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## Why did rural households permit their daughters to be urban factory workers? A case from rural Malay villages

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## Abbreviations

EPZ	Export Processing Zone
FTZA	Free Trade Zone Act
ILO	International Labour Organisation
NHE	new household economics
MNC	multinational corporation
NEP	New Economic Policy
UNCTC	United Nations Centre on Transnational Corporations
UNIDO	United Nations Industrial Development Organisation

In the 1970s and 1980s, outward-looking economic policies became a popular development strategy in the Third World. The establishment of export processing zones (EPZs) was intended to promote manufacturing of exports by attracting multinational corporations (MNCs) with free trade status. In their analyses of EPZs, economists have mainly emphasised macroeconomic impacts, such as the generation of foreign exchange, technology transfer, and employment creation (Warr 1987a). They see increased job opportunities for household members as an indicator of improvement in the economic welfare of workers' households. On the other hand, sociologists and anthropologists examine new job opportunities for women in EPZs in terms of their impacts on migrant households and interpret them as 'household strategies', such as economic survival or accumulation strategies (Fernández-Kelly 1983; Ong 1983). More recently, outcome researchers have studied the feminisation of factory labour in EPZs, emphasising issues of working conditions, labour markets, and migration (United Nations 1993, 1994; Kusago and Tzannatos 1998). Migration of young females from rural villages to urban factories in EPZs is prevalent in most developing countries, ranging from Mexico (*Maquiladora*), The Dominican Republic, Brazil, Taiwan, South Korea, Sri Lanka and China (Special Economic Zones) to Indonesia, Vietnam, and Russia (UNIDO 1980; ILO/UNCTC 1988; World Bank 1992). This flow of young females to cities could have major social and economic impacts on their rural households.

Conventional rural-urban migration theories focus primarily on economic motives to explain why people move. Some see a gender bias in these conventional theories. Because they have been developed mainly based on the experiences of male migrants, predominantly the heads of households, these theories might not be suitable for explaining female migration decisions. Although ethnographic researchers have explained how social relations within households differentiated each member's motives in a qualitative manner (Grasmuck and Pessar 1991), none of the previous efforts have dealt systematically with the question: what are the household determinants of female migration to EPZs?

This paper examines the determinants of this recent female migration phenomenon in EPZs by focusing attention on both economic and non-economic factors at the household level. The paper will first cover theoretical aspects of female migration decisions. It will then look at the Malaysian EPZs and the female migration phenomenon. It will introduce rural Malaysian household data, including the method it has applied to construct non-economic factor indices. This will be the basis for a household model of female migration, and the empirical results of this model will be discussed. Finally, on the basis of the statistical results, we will discuss the major reasons why some households allowed their daughters to migrate.

## Gender and household dimensions of migration theory

### The gender dimension in the migration framework

Migration has long been an important field in demography and economic development. Over the years, migration has been attributed to everything from educational aspirations to refugee flights. In the late nineteenth century Ravenstein formulated general 'laws of migration' from data on internal migration within European countries (Ravenstein 1885). Ravenstein's laws emphasise the preeminence of economic motives in migration and the tendency to move from rural to urban areas.

Nearly a century later, Sjaastad (1962) and Lee (1966), building on Ravenstein's laws, attempted to construct a more comprehensive theory. Lee's model is framed by three main factors—point of origin factors, destination factors, and intervening obstacles. The starting proposition is that origin and destination factors, such as job opportunities, can influence potential migrants both positively and negatively. Therefore, these individuals calculate the difference between the positive and negative factors of origin and destination, taking into account intervening obstacles such as transportation costs and distance. If the outcome of the calculation is positive, people choose to migrate; if not, they stay.

Following this individualised benefit-cost approach, Harris and Todaro (1970) constructed a two-sector migration model. The two-sector model deals with migration as an outcome of essential differences in

labour market structure between rural and urban areas. They attribute rural-urban migration to the existence of a significant wage gap between urban and agricultural earnings. Extending this model, Todaro presented a push-pull model of migration in a more systematic way (Todaro 1976). His migration model highlights specific economic motives for migration and hypothesises that a potential migrant will maximise expected net gains from migration. The expected net gains are perceived in terms of differences in real incomes between rural and urban job opportunities and the possibilities of an urban job. Thus Todaro's model suggests that a potential migrant will choose the destination that offers the largest expected net gain. The model has been applied to many cases of migration in the course of transformations from agrarian to industrial economies. As Pedraza (1991) argues, however, these models are based solely on cases of male migration, without suggesting the possibility of a distinctive logic for independent female migration. Thus, while most migration frameworks have tended to present models that are 'gender-neutral' in their conceptual design, they have not explicitly addressed the possibility that migration decisions might differ systematically between males and females.

Recent increases in female migration in developing countries have encouraged some scholars to question the usefulness of conventional migration theories. Thadani and Todaro (1979) were among the first to discuss a conceptual framework of female rural-urban migration. They explored the

limits of conventional theories and attempted to develop a conceptual framework particular to female migration. They directly addressed the issue of why women migrate, asserting that

[t]he migration of women, like that of men, is indeed likely to be job-oriented; employment opportunities and wage differentials, actual or perceived, between rural and urban areas are of central significance. A distinguishing feature of female compared to male migration, however, is the importance of marriage as a reason for migration...Socio-cultural evaluations also may be an effective constraint on the migration of women (Thadani and Todaro 1979:45–46).

