**ALTRUISM, CONFLICT AND THE
MIGRATION DECISION**

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This paper uses a dynastic model to analyse rural-urban migration in response to high unemployment rates and low expected income. Of special interest is the relatively high mobility of young generations. The model is able to explain why some migrants move to an area where their expected incomes are lower. Application of the model reveals different dynastic utilities between generations, which lead to conflicts between generations on migration decision and results in the higher mobility of the young generation.

I. INTRODUCTION

Income (or wage) has figured as a particularly important variable in the explanation of migration. Initially, prevailing current incomes between areas were the focus of concern, though this focus has subsequently been widened. A permanent income concept was introduced by Sjaastad(1962) and the possibility that employment prospects played a role in migration decision was considered by Todaro(1969). More recent studies have considered the hypothesis that migration behavior cannot be adequately explained by the traditional income differential approach in which the economic agent's own income in each sector matters without consideration of other family members. Mincer's (1978) exploration of the effect of family tie between spouses on the probability of migration and Borjas's (1990) model of immigration in the context of dynastic households that considers the welfare of children are examples.

The present paper goes beyond previous models of migration by allowing for reciprocal altruism between generations. This extension lead to reinforcing multiplicative effects of a family's decision to migrate. The model explains rural-urban migration in the face of a high unemployment rate and low expected income as the rational choice of an agent who aims to maximize dynastic utility. Disagreement

among family members on migration decisions and the higher mobility of the young are shown to result from differences in dynastic utility between generations:

II. ALTRUISM AND DYNASTIC MODEL

A. Dynastic Utility and Migration

Life-cycle dynastic utility of the older generation (i th generation, hereafter 'the father') is the summation of his dynastic utility over the remainder of his life time. This dynastic utility consists of the utility from his own consumption and his son's dynastic utility in each period. The son's life-cycle dynastic utility in turn is the summation of his dynastic utility over his life time. The son's dynastic utility is discounted by the father using the parent-to-child altruistic discount factor α , and the father's dynastic utility is discounted by the son using the child-to-parent altruistic discount factor $\tilde{\alpha}$. Therefore, the father's life time dynastic utility is affected by his son's altruism towards him as well as his altruism towards his son, and so is the son's. The father's life-cycle dynastic utility is

$$(1) \quad U_{i,F} = \sum_{t=T_1}^{T_2} \beta^{t-T_1} \tilde{U}_{i,F} [u_i(c_{i,t}), U_{i+1,S}; \alpha]$$

and the son's life-cycle dynastic utility is

$$(2) \quad U_{i+1,S} = \sum_{t=T_1}^{T_3} \beta^{t-T_1} \tilde{U}_{i+1,S} [u_{i+1}(c_{i+1,t}), U_{i,F}, U_{i+2}; \alpha, \tilde{\alpha}],$$

where $\tilde{U}_{i,F}$ is the father's dynastic utility at period t , u_i is the utility from his own consumption at period t ($c_{i,t}$), $\tilde{U}_{i+1,S}$ is the dynastic utility of the son ($i+1$ th generation) at period t , U_{i+2} is the dynastic utility of the $i+2$ th generation who is the

son of the $i+1$ th generation, β is a time discount factor, and α and $\tilde{\alpha}$ are, respectively, the parent-to-child and child-to-parent altruistic factors. For the father, dynastic utilities of descendants after the $i+1$ th generation are considered through the $i+1$ th generation's dynastic utility $U_{i+1,S}$. An increase in consumption has a direct effect on the utility of the generation, and then gives effects to the other generation who has altruistic feelings toward the former generation as tempered by their degree of altruism. Then, given the existence of reciprocal altruism in which the child's utility affects the parent's utility (α effect) and the parent's utility affects the child's utility ($\tilde{\alpha}$ effect), there are reinforcing feedbacks.

