply response to technological change is much lower (2.4 per cent). Where high transactions costs effectively cut the village off from outside staple markets, higher productivity translates mostly into lower local prices for staples. In Model 3, the local staple price drops by 14.5 per cent. This transfers the benefits of the technological change to local consumers who have a high marginal propensity to consume staples. The real income gain in Model 3 is highest for subsistence households (2.5 per cent, compared with 1.1 to 1.2 per cent in the other two models). Technological change results in only a negligible increase in total nominal village income in Model 3, however (less than 0.1 per cent). Even in real terms (i.e., taking into consideration the large decrease in staple price), the gains from technological change are modest in Model 3 (0.8 per cent) compared with Models 1 and 2 (1.2 to 1.4 per cent).

Table 4.6. **Agricultural Productivity Experiment***

Sector	Percentage Change From Base		
	Perfect Commodity Markets	Missing Labour Market	Missing Labour and Staples Market
Production (Prices):			
Staples	16.91	16.53	2.36 (-14.51)
Livestock	-0.09	-0.08	0.16
Resource Extraction	-1.79	-3.74	1.19
Services	-1.78	-3.11	0.76
Retail	2.22	2.44	-0.17
Labour Demand:			
Family	2.28	1.82	-0.91
Total	2.49	1.68	-0.84
Shadow Prices:			
Family Labour	0.80	0.68	0.08
Hired Labour	0.00	3.58	-1.97
Capital	1.83	1.69	0.37
Land	2.14	2.04	0.60
Household Farm Incomes:			
Total Nominal	1.36	1.23	0.06
Total Real	1.36	1.23	0.84
Real, By Household Group:			
Landless	1.17	1.09	2.52
Small-holder	1.37	1.25	0.69
Large-holder	1.36	1.22	0.80
Consumption:			
Leisure	0.33	0.36	0.75
Staples	0.99	0.91	17.05
Manufactures	1.36	1.23	0.07
External Linkages:			
Migration	-1.98	-1.67	-0.19
Marketed Surplus	17.92	17.62	n.a.
Net Imports:			
Intermediate	-0.34	-0.21	-0.41
Final	2.36	2.55	-0.16
Total	0.98	1.14	-0.29

* The numbers in this table represent the effects of a 10 per cent, factor-neutral increase in staple productivity (i.e., in the shift parameter of the staple production function).

What are the implications of technological change for migration in these different market scenarios? By raising the productivity of family labour on the farm, one would expect technological change to discourage out-migration. This is, indeed, the outcome in Models 1 and 2. The 10 per cent productivity increase results in a 2 per cent decrease in migration in Model 1 and a 1.7 per cent decrease in Model 2. Market failure nearly erases this migration effect in Model 3, however. Migration decreases, but only slightly (by 0.2 per cent).

The policy lessons from this experiment are clear: technological change has a minimal effect on production, incomes and migration in an imperfect market environment. High transactions costs which limit outside markets for the affected good mute the impact of technology policy on rural development and on reducing migration pressure. Diminishing returns to family inputs under existing technologies may limit the supply response to price changes. In order to be effective, technology policies need to be accompanied by efforts to make markets work better. Where markets work well, technology change often is more effective than price policy in stimulating production and reducing migration pressure. This point is illustrated nicely in the results from Models 1 and 2.

Experiment 6: Cash-crop Prices

Shifting from subsistence to cash-crop production will be the key to adjusting to market reforms in much of rural Mexico. Here, as in the previous experiment, market infrastructure is critical. High transactions costs that limit the profitability of cash-crop production constrain the adjustment process and make it difficult for local economies to make the transition from low-productivity, subsistence-staple production. In rural Mexico, migration is the inevitable accompaniment to low-productivity familial production. Increasing the efficiency of markets for goods in which producers have a comparative advantage is a prerequisite for successful adjustment to trade reforms. The results of Experiment 6, below, reveal that failure in other markets, e.g., staples, can seriously limit the supply response in cash crops, restricting the ability of local economies to reorient towards new market opportunities and provide alternatives to migration.