Essentially, they extended Harris and Todaro's individual benefit-cost approach into an individual female migration theory. Thadani and Todaro (1979) included women's motivation to marry as a determinant factor by comparing the difference in urban and rural marriage markets. They also argued that female migration is a result of interactions between individual economic, socio-cultural, and environmental factors, such as household economic power, household social structure, urban/rural differentials in income and employment opportunities, marital opportunities in urban areas, socio-cultural norms or customs regarding female lifestyle (for example, appropriate age for marriage), age, and education. As in Todaro (1969), Thadani and Todaro (1979) support the idea that females calculate the benefits and costs of migration, but include explicitly social and cultural factors as well as economic factors.

Following their framework, Behrman and Wolfe (1984) present a micro study of internal female migration in Nicaragua. In addition to labour market factors, they incorporate marriage market factors to explain the inter-regional flow of female migration. Interestingly, they find that the motive to marry a husband with a higher income is the most significant factor in explaining migration destinations. Young females probably migrate, however, not just for economic gains and marital purposes; rather, they are likely to consider a wide range of factors, such as work aspirations, consumption patterns in urban areas, enhancement of their skills and knowledge, and career development. Some of these can be understood as one's values and attitudes. Thus, at a minimum, Thadani and Todaro's model needs to be modified to incorporate more non-economic factors in addition to marriage motives when female migration decisions are being studied.

### **The household dimension in migration decision making**

Alternatives to individual-based benefit-cost approaches have emerged, which stress the importance of the active role of the household in migration decisions. Proponents of household approaches insist that individuals do not act alone in choosing the locations of their home and work; rather, households shape individual migration according to household strategies that maximise family economic welfare.

Economists (Mincer 1978) and sociologists (Arizpe 1982; Findley 1987; Massey 1990; Wood 1981, 1982) who advocate household-oriented approaches

usually make the fundamental assumption that altruism is a basic feature of every household, or alternatively that the head of the household is a benevolent dictator. The analogous terminology is a 'joint utility function' in which it is assumed that household choices are made to maximise total household welfare where the utility function is unified (Becker 1981). Empirical sociological studies have explored household strategies in developing countries, often labelling them economic survival or accumulation strategies (Findley 1987). In these studies, the family decides on a member's migration to an urban area if the family needs additional income to maintain the family economy or invest in a new business activity. In its selection of a household member as a migrant, the family considers the member's potential earnings in an urban area. Thus, if men's wage levels are expected to be higher than women's in the destination, the family will most likely select a male member as the migrant to maximise its household utility. The family also considers the level of opportunity costs associated with the household Z-goods, such as cooked food, washed clothing, cleaned room, child care, and elder care. If the family releases a household member who has contributed heavily to Z-good production, it has to bear the costs of the migration decision. On the other hand, if the family allows a household member who has consumed more Z-goods to migrate, it will be better off with the migration decision.

Almost no attempts have been made to analyse the migration decisions by incorporating income earnings, Z-goods opportunity costs, and non-economic

motives, along with conventional migration factors. By doing so, we could understand why some rural households send their daughters to urban factories.

## Malaysian EPZs and female migration

Malaysia has emerged as a successful industrial state in Southeast Asia. The New Economic Policy (NEP, 1971–90) is widely regarded as the engine driving this rapid economic growth, because it helped to promote foreign direct investment as an avenue of technology transfer, skill development, and better access to foreign markets (Ariff and Hill 1985; Edwards 1990; Jomo 1990; Kamal and Young 1988; Rajah 1993). As the centrepiece of this plan, the Malaysian government enacted the Free Trade Zone Act (FTZA) in 1971—an incentive package for investors and physical infrastructure (Warr 1987b)—to introduce EPZs. One of the main objectives of the NEP was to improve the social and economic status of the Malay, the ethnic majority, whose economic welfare had deteriorated in relative terms during the 1960s under the Green Revolution's expansion of medium and large scale land owners. This expansion mainly benefited Chinese landowners and adversely affected small-scale and landless Malay farmers (Snodgrass 1980). Hence the 12 geographically diverse EPZs, though concentrated on the west coast of the Malay Peninsula, were established to promote job opportunities for Malays in order to transform them from the agrarian sector to the industrial (Anazawa 1985; Sivalingam 1994).

The total number of workers in the Malaysian EPZs was more than 100,000, and the ratio of the total workers in the EPZs to total employment in the manufacturing sector was 8.5 per cent in 1990. Most important are the electrical and electronics industries, which account for 65 per cent of all jobs in the Malaysian EPZs. Second are the textile and garment industries with about 11 per cent of workers in the EPZs (Sivalingam 1994).

Since the early 1970s, Malaysian industrialisation has induced more autonomous female migration to cities than associated migration—that is, migration due to marriage or the husband's job transfer (Heng 1994; Khoo and Pirie 1984). In 1982, the ratio of single female migrants to the total number of female migrants was 55 per cent, and that of married female migrants was 44 per cent. These numbers have changed significantly so that by 1990 the ratio of single female migrants was 63 per cent, compared to 37 per cent for married female migrants (Department of Statistics 1982, 1986, 1990). As with EPZ experiences elsewhere, the majority of workers in Malaysian EPZs are young rural females between 16 and 25 years old, who have migrated for factory work (Fatimah 1985; Jamilah 1984, 1994).

Extant studies of female migrant workers in Malaysian EPZs have investigated the social and economic behaviour of female workers in urban areas, and presented evidence that these women have obtained greater choice over marriage partners and developed new forms of social relations with their parental households (Eden 1989; Fatimah 1985,

1991; Foo 1987; Jamilah 1994; Lie 1994; Lim 1978, 1981; Lockhead 1985; Ong 1983, 1987). Some of these studies make reference to the motives underlying female migration to EPZs, but a systematic analysis of female migration decisions has not been made.