The utility functions formalized above indicate that, when a potential migrant considers migration, he does not compare his own permanent utilities $\sum u_{j,t}$ in each sector but considers permanent dynastic utility U_j as affected by the utilities of his own and his family members' including the multiplier effect. Even when the father's own (permanent) utility does not increase by migration, the father will decide to migrate if his life-time dynastic utility is increased by an increase in his descendants' dynastic utilities.

B. Dynastic Model and Optimization

Adopting a 2-period overlapping generation model and a couple of assumptions on the utility function such as additive separability [Barro & Becker, 1986] and constant relative risk aversion, the dynastic model depicts features of the migration decision without losing generality. The first period of any generation is the period for education, and the second period is the one for working and earning. The older generation shares its income with the younger generation. Following the utility

functions (1) and (2) and adopting additive separability, the dynastic utility of the i th generation during its second period of life, or $U_{i,2}$, is the satisfaction it gets from the utility of its own consumption during the second period of its life plus the total or dynastic utility of the next generation which is then in its first period of life:

$$(3) \quad U_{i,2} = u_{i,2} + \alpha U_{i+1,1}$$

The child values its parent's utility in the first period of life, and expects to have a child of its own at the beginning of the second period giving dynastic utility as:

$$(4) \quad U_{i+1,1} = \hat{\alpha} U_{i,2} + u_{i+1,1} + \beta u_{i+1,2} + \beta \alpha U_{i+2,1}$$

or the sum of the parent's dynastic utility discounted by the child-to-parent altruistic factor $\hat{\alpha}$, the child's utility from own consumption over the two periods of life with the second period discounted by the time discount factor β , and the child's dynastic utility in the second period discounted by altruistic and time discount factors. Because there are no other living ancestors than the parent, no utility comes from forbearers prior to the child's immediate parents.

As each generation has the other generation's dynastic utility in its dynastic utility function as an argument, a change in $U_{i,2}$ influences $U_{i+1,1}$ and it affects $U_{i,2}$ also, leading to a multiplier effect. The process gives a finite change if the product of the altruistic factors is less than one.

The solution for the parent's dynastic utility taking account of reciprocal altruism is given by inserting (4) into (3) and solving for $U_{i,2}$ as in (3)' below, and for the child, dynastic utility is given by inserting (3) into (4) and solving for $U_{i+1,1}$ as in (4)' below:

$$(3)' \quad U_{i,2} = \frac{1}{1 - \alpha \hat{\alpha}} (u_{i,2} + \alpha u_{i+1,1} + \alpha \beta u_{i+1,2} + \alpha^2 \beta U_{i+2,1})$$

$$(4)' \quad U_{i+1,1} = \frac{1}{1 - \alpha \hat{\alpha}} (\hat{\alpha} u_{i,2} + u_{i+1,1} + \beta u_{i+1,2} + \alpha \beta U_{i+2,1})$$

(3)' and (4)' show how the dynastic utility of each generation is affected by altruistic factors when the consumption of any generation is changed. If need be, the parent's and the child's utility can be expressed in terms of the infinite sum of every generation's utility from own consumption by repeatedly substituting future versions of (3)' into (4)' and (4)' into (3)':

$$(5) \quad U_{i,2} = \frac{1}{1 - \alpha \hat{\alpha}} [u_{i,2} + \alpha u_{i+1,1} + \sum_{j=i+1}^{\infty} \left(\frac{\alpha \beta}{1 - \alpha \hat{\alpha}} \right)^{j-i} (u_{j,2} + \alpha u_{j+1,1})]$$

$$(6) \quad U_{i+1,1} = \frac{1}{1 - \alpha \hat{\alpha}} [\hat{\alpha} u_{i,2} + u_{i+1,1} + \frac{\beta}{1 - \alpha \hat{\alpha}} \sum_{j=i+1}^{\infty} \left(\frac{\alpha \beta}{1 - \alpha \hat{\alpha}} \right)^{j-i-1} (u_{j,2} + \alpha u_{j+1,1})]$$