The final experiment explores the local economy-wide effects of increasing the profitability of cash-crop production. This may be viewed as a productivity experiment, analogous to Experiment 5, for cash crops. Alternatively, it may be interpreted as a market-infrastructure experiment, in which transactions costs of marketing cash crops outside the local economy are reduced. This is different from a simple price experiment, because it affects the profitability of cash-crop production but not the local price of the cash crop for consumers and producers (i.e., purchasers of intermediate inputs). A real-world example corresponding to this experiment would be the establishment of a marketing facility for the cash crop near the village, or improvement in transportation infrastructure that lowers the cost of getting the cash crop to market[4]. Livestock is far

Table 4.7. **Cash-Crop Experiment***

Sector	Percentage Change From Base		
	Perfect Commodity Markets	Missing Labour Market	Missing Labour and Staples Market
Production (Prices):			
Staples	-0.71	-0.57	7.97 (10.58)
Livestock	11.08	11.07	10.90
Resource Extraction	-2.77	-1.89	-3.86
Services	-2.76	-2.20	-3.70
Retail	6.33	6.24	7.84
Labour Demand:			
Family	0.47	0.67	2.05
Total	0.28	0.61	1.88
Shadow Prices:			
Family Labour	1.25	1.30	1.53
Hired Labour	0.00	-1.48	0.74
Capital	6.94	6.99	7.74
Land	9.10	9.13	9.98
Household Farm Incomes:			
Total Nominal	4.22	4.28	4.89
Total Real	4.22	4.28	4.30
Real, by Household Group:			
Landless	4.50	4.54	3.29
Small-holder	4.42	4.47	4.63
Large-holder	4.00	4.06	4.10
Consumption:			
Leisure	2.59	2.57	2.30
Staples	3.31	3.35	-6.16
Manufactures	4.29	4.34	4.95
External Linkages:			
Migration	-3.06	-3.19	-3.74
Marketed Surplus	-0.97	-0.82	n.a.
Net Imports:			
Intermediate	0.28	0.22	0.19
Final	6.54	6.45	8.11
Total	3.35	3.28	3.96

* The numbers in the table represent the effects of a 10 per cent increase in the profitability of livestock production.

and away the dominant export from the village. It, therefore, represents the cash crop in this experiment. As noted earlier, livestock production has minimal labour demands, which makes this activity ideally suited for a high-migration environment where the opportunity cost of family labour is high. The low family resource intensity of livestock production also minimises the trade-off between channelling resources into this and other village production activities. Because of this, while the missing staple market in Model 3 should limit the livestock supply response, the effect will not be as great as would be the case in a more family-resource-intensive cash-crop sector.

The results of the cash-crop experiment appear in Table 4.7. They reveal a high livestock supply response to changes in the farmgate price in all three models, on the order of 11 per cent. This comes at the expense of all other production sectors in Models 1 and 2, where staple production falls by less than 1 per cent and non-agricultural production declines by 2 to 3 per cent. In Model 3, however, higher village incomes from livestock production stimulate the consumption and intermediate demands for staples, driving up both the staple price (by 10.6 per cent) and staple production (by 8 per cent). Because of the low labour-intensity of livestock production, the local staple subsistence constraint dampens the livestock supply response only slightly. However, it increases the adverse effects on the non-agricultural sectors, where output now falls by nearly 4 per cent.

The increased demand for the village non-tradables (staples) creates a slightly larger positive effect on incomes in small-holder and large-holder households. Nevertheless, the real income gain for landless households, with their high propensity to consume staples, is smaller when the regional staple market is missing. Although in nominal terms the income effect is about one half of a percentage point higher when staples are non-tradable, in real terms (i.e., adjusting for the higher local staple price) they are about the same in all three models. In short, the missing staple market dampens the livestock supply response without producing a significant income multiplier from non-tradables in the local economy. The negative effect of a missing staple market on cash-crop response is likely to be larger in cases where cash-crop production is more family-input intensive.