The majority of Malays are Muslims, and Muslim women have historically been less likely to work outside the household, partly because of Islamic teachings that discourage independent female activities (Rauf 1994; Siraj 1984). Contrary to this tradition, female migration to EPZs has mostly been from rural Islamic villages, and this situation provides us with an opportunity to analyse female migration decisions in the context of major social change. The combination of both a recent rapid, successful industrialisation in urban areas and the existence of traditional Islamic Malay villages gives us an interesting empirical setting for the analysis of daughters' rural-urban migration decisions at the household level.

## Data

### Sample design and data collection

The sample design involved a comparison of migrants and non-migrant households. It began in Penang with interviews of 138 women (otherwise randomly chosen) who had migrated recently from the state of Kelantan to work in EPZs. Then, their parents were interviewed in their home villages (90 households), along with non-migrant daughters and their parents (48 households) from the same villages. A wide range of data was collected from daughters and their parents. Migrants were asked

about their individual attributes, the migration process and decision, the migration network, individual perspectives and expectations concerning migration, participation in domestic Z-goods production, wages and expenditures, and remittance patterns. Non-migrant daughters were asked about a relevant subset of these issues. Household heads were asked jointly about their household economy (income and assets—including those each brought to the marriage), household consumption and production, demographics, individual attributes, their perspectives on their daughters' migration and future prospects.

## Descriptive statistics

**Characteristics of migrant and non-migrant daughters.** As is shown in Table 1, all the migrants worked at factories (electronics, semi-conductor or textiles) in Penang, and had been there, on average, for 12 months at the time of the interview. Non-migrants consisted of full-time workers, part-time workers, or family business and domestic work helpers, and included those who went to private schools after failing national standard exams. At the individual level, migrants and non-migrants ranged from 16 to 30 years of age. This range is very similar to that of a previous study on female migrants in Malaysia (Jamilah 1984).

The educational backgrounds for both migrant and non-migrant daughters are quite high compared with the findings of the previous study. More than 70 per cent of the total respondents—both migrant and

non-migrant daughters—had an educational level beyond Form 3. The same data show, however, that non-migrants had higher educational attainment on average, especially in going on to Form 6. In Malaysia, because of the strong positive relationship between educational attainment and good jobs (Siti Rohani 1994), these data suggest, as conventional individual migration theory would predict, that migrants might be somewhat more likely to leave school early than non-migrants. Also, considering the increase in educational costs for households, such as school uniforms and examination fees, the economic status of their household might also be an important factor for determining migration.

Migrants were ranked slightly lower in sibling order relative to non-migrants (SIB. RANK:ALL: p-value: 0.174). This difference might imply that non-migrants stay at home because of a need for their presence at home to do agricultural work and/or domestic work, such as cooking, cleaning, child-care, and other tasks. If, however, we compare the rank order of female siblings (SIB. RANK:FEMALE), migrant and non-migrant households are more similar. Thus, we would need to look carefully at household demographic structure, the existence of small siblings, the presence of elderly family members, and the number of female members within the household, to evaluate whether the level of the daughters' contribution to their households at home has a discernible influence on their migration decisions.



**Table 1 Descriptive Statistics**

	All households (N=138)		Migrant households (N=90)		Non-Migrant households (N=48)		p-value
	Mean	SD*	Mean	SD*	Mean	SD*	
Daughter's Characteristics							
(a) Human Capital							
Age	20.74	2.67	20.43	2.64	21.36	2.65	0.023
Education	10.74	1.80	10.61	1.65	11.00	2.08	0.174
SIB. Rank: All	3.08	1.87	3.43	1.89	2.98	1.80	0.174
SIB. Rank: Female	2.14	1.26	2.21	1.27	2.00	1.26	0.351
(b) Migrants' earning							
Income (Penang)	-	-	441.98	87.23	-	-	-
Remit (per month)	-	-	98.77	60.95	-	-	-
MIG time (months)	-	-	12.36	9.26	-	-	-
Household characteristics							
(a) Household head							
Female head	0.12	0.33	0.14	0.35	0.08	0.28	0.302
Age	53.03	9.13	52.34	9.04	54.31	9.26	0.229
Education	3.85	3.41	3.66	3.29	4.21	3.34	0.367
Agriculture	0.61	0.49	0.64	0.48	0.54	0.50	0.242
(b) Household economy							
Household base							
Wealth total	56,853	65,275	52,870	65,923	64,821	63,942	0.365
Land	50,600	63,519	47,886	64,807	56,027	61,212	0.537
Savings	1,799	3,803	1,229	3,288	2,940	4,494	0.012
Loans	-1,651	4,709	-978	3,292	-2,857	6,544	0.027
Durable goods	5,153	6,417	3,664	2,871	7,995	9,754	0.000
Livestock	157	235	177	262	120	167	0.180
Family income**	528.24	318.64	426.02	224.15	719.90	378.52	0.000
Per capital income**	88.30	56.98	71.37	45.12	120.03	63.51	0.000
Mother working	0.52	0.50	0.59	0.49	0.40	0.49	0.031
(c) Household demography							
Size	6.68	2.68	6.72	2.56	6.60	2.94	0.707
Small children	0.67	0.93	0.72	0.97	0.57	0.87	0.339
Elder	0.10	0.35	0.14	0.41	0.02	0.15	0.056
Women substitute	0.99	0.78	1.17	0.69	0.62	0.83	0.000
(d) Household network							
Family migration	0.58	0.87	0.68	0.97	0.38	0.58	0.070
(e) Regional factor							
Bachok (BA)	0.21	0.41	0.20	0.40	0.24	0.43	0.346
Kota Bharu (KB)	0.17	0.37	0.14	0.35	0.21	0.41	0.341
Pasir Mas (PM)	0.18	0.38	0.14	0.35	0.24	0.43	0.214
Pasir Puteh (PP)	0.19	0.39	0.17	0.38	0.24	0.43	0.375
Tanah Merah (TM)	0.25	0.43	0.34	0.48	0.07	0.25	0.000

**Notes:** \* SD stands for Standard Deviation.

\*\* INCOME is monthly income and household income data does not include daughter's remittances.