The father is assumed to distribute his income between himself and his child, so as to maximize his dynastic utility. From (3)', the father's problem is:

$$\text{Max } U_{i,2} = \frac{1}{1 - \alpha \hat{\alpha}} (u_{i,2} + \alpha u_{i+1,1} + \alpha \beta u_{i+1,2} + \alpha^2 \beta U_{i+2,1})$$

$$\text{s.t. } k_{i-1} (1 + r_{i-1}) + y_{i,2} = c_{i,2} + c_{i+1,1} + k_i$$

With his income $(y_{i,2})$, bequests he receives (k_{i-1}) and an interest rate (r_{i-1}) , he tries to maximize his dynastic utility by choosing the optimal allocation of his wealth to his own consumption $c_{i,2}$, his child's consumption $c_{i+1,1}$, and the level of his bequests to his descendants k_i .

From the first order conditions, the relation between marginal utilities is:

$$(7) \quad \frac{\partial u_{i,2}}{\partial c_{i,2}} = \alpha \frac{\partial u_{i+1,1}}{\partial c_{i+1,1}} = \alpha \beta \left[\frac{\partial u_{i+1,2}}{\partial k_i} + \alpha \frac{\partial u_{i+2,1}}{\partial k_i} \right]$$

indicating that the parent's marginal utility from the parent's own consumption should be the same as the child's marginal utility from its own consumption discounted by the parent-to-child altruistic factor α .

From the equation (7), if $u_{i,j}$ is a well behaved concave function and every generation has the same utility function, then the consumption of the parent ($c_{i,2}$) will be smaller than that of the child ($c_{i+1,1}$) when α , the parent's love toward the son, is greater than 1.

C. Expected Incomes and Dynastic Utility

Rural-urban migrants have difficulty in finding desirable jobs. At best they are employed in blue-collar jobs because migrants in general do not have high levels of education, capital to invest, nor opportunities to receive job-training, especially when they are old [Lee,1985; KDI,1981, 1989; KRIHS,1989]. Therefore, even if they can increase their incomes after migration, it is not through occupational mobility to white-collar jobs but through accumulating human capital in some range of jobs such as informal sector jobs, or blue collar jobs. If most or even some rural-urban migrants fail to be employed in white-collar jobs throughout their lives, the theory explaining migration as a movement to find a better job may need to be revised. Dynastic altruism may help explain this phenomenon. Two assumptions are needed:

Assumption 1: The father expects his descendants will have higher permanent incomes in an urban area because they will receive additional education or, the child, who migrates before the primary education is completed, is primarily educated in the

urban area where school quality is superior and better suited to urban life, and thus gain better jobs. The urban education may require additional tuition π .

Assumption 2: The rural sector income y_R can be higher than the urban income y_B which the father receives, and lower than the urban income y_W which the descendants are expected to receive.

Then the expected incomes in urban areas are,

$$\begin{aligned} y_{i,2} &= E(y_{i+1,u} | \Omega_{i+1}) = y_{i+1,B} \\ y_{j+1,2} &= E(y_{j+2,u} | \Omega_{i+1}) = y_{j+2,W}, \quad j = i, i+1, i+2, \dots, 1 \end{aligned}$$

where $y_{i,2}$ is the father's expected income at his second period of life in the urban area, $y_{j+1,2}$ is the father's expectation of the $j+1$ th generation's second period income, $y_{j+2,u}$ is the urban sector income at the $j+2$ th period and Ω_{i+1} is an information set at the $i+1$ th period.