Overall, the results of the cash-crop experiment mirror those of the first migration experiment, presented in Table 4.1. This similarity is no coincidence. Both experiments examine the effect of an increase in the returns to a village export. In the first case the export is labour; in the second it is livestock. In both experiments, increased supply (of migrants or of livestock) comes at the expense of other sectors' production in the village. The only exception is staple production in the second case, where there is a missing regional staple market. The missing staple market limits the supply response in livestock just as it limits the migration response in Experiment 1. Nevertheless, by stimulating the demand for non-tradables (labour in Model 2, staples and labour in Model 3), the increased returns to the village export unleash a positive local income multiplier that is absent in the case where both staples and hired labour are tradables (Model 1). That is, both of these experiments reveal a trade-off between maximising supply response and stimulating local incomes, at least in the short run. In the long

run, better integration with outside markets should enable the local economy to reorient itself around the production of goods in which it enjoys a regional comparative advantage, with positive results for local incomes. Indeed, this has been the case historically in rural economies of today's developed countries, from corn in Iowa to wine in Bordeaux.

Notes

1. A positive migration elasticity with respect to remittances does not necessarily hold in a micro economy-wide model. In a Javan village studied by Taylor and Adelman (1995) there is evidence of a backward-bending migrant-supply curve, due to relatively high per capita incomes and a concentration of migration in high-income households with a high marginal utility of leisure.
2. That is, a model in which the treatment of the village is analogous to the neoclassical treatment of the household farm as being perfectly integrated with outside markets, and thus, a price-taker.
3. This finding reflects the fairly large share of marketed surplus in total corn output in the base.
4. If the latter also resulted in lower transactions costs for consumers, the price band for the good would narrow both from the bottom (lower transactions costs and thus higher farmgate price for producers) and from the top (lower purchase price for consumers). The present experiment explores the effect of compressing the price band only from the bottom, that is, on the producer side.

Chapter 5

Conclusions

Micro economy-wide models occupy a middle ground between household farm models and aggregate, economy-wide models for policy analysis. Like household farm models, they are rooted in the micro economy and are constructed "from the ground up", using household farm survey data. This is in contrast to "macro" CGE and SAM-based models, which are estimated using aggregate data usually provided by government statistics bureaux.

Aggregate economy-wide models are not well suited for examining the local impacts of migration or policy changes; their aggregate character conceals important linkages and interactions among households, production sectors, and other institutions at the local level. The experiments in Chapters 3 and 4 highlight the importance of the diversity of local production and the structure of local markets in shaping migration and policy impacts. Micro economy-wide models are designed to take these considerations into account, but they also capture income linkages among economic actors and general-equilibrium feedbacks absent in household farm models. They highlight interactions among different types of household farms, in contrast to household farm modelling's focus on a "typical" or "representative" household. The findings presented in Chapters 3 and 4 reveal that these indirect linkage and general equilibrium effects are important, and they may even be more significant than direct effects in shaping the impacts of migration and policy changes on local economies.

Micro economy-wide models have been constructed and used for policy analysis in diverse developing-country settings ranging from the Mexican example presented here to villages in India, Senegal, Java, and a village-town economy in Kenya. Several others are in progress. Those involved in these research efforts believe that the benefits of micro economy-wide modelling for policy analysis far outweigh the costs. A well-designed micro household farm survey can provide nearly all of the data needed to estimate micro economy-wide models. SAMs are relatively easy to construct, given data availability. Because they are merely an accounting framework, they do not require a great degree of economic skill. With a consistent SAM, simple matrix manipulation using standard linear algebra algorithms yields a SAM multiplier matrix. This explains the popularity of SAMs and SAM multipliers for policy analysis at the national level.

The enormous advances that have occurred over the last decade in computer hardware and in non-linear programming software bring micro CGE modelling within reach of economists with some post-graduate training. It can safely be said that it is easier to construct a micro CGE model today than it was to estimate a linear programming model a decade ago. The programming and policy analysis can easily be done on PCs.