**Characteristics of migrant and non-migrant households.** Migrant households had younger household heads, less educational background, and more female household heads than non-migrant households. In terms of primary occupation, 64 per cent of migrant households relied on agriculture as their main economic activity compared to 54 per cent of non-migrant households.

Although migrant households had lower wealth levels (including land values) than non-migrant households on average, these differences are not significant (p-values: 0.365 for wealth total and 0.537 for land). A breakdown of land holdings by different land size categories shows that migrant households were much more likely to be landless, in that about 24 per cent of migrant households had no land, while only 8 per cent of non-migrant households had no land. At the other end of the spectrum, 14 per cent of migrant households owned more than 5 acres of land, compared to 19 per cent of non-migrant households. If we look at other wealth measures, non-migrant households had more savings and durable goods, and these differences are statistically significant (p-values: 0.012 for savings and 0.000 for durable goods). This higher wealth of non-migrant households in savings and durable goods implies that they might have less incentive to send a daughter to an urban area for work. In fact, migrant households had lower net monthly income per family (RM 426.02 for migrant households and RM 719.90 for non-migrant households). On average, migrant daughters sent

remittances to their families of RM 98.82 per month or about 23 per cent of the household income. These data suggest that a daughter's remittances contribute significantly to the household's income level, and thus might well be a significant factor in explaining migration.

The average number of family members in migrant families was slightly larger than that of non-migrant families. Migrant families generally had more small children than non-migrant families. Migrant households also had more migration networks or experiences than did non-migrant households (p-value: 0.070).

In terms of the mother's working status, more mothers of migrant daughters worked (nearly 60 per cent) and earned income by themselves than mothers of non-migrant daughters (40 per cent), and this difference is statistically significant (p-value: 0.031). The number of women, excluding students, staying at home to help with domestic work (WOMEN) shows that migrant households have, on average, more adult women at home than non-migrant households (p-value: 0.000). These two facts together suggest that (1) changes in the level of female members'—particularly the mother's—time spent on Z-goods production induced by a daughter's migration could be an important factor in the migration decision; and (2) the number of adult women available to take over a daughter's domestic work efforts could also be an indicator of the household's potential for absorbing the likely work load increase needed to avoid a loss in Z-goods consumption.

The five regions selected in Kelantan have both migrants and non-migrants. Tanah Merah, however, has proportionately very few non-migrants compared with other regions. Tanah Merah is the farthest of the regions from Kelantan's main city, Kota Bharu, so it is more difficult for females to commute to work in the city from this region. Also, Tanah Merah is one of the regions within Kelantan where poverty has been most pervasive. Thus, limited job alternatives and poverty might together make Tanah Merah a more likely source of female migrants than other regions.

### Non-economic factor indices

Conventional approaches to migration decisions mostly concentrate on economic factors. As Thadani and Todaro (1979) point out, however, non-economic factors or motivations also may be of importance in women's migration decisions. In order to incorporate non-economic factors in our migration framework, we need to construct coherent non-economic factors. A number of steps are taken in this paper to construct non-economic factors.

**Step 1.** Data collection on the views of the daughter and her household head by asking five questions on daughter's lifestyle, women's work, marriage partner selection, domestic work sharing, and associating with boys.

**Step 2.** Identification of fundamental values of the daughter and her household head toward gender roles by applying factor analysis to the data collected through Step 1.

Step 2 is critical for developing a careful understanding of the fundamental views of those questioned toward gender issues. Even if we ask several questions regarding a person's traditional/modern views, we cannot recognise which one represents what kind of non-economic factor in migration decisions, because there might be some underlying factors that cross over in their answers. Individual responses to questions regarding attitudes may be strongly correlated. For example, if we ask a question regarding preferences in marriage selection—say arranged or non-arranged—and a question regarding opinions on the sharing of domestic work after the marriage, answers to these questions could be used separately to indicate one's preference or opinion. However, if we treat the data in this way, we may fail to control for possible correlation between the two, that is traditionalism in marriage selection and traditionalism in married life. These responses may constitute a set of potential predictors or variables that need to be described or interpreted together as traditionalism rather than as two different variables. To identify such a set of possible underlying values or attitudes across these variables, factor analysis was applied in this paper.

In this way, we have identified the following two non-economic factor indices based on the raw data collected by asking the five-attitudinal questions.

**Factor 1.** 'Daughter's or Household Head's attitudes on women's choice for their life' (DCHOICE for daughter's, HCHOICE for household head's).

**Factor 2.** ‘Daughters’ or Household Head’s wishes on marriage partner’ (DWISHES for daughter’s, HWISHES for household head’s).

### A household model of female migration decisions

This section first describes our approach to migration, and then develops the empirical analysis using a mover-stayer model, which has been adapted to include some factors that are generally omitted from standard models, such as non-economic factors, Z-goods production, and consumption decisions. The conclusion evaluates the effectiveness of the approach in explaining female migration decisions.