III. THE MIGRATION DECISION

A. Dynastic Utilities of Each Generation

The father, who is a decision maker of the household, decides whether or not to migrate after considering his dynastic utility from each alternative. He has three alternatives: to stay on the farm; to migrate by household; or to send his son to the urban area. To look at this situation more closely, consider a constant relative risk

¹ At the $i+1$ th period, the expected income of the descendant who will be born in the $j+1$ th period is

$$\begin{aligned} y_{j+1,2} &= E(y_{j+2,u} | \Omega_{i+1}) = E((1+g_{j+1,u})y_{j+1,u} | \Omega_{i+1}) \quad \text{where } g \text{ is an income growth rate} \\ &= E((1+g_{j+1,u}) | \Omega_{i+1}) E(y_{j+1,u} | \Omega_{i+1}) \quad \text{if } g \text{ and } y \text{ are independent in } \Omega \\ &= E((1+g_{j+1,u})(1+g_{j,u}) \dots (1+g_{i+1,u}) | \Omega_{i+1}) E(y_{i+1,u} | \Omega_{i+1}). \end{aligned}$$

In this paper, per worker income growth is ignored. It is considered in Tcha(1992).

aversion utility function. If the income of the head of the household is y , and the two generations consume all y in that period, the utility of each generation is:

$$(8) \quad u_{i,2} = [1/(1-\sigma)]c_{i,2}^{1-\sigma}, \quad u_{i+1,1} = [1/(1-\sigma)]c_{i+1,1}^{1-\sigma}$$

where $c_{i,2} + c_{i+1,1} = y$
 $c_{i,2}$: consumption of the parent (who was born at the i th period)
 $c_{i+1,1}$: consumption of the child (who is born at the beginning of the $i+1$ th period)
 σ : measure of relative risk aversion.

With equations (7) and (8), the consumption share of each generation is:

$$(9) \quad c_{i,2} = \frac{\alpha^{(-1/\sigma)}}{1 + \alpha^{(-1/\sigma)}} y, \quad c_{i+1,1} = \frac{1}{1 + \alpha^{(-1/\sigma)}} y$$

When the parent migrates to the urban area and tries to increase his dynastic income by sending his child to college, he may have to pay π as tuition. His disposable income is then $(y_B - \pi)$ and that of his descendants' will be $(y_W - \pi)$, since in every period the older generation will pay tuition π for his child in an urban area². From inserting (9) into (8) and then into (5), dynastic utilities from three alternatives are obtained as:³

Household Migration:

$$(10) \quad V_{i,2} = K [(y_B - \pi)^{1-\sigma} + \frac{\alpha\beta}{1 - \alpha\hat{\alpha} - \alpha\beta} (y_W - \pi)^{1-\sigma}]$$

² π represents the difference of education cost between urban and rural areas, mainly the cost required for higher education such as colleges or universities. Therefore this π cannot apply to the child who does not go to college, but π is used in the present study because many families either actually send their children to college or ex ante expect them to go to college in the urban area after migration. The existence of π does not in any case seriously change the results of the model.

³ For dynastic utilities in (10), (11) and (12) to be finite, it is necessary that $0 < [\alpha\beta/(1-\alpha\hat{\alpha})] < 1$. The left side inequality requiring $(\alpha\hat{\alpha} < 1)$ has already been noted in connection with (3)' and (4)'. For the right side inequality, an additional condition is necessary, which may be written as $(\alpha\hat{\alpha} < 1 - \alpha\beta < 1)$.

Son's Migration:

$$(11) \quad W_{i,2} = K [(y_R - \rho)^{1-\sigma} + \frac{\alpha\beta}{1 - \alpha\hat{\alpha} - \alpha\beta} (y_W - \pi)^{1-\sigma}]$$

Staying on Farm:

$$(12) \quad Z_{i,2} = K [y_R^{1-\sigma} + \frac{\alpha\beta}{1 - \alpha\hat{\alpha} - \alpha\beta} y_R^{1-\sigma}]$$

$$\text{where } K = \left(\frac{1}{1 - \alpha\hat{\alpha}} \right) \left(\frac{1}{1 - \sigma} \right) \alpha (1 + \alpha^{-1/\sigma})^\sigma$$

and ρ : extra living expense and tuition required to support a son in an urban area