The migration and policy experiments presented in this book illustrate a few of the potential uses for these models. The migration experiments provide a window into the often complex impacts of migration on migrant-sending economies, and the policy experiments offer a ground-level perspective of the likely impacts of alternative development and trade policies.

Migration and Development

Migration influences local economies in ways that are usually overlooked by migration research. The micro economy-wide models at the core of Chapters 3 and 4 highlight economic linkages which transmit the impacts of migration from migrant to non-migrant households. Because of the importance of these linkages, remittance-use surveys of migrant households are likely to offer a limited and distorted picture of the impacts of migration on migrant-sending economies. Migration and remittances unleash an array of income and price effects which tend to transform village production and have a significant impact on incomes in households that do not contain migrants. As a result, many and perhaps most of migration's impacts on local economies are not to be found within the migrant households themselves.

Simulation results suggest that migration produces short-term negative effects but longer-term positive effects on village production. Predictably, as the economic returns from sending migrants abroad increase, there tends to be a reorientation of village economies around international migration. There is a restructuring of village production away from labour-intensive activities and production processes, and a channelling of family resources into migration.

In the short run, the loss of labour to migration and a higher opportunity cost of family time negatively affect the local production of tradables. The migration experiments in Chapter 4 reveal a "Dutch disease" effect of migrant labour exports on village production in the short run, as migration competes with the local production of tradables for scarce family resources. Despite these negative short-run effects on production, migration has a large, positive effect on household farm incomes, on the demand for non-tradables, and on trade linkages between local economies and the outside world.

Lacking access to outside credit markets, in the long run the local economy benefits from the increased savings made possible by migration. The findings from Experiment 2 in Chapter 4 support the new economics of labour migration hypothesis that migrants act as financial intermediaries, loosening credit constraints on investment in local production (Stark, 1982). They do this by providing their households of origin with access to liquidity, in the form of migrant remittances. They also may promote investments by offering income insurance, promising to assist households in times of economic distress or in the event that new investments fail to produce. Risk is not explicitly incorporated into the micro economy-wide models used here. Nevertheless, the insurance role of migrants may shape the parameters of this model by influencing the underlying structure of the local economy, from which the model is estimated.

Development and Trade Policy

Comparisons of policy experiment results across the three versions of the village model reveal that market failures limit the responsiveness of local production to migration and policy changes. They also limit the extent to which technological change in food production can raise rural incomes and discourage out-migration. The results of Experiment 5 in Chapter 4 suggest that a factor-neutral technological change can produce a large increase in local incomes and a decrease in migration when the local economy is closely integrated with commodity markets outside the village. Given decreasing returns to scale in local production, technology policy gives a larger boost than price policy to local production and incomes when regional markets work. However, these positive income and migration effects are almost completely neutralised when there is a missing regional market for staples. In short, well-functioning rural markets are critical to achieving the income-growth effects of technological change envisioned by Mellor (1976) and others, and to provide local income alternatives to migration.

Nevertheless, by making some local goods and factors non-tradable, missing markets create positive income linkages within the local economy that are absent when the economy is perfectly integrated with outside markets. If the production of non-tradables involves a relatively intensive use of labour, then market liberalisation may have an adverse effect on local employment and stimulate, rather than retard, migration in the short run. Market failure has the effect of protecting the sectors characterised by high transactions costs.

This finding suggests difficult policy choices. On one hand, policies to integrate local economies with regional and world markets, e.g., by investing in improved market infrastructure, are critical to increasing the supply response of household farms. On the other hand, by transforming local non-tradables into tradables, market integration adversely affects some producers (i.e., of the previously non-tradable goods), and it may adversely affect village incomes in the short run. Reaping the gains from trade requires a reorientation of production activities in favour of tradables in which local producers have a comparative advantage in regional or world markets. In much of rural Mexico, this means shifting production away from low-input staples towards cash crops, livestock and non-agricultural production.