#### How does the daughter’s household evaluate the migration opportunity?

Following the New Household Economics (NHE) assumption of a unified household, we can model the daughter’s migration decision from the household’s (parents’) perspective (Becker 1981). Assuming a household is composed of a father, mother, daughter, and other members, the unified household approach provides an estimable household welfare function (Low 1986; Findley 1987; Mincer 1978).

#### A joint household welfare maximisation model

In the NHE approach, households maximise household welfare subject to a full household income and time constraints. Formal presentation of the model begins with consideration of the household’s social welfare function. The welfare function,  $W$ , is defined over three economic goods—leisure ( $t_l$ ), a composite consumption good

( $x$ ), and non-market home produced goods ( $Z$ )—with standard assumptions on first and second order conditions of  $W' > 0$  and  $W'' < 0$ .  $Z$  is the household member’s consumption of Z-goods produced.  $E$  is a vector of non-economic factors.  $C$  is the fixed costs incurred to migrate. The decision compares two states: the daughter migrating to urban EPZs ( $u$ ) or remaining in the rural village ( $r$ ).

The welfare function for the migration and non-migration cases are written here as

$$(1.1) W_u^h = U_u^d(t_{lu}^d, x_u^d, Z_u^{dc}, E_u^d, C) + U_u^{h-d}(t_{lu}^{ic}, x_u^i, Z_u^{ic}, E_u^h) \quad \text{where } i=f, m, -d$$

$$(1.2) W_r^h = U_r^h(t_{lr}^j, x_r^j, Z_r^{jc}, E_r^h) \quad \text{where } j=f, m, d, -d$$

where  $h$  = household and  $h-d$  = household members except the daughter, and  $W_u^h$  is assumed to be additively separable.

The household’s full income budget constraints under migration and non-migration scenarios are

(a) Migration case (= urban)

$$(2.1) w_u^d T^d = w_u^d (t_{lu}^d + t_{Zu}^d) + P^d x_u^d + R^d$$

$$(2.2) \sum_i w_r^i T^i + R^d + OT = \sum_i w_r^i (t_{lu}^i + t_{Zu}^i) + \sum_i p^i x_u^i$$

(b) Non-migration case (= rural)

$$(3) \sum_j w_r^j T^j + OT = \sum_j w_r^j (t_{lr}^j + t_{Zr}^j) + \sum_j p^j x_r^j$$

where  $T^i, T^j$  are total time available to person  $i$  and  $j$ ;  $w$  is market wage;  $p^i, p^j$  are price index of market goods consumed and  $p^z$  is price index of Z-goods consumed;  $R^d$  is the net value of transfers the daughter makes to the household, and  $OT$  is the net value of transfers exogenous to the household.

The household model also has a Z-goods production function and time constraint. Assume that Z-goods are produced with the time input of household members—say fathers, mothers, daughters, and other household members—and home production technology of each member  $a^i$  and  $a^j$ ;  $s$  indicates each member's share of Z-goods consumption, and  $q$  is the quality measure of Z-goods produced ( $i = f, m, -d; j = f, m, d, -d$ ).

$$(4.1) Z_u^{dc} = Z_u^{dp} = a^d t_{Zu}^d$$

$$(4.2) Z_u^{hc} = \sum_i Z_u^{ic} = \sum_i Z_u^{ip} = q \sum_i s_i^u \sum_i [a^i t_{Zu}^i]$$

$$(4.3) Z_r^{hc} = \sum_j Z_r^{jc} = \sum_j Z_r^{jp} = q \sum_j s_r^j \sum_j [a^j t_{Zr}^j]$$

$$(4.4) t_{lu}^d + t_{wu}^d + t_{Zu}^d = T^d$$

$$(4.5) t_{lu}^i + t_{wu}^i + t_{Zu}^i = T^i \quad \text{where } i=f, m, -d$$

$$(4.6) t_{lr}^j + t_{wr}^j + t_{Zr}^j = T^j \quad \text{where } j=f, m, d, -d$$

The migration decision depends on the sign of the criterion function,  $M^{h*}$

$$(5) M^{h*} = W_u^{h*} (t_{lu}^d, X_u^d, t_{lu}^i, X_u^i, Z_u^{ic}; E_u^h, C) - W_r^{h*} (t_{lr}^j, X_r^j, Z_r^{jc}; E_r^h)$$

where  $W_{u,r}^{h*}$  is the optimal level of household welfare in the two states of migration and non-migration. A prospective migrant daughter chooses to migrate if  $M^{h*} > 0$  and to stay if  $M^{h*} < 0$ .

### Model specification

We apply a mover-stayer model to estimate the gains and losses associated with migration. Our model treats the issue of self-selection bias in data collected, which is essential to effectively predict migration outcomes (Nakosteen and Zimmer 1980; Robinson and Tomes 1982; Tunali 1985; Falaris 1987, 1995; Cackley 1993; Barham and Boucher 1998).

The structural form of the model consists of a migration decision equation and earnings equations for migrants and non-migrants. Stating the exogenous variables included in each equation specifies the model.