(10) shows that the parent's dynastic utility if the family moves to the urban area ($V_{i,2}$) depends on its expected income and descendants' expected incomes in the urban area, a dynastic multiplier which is a function of the altruism coefficients and the discount factor, and the risk aversion measure σ from the utility function. (11) shows that the parent's dynastic utility if he sends his son to the urban area ($W_{i,2}$) consists of his farm income net of expense to support his son, his descendants' urban net income, the same dynastic multiplier as in (10) and σ . When the father sends his son, in addition to tuition, he has to pay extra money⁴ γ for his child's living expenses in the urban area. Note that if the extra living expense is γ , the parent's real disposable income when he stays in the rural area becomes $y_R - \pi - \gamma$ ($= y_R - \rho$, where $\rho = \pi + \gamma$) and he allocates that amount between himself and his child. From period $i+2$, descendants will stay, receive education and find a job in the urban area. Finally, (12) shows that the parent's dynastic

⁴ γ arises from the difference in the living cost across sectors and is different from π . γ is the additional expense of supporting a child in the urban area such as rents and commuting costs.

utility if the family remains in the rural area ($Z_{i,2}$) depends on the rural area income, the same dynastic multiplier as in (10) and (11), and σ . The father compares these three dynastic utilities and decides whether or not to migrate or send his son.

Because the child has a different dynastic utility from the parent, his conditions for household migration or individual migration are different. Inserting the consumption amounts implied by the constant relative risk aversion utility function into the dynastic utility function gives the child's dynastic utility from each alternative as follows.

Household Migration:

$$(13) \quad V_{i+1,1} = K' [(y_B - \pi)^{1-\sigma} + \frac{\alpha\beta}{(1 - \alpha\hat{\alpha} - \alpha\beta)} \frac{(1+\alpha^{-1/\sigma})}{(1+\hat{\alpha}\alpha^{(\sigma-1)/\sigma})} (y_W - \pi)^{1-\sigma}]$$

Son's Migration:

$$(14) \quad W_{i+1,1} = K' [(y_R - \rho)^{1-\sigma} + \frac{\alpha\beta}{(1 - \alpha\hat{\alpha} - \alpha\beta)} \frac{(1+\alpha^{-1/\sigma})}{(1+\hat{\alpha}\alpha^{(\sigma-1)/\sigma})} (y_W - \pi)^{1-\sigma}]$$

Staying on farm:

$$(15) \quad Z_{i+1,1} = K' [y_R^{1-\sigma} + \frac{\alpha\beta}{(1 - \alpha\hat{\alpha} - \alpha\beta)} \frac{(1+\alpha^{-1/\sigma})}{(1+\hat{\alpha}\alpha^{(\sigma-1)/\sigma})} y_R^{1-\sigma}]$$

$$\text{where } K' = \frac{1}{1 - \alpha\hat{\alpha}} \frac{1}{1 - \sigma} (1 + \alpha^{-1/\sigma})^{\sigma-1} (1 + \hat{\alpha}\alpha^{(\sigma-1)/\sigma})$$

The child compares these three dynastic utilities and decides on his preference for staying, household migration, or his individual migration.

B. Viewpoint of the Father

(a) Conditions for Migration of the Household

The condition for the household to migrate is that this decision yields more utility than the other two alternatives (child migrates alone, or neither household nor child

migrates), i.e., (i) $V_{i,2} - Z_{i,2} > 0$ and (ii) $V_{i,2} - W_{i,2} > 0$.

Subtracting (12) from (10) gives condition (i) for household migration being preferred to household staying:

$$(16) \quad K \{ [(y_B - \pi)^{1-\sigma} - y_R^{1-\sigma}] + \frac{\alpha\beta}{1 - \alpha\hat{\alpha} - \alpha\beta} [(y_W - \pi)^{1-\sigma} - y_R^{1-\sigma}] \} > 0$$

This implies that the parent's difference in powers of expected income from migrating (first bracket) and the descendants' difference in powers of expected income (second bracket) adjusted by dynastic and time discount factors should be greater than zero. Therefore, even when the parent expects an income loss from migration, the parent decides to migrate if the compensation from descendants' income is large enough.