Achieving this transition expediently is likely to require policies to assist local economic restructuring, including making complementary markets (e.g., for credit and insurance) work. In the past, migrants have been the chief financial intermediaries for rural households that have managed to accomplish this transition. They have provided their households of origin with financial resources, in the form of remittances, to finance new investments, as well as with insurance against income risk. In the absence of carefully designed policies to assist with economic restructuring, market liberalisation may lead to lower rural incomes and increased out-migration in both the short and long run.

Limitations and Extensions

The micro economy-wide modelling presented in this book has a number of limitations that suggest directions for future research. These limitations are by no means inherent in micro economy-wide modelling — only in the small-scale, village and village-town models developed to date. They concern *1)* scope, *2)* generalisability, and *3)* statics versus dynamics.

Scope

A focus on individual villages, groups of villages, or village-town economies necessarily restricts the usefulness of models for examining regional employment and income multipliers of migration and policy changes. From a modelling point of view, this limitation can be dealt with easily, by extending the boundaries of the model beyond the village to larger (i.e., village-town, county, or province) economies. The procedure for building geographically more expansive models is identical to the one used in this book. The only difference (and real additional cost) is broadening the data base to support this modelling. The usefulness of regional economy-wide models for policy analysis would probably justify the expense, especially if one can "piggy back" on existing household farm survey efforts. The incremental cost of gathering data to support this modelling is relatively small. Modest steps are being taken in this direction, using survey data from 3 villages and a town in Mexico (Fredericks and Taylor, 1995) and from 4 Zambian villages (Holden, Taylor and Hampton, 1995). However, data collection for larger region-wide economic modelling almost certainly will require initiatives by country governments in conjunction with international development agencies.

Generalising the Results

Village-wide models provide an understanding of the inner workings of local economies and responses to outside market and policy changes not available from more aggregate models. However, generalisability has been sacrificed to achieve this micro detail. Two approaches are possible to test and enhance the generalisability of findings from micro economy-wide models. The first is to construct geographically larger models, supported by region-wide data collection, as suggested above. Alternatively, researchers can perform purposive sampling of different types of villages, i.e., ones representing a range of geographic, market, and even cultural contexts. This approach generally does not increase the scope of the modelling, but it does make it possible to test the generalisability of findings for villages in different settings. It is the approach we are currently using in Mexico, where our surveys are being extended to villages and village-towns in agro-export regions of the northwest, in villages traditionally less connected to the United States through migration (e.g., in Puebla), and in relatively recent migrant-sending areas in the south (Oaxaca).

Statics Versus Dynamics in Micro Economy-wide Models

The models in this book are static: They can be used to compare production, incomes, employment, migration, and village "macro" balances before and after an exogenous migration or policy change, but they are not designed to trace out adjustment paths or to explore dynamic implications of exogenous shocks. The modelling technology can be extended to construct dynamic micro CGEs where adjustment paths and inter-temporal effects are important. The "new economics of labour migration" experiment (Experiment 2 in Chapter 4) is a step in this direction, because it links two static CGEs together through investment and capital stock-updating equations. The importance of evolving "migration networks" in shaping both migration incentives and the impacts of migration on local economies (e.g., Massey *et al.*, 1993) suggests that a more dynamic approach than the one used in this book may be appropriate. Other applications using dynamic micro economy-wide models are under way. For example, Holden *et al.* (1995) represents the first stage in a research effort to explore dynamic implications of structural adjustment for local environments in rural Zambia. Policies that affect input prices and transactions costs create environmental impacts through land clearing. To evaluate this, environmental accounting will be introduced into a micro economy-wide model, along with land clearing activities that respond to changes in the shadow value of land for subsistence (*chitemene*) and commercial crop production.

Modelling and estimation techniques for the most part already have been developed to extend micro economy-wide modelling in these new directions. Lack of data to support this modelling and estimation is now the primary constraint. I hope that the present research will help encourage large-scale data collection to complement the independent small-scale surveys that have been supporting the first generation of micro economy-wide models.

References

ADAMS, R.H., Jr. (1993), "The Economic and Demographic Determinants of International Migration in Rural Egypt", *Journal of Development Studies*, 30(1):146-67.