#### A. First Stage Probit

$$(6) \text{MIG} = \alpha'_0 + \alpha'_1 \text{WEALTH} + \alpha'_2 \text{WEALTH2} + \alpha'_3 \text{HHSIZE} + \alpha'_4 \text{MWORK} + \alpha'_5 \text{WOMEN} + \alpha'_6 \text{CHILD06} + \alpha'_7 \text{FAMMIG} + \alpha'_8 \text{HZCONSUMP1} + \alpha'_9 \text{HZCONSUMP2} + \alpha'_{10} \text{HZBURDEN1} + \alpha'_{11} \text{HZBURDEN2} + \alpha'_{12} \text{DZCONSUMP1} + \alpha'_{13} \text{DZBURDEN1} + \alpha'_{14} \text{DZBURDEN2} + \alpha'_{15} \text{HCHOICE} + \alpha'_{16} \text{HWISHES} + \alpha'_{17} \text{DCHOICE} + \alpha'_{18} \text{DWISHES} + \alpha'_{19} \text{AGE} + \alpha'_{20} \text{AGE2} + \alpha'_{21} \text{EDU} + \alpha'_{22} \text{EDU2} + \alpha'_{23} \text{BA} + \alpha'_{24} \text{PM} + \alpha'_{25} \text{PP} + \alpha'_{26} \text{TM} + \delta'$$

The first stage in the procedure is to estimate the reduced form naive probit (6) by including all the variables except the daughter's net income variable. Household wealth variables (WEALTH, WEALTH2) are included, since in the household model these show the level of household consumption needs. Household size is included in the household model (HHSIZE (the number of family members)). The number of family members who have migrated (FAMMIG) is included, since the family-based migration network might influence the daughter's migration. The working status of the mother (MWORK), the number of adult women at home (WOMEN), and the number of small children aged under 6 (CHILD06), are factors determining daughter's local labour market participation and eventually affect her wage levels. For example, if the mother works and there are small children at home and no female substitutes available at home, then the daughter may need to stay at home to help with domestic work and would consequently be less likely to migrate. The household model includes net changes in household (other than the prospective migrant daughter's) Z-goods consumption and production before and after the migration.

HZCONSUMP1 = net changes in the household's domestic goods consumption.

HZCONSUMP2 = net changes in the household's child and elder care consumption.

HZBURDEN1 = net changes in the household's domestic work burden.

HZBURDEN2 = net changes in the household's child and elder care burden.

Similarly, net changes in the daughter's Z-goods consumption and production (DZCONSUMP1=net changes in the daughter's domestic goods consumption, DZBURDEN1=net changes in the daughter's domestic work burden, DZBURDEN2=net changes in the daughter's child and elder care burden) are included, because these influence the household welfare function described as (5.1) and (5.2). The perspective of the household and the daughter on the daughter's independent decision regarding lifestyle (HCHOICE, DCHOICE) and marriage partner (HWISHES, DWISHES) are included as non-economic factors. Daughter's human capital factors such as age (AGE, AGE2) and education (EDU, EDU2) are included. BA, PM, PP, and TM are regional dummy variables with KB, the closest region to the state capital, as the base.

## B. Estimation of earnings equations

$$(7.1) Y_u = \beta_0 + \beta_1 AGE + \beta_2 AGE2 + \beta_3 EDU + \beta_4 EDU2 + \beta_5 \lambda_u + \sigma$$

$$(7.2) Y_r = \gamma_0 + \gamma_1 AGE + \gamma_2 AGE2 + \gamma_3 EDU + \gamma_4 EDU2 + \gamma_5 WEALTH + \gamma_6 WEALTH2 + \gamma_7 MWORK + \gamma_8 WOMEN + \gamma_9 CHILD06 + \gamma_{10} FAMMIG + \gamma_{11} BA + \gamma_{12} PM + \gamma_{13} PP + \gamma_{14} TM + \gamma_{15} \lambda_r + \eta$$

Fitted values from the first stage naive probit for  $\lambda_u$ ,  $\lambda_r$  are used in Income Equations 7.1 and 7.2 to obtain unbiased estimators of income earnings both at the point of origin and at the destination for migrants. Urban earnings are determined only by individual characteristics (AGE, AGE2, EDU, and EDU2), whereas rural earnings

are determined by individual characteristics and also household economic and physical needs. Household economic needs include the household wealth level (WEALTH, WEALTH2) as an indicator of the level of household economy. MWORK, WOMEN, and CHILD06 are included to explain the household's needs for the daughter's work at home. Regional dummy variables are also included to represent regional differences in women's earning opportunities.  $I_u$  and  $I_r$  are the inverse Mill's ratio, unobservable selectivity variables.

### C. Second stage probit

$$(8) \text{MIG} = \alpha_0 + \alpha_1 \text{DYGAIN} + \alpha_2 \text{WEALTH} + \alpha_3 \text{WEALTH2} + \alpha_4 \text{HHSIZE} + \alpha_5 \text{FAMMIG} + \alpha_6 \text{MWORK} + \alpha_7 \text{WOMEN} + \alpha_8 \text{CHILD06} + \alpha_9 \text{HZCONSUMP1} + \alpha_{10} \text{HZCONSUMP2} + \alpha_{11} \text{HZBURDEN1} + \alpha_{12} \text{HZBURDEN2} + \alpha_{13} \text{DZCONSUMP1} + \alpha_{14} \text{DZBURDEN1} + \alpha_{15} \text{DZBURDEN2} + \alpha_{16} \text{HCHOICE} + \alpha_{17} \text{HWISHES} + \alpha_{18} \text{DCHOICE} + \alpha_{19} \text{DWISHES} + \alpha_{20} \text{BA} + \alpha_{21} \text{PM} + \alpha_{22} \text{PP} + \alpha_{23} \text{TM} + \delta$$

The second stage in the estimation procedure entails the structural form of the migration criterion function (8) by including the daughter's net expected income gains between rural and urban labour markets (DYGAIN). Using fitted values of earnings from Equations 7.1 and 7.2, DYGAIN is predicted. Unlike the first stage probit, AGE, AGE2, EDU, and EDU2 are omitted, because these are individual characteristics which are applicable only to the income equations.