The left side of (16) is a measure of the gain from household migration recognizing dynastic motives. The equilibrium rural income $\hat{Y}_{RF}$ that leaves the father indifferent between the household staying or migrating is a rural income such that the left side of (16) is zero, or solving,

$$(16)' \quad \hat{Y}_{RF} = \left[\frac{(y_W - \pi)^{1-\sigma} + \Theta_F (y_B - \pi)^{1-\sigma}}{1 + \Theta_F} \right]^{1/1-\sigma}$$

where $\Theta_F = (1 - \alpha\hat{\alpha} - \alpha\beta)/\alpha\beta$

implying $\hat{Y}_{RF}$ is a weighted sum of the migrant's expected income and the descendants' expected income after migration where the weight is given by a non-linear combination of α , $\hat{\alpha}$ and β . (16)' indicates that the equalizing rural income increases as y_W and y_B increase and as education cost π decreases. Other implications from (13)' are proposed:

PROPOSITION 3.1 *The equilibrium rural income that binds the father to the rural area should increase as his altruism towards his son increases.*

Proof Because $\frac{\partial \tilde{Y}_{RF}}{\partial \Theta_F} = \frac{1}{1-\sigma} \left[\frac{(y_B - \pi)^{1-\sigma} - (y_W - \pi)^{1-\sigma}}{(1 + \Theta_F)^2} \right] \tilde{Y}_{RF}^\sigma$

$$< 0 \quad \text{as} \quad y_W > y_B,$$

and $\frac{\partial \Theta_F}{\partial \alpha} = -\frac{1}{\alpha^2 \beta} < 0,$

it can be shown that $\frac{\partial \tilde{Y}_{RF}}{\partial \alpha} = \frac{\partial \tilde{Y}_{RF}}{\partial \Theta_F} \frac{\partial \Theta_F}{\partial \alpha} > 0$ ■

The parent with a larger parent-to-child altruistic factor α is more likely to migrate even with smaller compensation because utilities of descendants are more important and more weight is on $(y_W - \pi)^{1-\sigma}$. The same consideration applies to the time discount factor β ($\partial \Theta_F / \partial \beta < 0$, $\partial \tilde{Y}_{RF} / \partial \Theta_F < 0$).

PROPOSITION 3.2 *The equilibrium rural income that can bind the father to the rural area should increase as his son's altruism towards the father increases.*

Proof It is clear that $\frac{\partial \tilde{Y}_{RF}}{\partial \hat{\alpha}} = \frac{\partial \tilde{Y}_{RF}}{\partial \Theta_F} \frac{\partial \Theta_F}{\partial \hat{\alpha}} > 0$

because $\frac{\partial \Theta_F}{\partial \hat{\alpha}} = -\frac{\hat{\alpha}}{\alpha \beta} < 0$, and $\frac{\partial \tilde{Y}_{RF}}{\partial \Theta_F} < 0$ ■

Therefore, given rural sector and urban sector incomes, the larger $\hat{\alpha}$ makes the father more likely to move. When the father does not have any love towards his child ($\alpha=0$), only the first bracket in (16), which is the net gain (or loss) of the father by migration, remains because $\alpha\beta/(1-\alpha\hat{\alpha}-\alpha\beta) = 0$. In this case, the model reduces to the traditional model. In the dynastic model, however, the second term (compensation from descendants) is added, which can explain why sometimes the father migrates even when

his expected income in the destination area is not high.