ADELMAN, I. (1984), "Beyond Export-Led Growth", *World Development*, 12(9):937-949.

ADELMAN, I. and J.E. TAYLOR (1994), *Integrated Agricultural Household Modelling*, Rome: FAO.

ADELMAN, I., J.E. TAYLOR and S. VOGEL (1988), "Life in a Mexican Village: A SAM Perspective", *Journal of Development Studies*, 25:5-24.

BARDHAN, P. (1988), "Alternative Approaches to Development Economics", in *Handbook of Development Economics*, Vol. 1 (H. Chenery and T.N. Srinivasen, eds.), Elsevier Science Publishers, New York.

DE JANVRY, A., M. FAFCHAMPS and E. SADOULET (1991), "Peasant Household Behavior with Missing Markets: Some Paradoxes Explained", *The Economic Journal*, 101:1400-1417.

DURAND, J. and D.S. MASSEY (1992), "Mexican Migration to the United States: A Critical Review", *Latin American Research Review*, 27:3-42.

FLETCHER, P.L and J.E. TAYLOR (1992), "Migration and the Transformation of a Mexican Village House Economy", presented at the Conference "New Perspectives on Mexico-US Migration", University of Chicago, October 22-23.

FLETCHER, P.L., B.S. ORLOVE and J.E. TAYLOR (1994), *Income Sources and Consumption in Two Mexican Villages*, Department of Agricultural Economics (draft manuscript), University of California, Davis.

GOLAN, E. (1995), "The Village Economy and Tenure Security in West Africa: A Senegalese Village SAM", in Taylor and Adelman, pp. 31-68.

HARRIS, J.R. and M.P. TODARO (1970), "Migration, Unemployment and Development: A Two-sector Analysis", *The American Economic Review*, 60:126-42.

HAZELL, P.B.S. and A. ROELL (1983), "Rural Growth Linkages: Household Expenditure Patterns in Malaysia and Nigeria", *IFPRI Research Report 41*, IFPRI, Washington, D.C.

HECKMAN, J. (1976), "The Common Structure of Statistical Models of Truncation, Sample Selection and Limited Dependent Variables and a Simple Estimator for Such Models", *Annals of Economic and Social Measurement*, 5:475-92.

HIRSCHMAN, A.O. (1958), *The Strategy of Economic Development*, Yale University Press, New Haven.

KENNEDY, E. and T. REARDON (1994), "Shift to Non-traditional Grains in the Diets of East and West Africa: The Role of Women's Opportunity Cost of Time", *Food Policy*, 19 (1):45-56.

LEWIS, B.D. and E. THORBECKE (1992), "District-Level Economic Linkages in Kenya: Evidence Based on a Small Regional Social Accounting Matrix", *World Development*, 20(6):881-97.

LEWIS, B.D. and E. THORBECKE (1995), "Economic Linkages in a Small Regional Economy: The Case of Kutus Regions, Kenya", in Taylor and Adelman, pp. 142-72.

LEWIS, W.A. (1954), "Economic Development with Unlimited Supplies of Labour", *Manchester School of Economic and Social Studies*, 22(May): 139-191.

LUCAS, Robert E.B. (1985), "Emigration to South Africa's Mines", *American Economic Review*, 77 No. 3, pp. 313-330.

LUCAS, Robert E.B. and O. STARK (1985), "Motivations to Remit: Evidence from Botswana", *Journal of Political Economy*, 93(5):901-918.

MARTIN, P.L. (1991), "Labor Migration: Theory and Reality", in Martin and Papademetriou, eds., pp. 27-42.

MASSEY, Douglas S. (1989), "International Migration and Economic Development in Comparative Perspective", *Population and Development Review*, 14(3):383-414.

MASSEY, D.S., R. ALARCON, J. DURAND and H. GONZALEZ (1987), *Return to Aztlan: The Social Process of International Migration from Western Mexico*, University of California Press, Berkeley and Los Angeles.