## Estimation results

### A. Estimates of the First Stage Probit

Table 2 shows the econometric results of the first stage probit in the household model. Contrary to our expectations, the coefficient estimate on HHSIZE is negative and significant to the migration decision (t-ratio: -2.875). This suggests that households with more members tend not to send daughters to urban factories (please see Appendix: descriptive statistics of regressors).

The coefficient estimate on WOMEN is positive and significant to the migration decision (t-ratio: 2.03). This predicts that substitutability in domestic work is very important to the daughter's migration decision. Although neither the coefficient estimate on the presence of small children at home (CHILD06) nor the one on the mother's work (MWORK) are statistically significant in the daughter's migration decision (t-ratios: -1.04 for CHILD06 and -0.31 for MWORK), the signs are as we would expect.

Among Z-goods production and consumption variables, the coefficient estimate on a daughter's expected changes in Z-goods consumption (DZCONSUMP1), as we might expect, is significant and has a positive effect on the migration decision (t-ratio: 2.498). Also, the coefficient estimate on a daughter's expected changes in special Z-goods production (DZBURDEN2) is significant and has a negative effect on the migration decision (t-ratio: -2.073). At the household level, the parameter coefficients on Z-goods production and consumption variables are significant and their signs are consistent with our expectations (t-ratios:

**Table 2 Econometric results: first stage probit**

Dependent variable: MIG

Variable	Coefficient		SE	t-ratio
Constant	54.81	***	19.89	2.756
AGE	-0.501		1.55	-0.322
AGE2	0.026		0.034	0.786
EDU	-0.882		0.882	-1
EDU2	0.054		0.049	1.107
WEALTH	-0.004		0.012	-0.333
WEALTH2	0.0042+00		0.0062+00	0.677
HHSIZE	-0.862	***	0.299	-2.875
MWORK	-0.187		0.603	-0.31
WOMEN	0.957	**	0.471	2.03
CHILD06	-0.858		0.824	-1.04
FAMMIG	0.684	*	0.410	1.667
HZCONSUMP1	0.515	***	0.151	3.409
HZCONSUMP2	0.710	**	0.306	2.32
HZBURDEN1	-0.379	***	0.115	-3.293
HZBURDEN2	-0.871	**	0.362	-2.406
DZCONSUMP1	0.101	**	0.040	2.498
DZBURDEN1	-0.062		0.049	-1.257
DZBURDEN2	-0.559	**	0.27	-2.073
HCHOICE	-0.361		0.325	-1.108
HWISHES	1.275	**	0.510	2.498
DCHOICE	-0.070		0.252	-0.278
DWISHES	0.019		0.277	0.07
BA	0.662		0.912	0.726
PM	-0.430		1.379	-0.312
PP	-0.611		1.328	-0.46
TM	2.087	*	1.173	1.78

**Note:** \* 10 per cent, \*\* 5 per cent, \*\*\* 1 per cent significant levels

Log-L -30.785

Frequencies of actual and predicted outcomes

Actual	Predicted		Total
	0	1	
0	36	12	48
1	7	83	90
Total	43	95	138



3.409 for HZCONSUMP1, 2.320 for HZCONSUMP2, -3.293 for HZBURDEN1, and -2.406 for HZBURDEN2).

The coefficient estimate on HWISHES is strongly positive and significant to the migration decision (t-ratio: 2.498), while the coefficient estimates on other non-economic factors explain very little about the migration decision. This means that the wishes of the household head regarding his daughter's marital partner (supporting the daughter's self-selection) are important in the daughter's migration decisions.

Regional dummy variables show that Tanah Merah (TM) is significant at the 10 per cent level to the daughter's migration decision (t-ratio: 1.780). Household wealth and the daughter's human capital levels are not significant in the household level formation of the migration decision.

### B. Estimates of earnings equations

Estimates of the income earning equations for the household model are shown in Table 3. The results are very similar to the individual model, but the coefficient estimate on EDU is positive and significant at the 10 per cent level to women's urban wages (t-ratio: 1.692). The coefficient estimate on  $l_u$  is again negative but not significant (t-ratio: -1.441).

As for income earning estimates in rural areas, similar to the individual model, the coefficients on MWORK and WOMEN are significant to women's rural wages (t-ratios: -2.362 for MWORK and 3.61 for WOMEN). The self-selection bias term,  $l_r$ , does very little to explain the wages of rural women.

### C. Estimates of the second stage probit

Table 4 shows the econometric results of the structural probit of female migration by including the daughter's expected net income gains corrected for sample-selection bias.

This time, in accordance with most migration models, the coefficient estimate of DYGAIN is positive and significant at the 5 per cent level to the migration decision (t-ratio: 2.067), suggesting that net income gains of the daughter's migration are very important in the household's decision about a daughter's migration.

The parameter coefficients on Z-goods production and consumption variables are similar to the first stage probit. Household level coefficient estimates on Z-goods variables are all significant to the migration decision (t-ratios: 4.315 for HZCONSUMP1 (net changes in the household's domestic goods consumption), 1.608 for HZCONSUMP2 (net changes in the household's child and elder care consumption), -3.183 for HZBURDEN1 (net changes in the household's domestic work burden), and -1.683 for HZBURDEN2 (net changes in the household's child and elder care burden)).

Similar to the first stage probit, the coefficient estimates on HWISHES (the household head's preference for his daughter's marriage partner) and TM (Tanah Merah) are all positive and significant to the migration decision (t-ratios: 2.061 for HWISHES, and 1.802 for TM). The coefficient estimate on the mother's working status (MWORK) is negative, but not significant to the

migration decision (t-ratio: -1.327). Meanwhile, the coefficient estimates of WEALTH (the level of household's assets), HHSIZE (the number of family members) and FAMMIG (the number of family migrants) show that these are not important to the migration decision.

## Conclusions

The household model suggests that economic motives, Z-goods production and consumption, the importance of the household head's view, and the location of their rural points of origin, are the most important factors.

Todaro's migration model emphasises the significance of economic gains obtained from migration decisions. This paper has supported the view that economic motives (income earnings) are a very strong factor in a family allowing its daughters to migrate to urban factories (t-ratio: 2.067 for DYGAIN).

Moreover, it has shown the importance of other economic factors at the family level in the migration decision; namely, who produces and consumes domestic Z-goods, and to what extent. The trade-off between Z-goods production at home and income earnings from outside is probably severe for female members, since, in most rural

**Table 3 Econometric results: earnings equations**

Variable	Urban (log Yu)			Rural (log Yr)		
	Coefficient	SE	t-ratio	Coefficient	SE	t-ratio
Constant	-698.82	4922	-0.142	-5427.4	8683	-0.625
AGE	14.524	421.8	0.034	502.15	834.8	0.602
AGE2	-0.290	9.455	-0.031	-5.0033	18.44	-0.27
EDU	833.68 *	492.8	1.692	98.719	546.1	0.181
EDU2	-31.913	25.45	-1.254	-9.832	28.4	-0.346
WEALTH				3.369	9.179	0.367
WEALTH2				-0.029	0.0419	-0.699
MWORK				-891.03	** 377.2	-2.362
WOMEN				927.45	*** 256.9	3.61
CHILD06				-262	233.6	-1.122
FAMMIG				-383	312.4	-1.226
BA				-111.7	544.3	-0.205
PM				-832.71	521	-1.598
PP				-938.81	579.2	-1.621
TM				-405.48	840.6	-0.482
LAMBDA u	-444.52	308.4	-1.441			
LAMBDA r				-203.16	424.1	-0.479
<b>R<sup>2</sup></b>	<b>0.145</b>			<b>0.585</b>		

Note: \* 10 per cent, \*\* 5 per cent, \*\*\* 1 per cent significant levels

**Table 4 Econometric results: second stage probit**

Dependent variable: MIG

Variable	Coefficient		SE	t-ratio
Constant	2.611	*	1.392	1.876
DYGAIN	0.006+0	**	0.0003	2.067
WEALTH	-0.006		0.0097	-0.711
WEALTH2	0.0024+00		0.0046+00	0.522
HHSIZE	-0.372	***	0.14	-2.663
MWORK	-0.748		0.5642	-1.327
WOMEN	0.008		0.405	0.022
CHILD06	-0.545		0.4286	-1.273
FAMMIG	-0.073		0.293	-0.251
HZCONSUMP1	0.262	***	0.0609	4.315
HZCONSUMP2	0.326		0.2029	1.608
HZBURDEN1	-0.200	***	0.0629	-3.183
HZBURDEN2	-0.367	*	0.2185	-1.683
DZCONSUMP1	0.066	***	0.0251	2.641
DZBURDEN1	-0.027		0.0355	-0.775
DZBURDEN2	-0.260	*	0.1537	-1.697
HCHOICE	-0.049		0.2321	-0.214
HWISHES	0.560	**	0.2721	2.061
DCHOICE	0.009		0.1902	0.052
DWISHES	-0.013		0.2059	-0.064
BA	0.577		0.7181	0.805
PM	-0.662		0.7308	-0.906
PP	-0.712		0.8227	-0.866
TM	1.322	*	0.7339	1.802

**Note:** \* 10 per cent, \*\* 5 per cent, \*\*\* 1 per cent significant levels

Log-L -34.624

Frequencies of actual and predicted outcomes

Actual	Predicted		Total
	0	1	
0	33	15	48
1	8	82	90
Total	41	97	138

households, female members tend to assume more responsibility for Z-goods production than their male counterparts. This point has been clearly shown in this paper.

Interestingly, it has also shown that non-economic perceptions play a key role in the migration decision. A household head tends to allow his daughter to migrate to the city if his view towards his daughter's marriage partner selection is more supportive of the daughter's self-selection.

These results may be related to the fact that this paper has dealt with 'females', who, in recent years, have been recognised as the family members who allocate more time for their family work (cooking, cleaning, child-care, elder-care, and so forth) and spend more money for their family members (especially siblings and children). If some male family members spend much of their time providing financial support to their families, the framework that this paper has developed could also be useful for studying male migration decisions. In other words, the inclusion of the opportunity costs and benefits of domestic work contribution and non-economic factors would deepen our views and understanding about migration decisions.

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**Appendix: descriptive statistics of regressors (n=138)**


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Variable	Mean	SD
AGE	20.7	2.670
AGE2	437.2	118.64
EDU	10.7	1.803
EDU2	118.5	34.80
WEALTH	56.8	65.27
WEALTH2	7461.6	15980
HHSIZE	6.68	2.684
MWORK	0.52	0.501
WOMEN	0.98	0.782
CHILD06	0.67	0.937
FAMMIG	0.57	0.867
HZCONSUMP1	5.17	11.08
HZCONSUMP2	0.60	3.324
HZBURDEN1	6.21	7.250
HZBURDEN2	0.91	3.250
DZCONSUMP1	-34.67	11.92
DZBURDEN1	-12.76	7.02
DZBURDEN2	-1.62	2.37
HCHOICE	0.008	1.007
HWISHES	-0.008	1.000
DCHOICE	0.020	0.990
DWISHES	0.012	1.000
BA	0.21	0.412
KB	0.17	0.372
PM	0.17	0.383
PP	0.19	0.395
TM	0.25	0.435

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