MASSEY, D.S., J. ARANGO, G. HUGO, A. KOUAOUCI, A. PELLEGRINO and J.E. TAYLOR (1993), "Theories of International Migration: An Integration and Appraisal", *Population and Development Review*, 19(3):431-66, September.

MELLOR, J. (1976), *The New Economics of Growth*, Cornell University Press, Ithaca.

MURTAGH, Bruce A. and Michael A. SANDERS (1983), "MINOS 5.1 User's Guide", *Report SOL 83-20R*, Stanford University (revised January 1987).

OBERAI, A. and H.K. SINGH (1980), "Migration, Remittances and Rural Development: Findings of a Case Study in the Indian Punjab", *International Labor Review*, 119, No. 2, pp. 229-41.

PAPADEMETRIOU, D.G. and P.L. MARTIN, eds. (1991), *The Unsettled Relationahip: Labor Migration and Economic Development*, Greenwood Press, New York.

PARIKH, A. and E. THORBECKE (forthcoming), "Impact of Rural Industrialization on Village Life and Economy: A SAM Approach", *Economic Development and Cultural Change*.

RALSTON, K. (1995), "Household Nutrition and Economic Linkages: A Village Social Accounting Matrix for West Java, Indonesia", in Taylor and Adelman, pp. 173-213.

RANGARAJAN, V. (1982), "Agricultural Growth and Industrial Performance in India", *IFPRI Research Report* 33, IFPRI, Washington, D.C.

REARDON, T., C. Delgnado and P. MATLON (1992), "Determinants and Effects of Income Diversification Amongst Farm Households in Burkina Faso", *Journal of Development Studies*, 28(2):264-96.

REICHERT, J.S. (1981), "The Migrant Syndrome: Seasonal US Wage Labor and Rural Development in Central Mexico", *Human Organization*, 40:56-66.

REMPEL, H. and R.A. LOBDELL (1978), "The Role of Urban-to-Rural Remittances in Rural Development", *Journal of Development Studies*, 14(3):324-341.

RUSSELL, S.S. and M.S. TEITELBAUM (1992), *International Migration and International Trade*, World Bank Discussion Paper No. 160, The World Bank, Washington, D.C.

SINGH, I., L. SQUIRE and J. STRAUSS (1986), *Agricultural Household Models, Extensions, Applications and Policy*, The World Bank and The Johns Hopkins University Press, Baltimore.

STARK, O. (1982), "Research on Rural-to-Urban Migration in Less Developed Countries: The Confusion Frontier and Why We Should Pause to Rethink Afresh", *World Development*, 10(1), pp. 63-70.

STARK, O. (1980), "On the Role of Urban-to-Rural Remittances in Rural Development", *Journal of Development Studies*, 16, pp. 369-74.

STARK, O. and E. KATZ (1986), "Labor Migration and Risk Aversion in Less Developed Countries", *Journal of Labor Economics*, 4.

STARK, O. and D. LEVHARI (1982), "On Migration and Risk in LDCs", *Economic Development and Cultural Change*, 31:191-96.

STARK, O. and Robert E.B. LUCAS (1988), "Migration, Remittances and the Family", *Economic Development and Cultural Change*, 36.

STARK, O. and M. ROSENZWEIG (1989), "Consumption Smoothing, Migration and Marriage: Evidence from Rural India", *Journal of Political Economy*, 97.

STARK, O. and J.E. TAYLOR (1991), "Migration Incentives, Migration Types: The Role of Relative Deprivation", *The Economic Journal*, 101(September):1163-1178.

STARK, O. and J.E. TAYLOR (1989), "Relative Deprivation and International Migration", *Demography*, 26, pp. 1-14.

STARK, O., J.E. TAYLOR and S. YITZHAKI (1988), "Migration, Remittances in Inequality: A Sensitivity Analysis Using the Extended Gini Index", *Journal of Development Economics*, 28:309-322.

STARK, O., J.E. TAYLOR and S. YITZHAKI (1986), "Remittances and Inequality", *The Economic Journal*, 96(September):722-740.

STARK, O. (1992), "Remittances and Inequality Reconsidered: Direct, Indirect and Intertemporal Effects", *Journal of Policy Modelling*, 14(2):187-208.

STARK, O. (1987), "Undocumented Mexico-US Migration and the Returns to Households in Rural Mexico", *American Journal of Agricultural Economics*, 69(August):626-638.

STARK, O. (1986), "Differential Migration, Networks, Information and Risk", in Stark, ed., *Migration Theory, Human Capital and Development*, pp. 147-171, JAI Press, Greenwich, CT.

STARK, O. and I. ADELMAN (1994), *Village Economies: The Design, Estimation and Use of Village-Wide Economic Models*, Cambridge University Press, London and New York.

STUART, J. and M. KEARNEY (1981), *Causes and Effects of Agricultural Labor Migration from the Mixteca of Oaxaca to California*, La Jolla: Center for US-Mexican Studies, University of California, San Diego.

SUBRAMANIAN, S. (1995), "Production and Distribution in a Dry-Land Village Economy", in Taylor and Adelman, pp. 69-114.

SUBRAMANIAN, S. and E. SADOULET (1990), "The Transmission of Production Fluctuations and Technical Change in a Village Economy: A Social Accounting Matrix Approach", *Economic Development and Cultural Change*, 39(1):131-173.

TAYLOR, J.E. (1994), "International Migration and Economic Development: A Micro Economy-Wide Analysis", paper presented at the OECD Development Center Workshop on Development Strategy, Employment and Migration, July 11-13, Paris.

TAYLOR, J.E. (1995), "Migration and the Changing Structure of a Mexican Village Economy", in Taylor and Adelman, pp. 115-141.

TAYLOR, J.E. (1992), "Remittances and Inequality Reconsidered: Direct, Indirect and Intertemporal Effects", *Journal of Policy Modelling*, 14(2):187-208.

TAYLOR, J.E. (1987), "Undocumented Mexico-US Migration and the Returns to Households in Rural Mexico", *American Journal of Agricultural Economics*, 69(August):626-638.

TAYLOR, J.E. (1986), "Differential Migration, Networks, Information and Risk", in Stark, ed., *Migration Theory, Human Capital and Development*, pp. 147-171, JAI Press, Greenwich, CT.

TAYLOR, J.E. and I. ADELMAN (1995), *Village Economies: The Design, Estimation and Use of Village-Wide Economic Models*, Cambridge University Press, Cambridge, UK and New York.

TAYLOR, J.E. and T.J. WYATT (1994), "Migration, Assets and Income Inequality in a Diversified Household-Farm Economy: Evidence from Mexico", presented at the American Agricultural Economics Association Annual Meetings, August 1-4, Orlando, FL.

TAYLOR, J.E. and A. YUNEZ-NAUDE (1995), "Impacts of Policy Reforms on Two *Ejidal* Towns: A Comparative Study", (draft manuscript), presented at the Plenary Conference of the North American Agricultural Policy Research Consortium, Stanford University, May 5-6, University of California, Davis.

TODARO, M.P. (1969), "A Model of Migration and Urban Unemployment in Less-developed Countries", *The American Economic Review*, 59:138-48.

TODARO, M.P. and L. MARUSZKO (1987), "Illegal Migration and US Immigration Reform: A Conceptual Framework", *Population and Development Review*, 13:101-14.

TURNHAM, D.J. (1993), *Employment and Development: A New Review of Evidence*, Development Centre, OECD, Paris.

WEIST, R. (1979), "Implications of International Labor Migration for Mexican Rural Development", in Camara and Van Kemper, eds., *Migration across Frontiers: Mexico and the United States*, contributions of the Latin American Anthropology Group, Vol. 3. Institute of Mesoamerican Studies, State University of New York, pp. 85-97, Albany, NY.

YAP, L. (1977), "The Attraction of Cities: A Review of the Migration Literature", *Journal of Development Economics*, 4:239-264.