PROPOSITION 3.3 *If the father does not love his son at all ($\alpha = 0$), he considers only his expected income and utility regardless of the son's love towards him.*

PROPOSITION 3.4 *Even if the son does not love his father at all ($\hat{\alpha} = 0$), as long as the father's altruism towards a son is not zero, the father still considers son's income.*

Condition (ii) stated at the outset of this section means that in order to be the best alternative, migration by the household should give a higher dynastic utility to the father than sending his son. From (10) and (11), condition (ii) can be expressed as:

$$V_{i,2} - W_{i,2} = K [(y_B - \pi)^{1-\sigma} - (y_R - \rho)^{1-\sigma}] > 0.$$

In order to satisfy the above condition, regardless of the size of σ , the following condition must be satisfied:

$$(17) \quad y_B - \pi > y_R - \rho \quad \text{or} \quad y_B > y_R - \rho + \pi = y_R - \gamma$$

PROPOSITION 3.5 *The father prefers household migration to sending his son if the father's expected income in the urban area (y_B) is greater than the rural sector income net of the extra living expense of the son in the urban area ($y_R - \gamma$).*

Even when y_W is large enough to induce the household to migrate from condition (i), if the migrant's expected income (y_B) is not larger than the rural sector income net of the extra living expenses in the urban area ($y_R - \gamma$), the father will not migrate because his dynastic income after migration is less than if his son migrates alone. He can do better by supporting his son in the urban area out of his farm earnings than taking the pay cut to move to the urban area.

(b) Conditions for Sending the Younger Generation

The conditions for the father to send his child only are : (iii) $W_{i,2} - Z_{i,2} > 0$ and (iv) $W_{i,2} - V_{i,2} > 0$, i.e., the dynastic utility of the father from his child's individual migration must be higher than that from staying and from household migration.

From equations (11) and (12), condition (iii) becomes:

$$(18) \quad K \{ [(y_R - \rho)^{1-\sigma} - y_R^{1-\sigma}] + \frac{\alpha\beta}{1 - \alpha\hat{\alpha} - \alpha\beta} [(y_W - \pi)^{1-\sigma} - y_R^{1-\sigma}] \} > 0.$$

Thus the higher is y_W , and the lower is y_R , π or ρ , the more likely it is that the father will send his child to the urban area.

If we assume that the urban extra living expense is a fixed portion of the father's income ($\rho = \rho' y_R$, where ρ' is a constant greater than zero and less than one)⁵, using (18), the rural income that makes the father indifferent between sending his son to the urban area and staying on the farm together is obtained as:

$$(18)' \quad \tilde{y}_{RF} = [1 + \Theta_F - \Theta_F (1 - \rho')^{1-\sigma}]^{1/(\sigma-1)} (y_W - \pi)$$

PROPOSITION 3.6 *The rural sector income that prevents the father from sending his son to the urban area should increase as parent-to-child altruism or child-to-parent altruism increases.*

Proof It was shown that $\partial\Theta_F/\partial\alpha < 0$ and $\partial\Theta_F/\partial\hat{\alpha} < 0$.

From (18)',

$$\frac{\partial\tilde{y}_{RF}}{\partial\Theta_F} = \frac{1}{\sigma-1} (1 - (1 - \rho')^{1-\sigma}) (1 + \Theta_F - \Theta_F (1 - \rho')^{1-\sigma})^{\sigma-2/1-\sigma} (y_W - \pi) < 0.$$

Therefore, $\partial\tilde{y}_{RF}/\partial\alpha = (\partial\tilde{y}_{RF}/\partial\Theta_F) (\partial\Theta_F/\partial\alpha) > 0$

⁵ Korean data ("Annual Report on the Urban Consumer Expending Survey" by Economic Planning Board) shows that ρ' was about 0.07 throughout 1963-1989.

and $\partial\tilde{y}_{RF}/\partial\hat{\alpha} = (\partial\tilde{y}_{RF}/\partial\Theta_F) (\partial\Theta_F/\partial\hat{\alpha}) > 0$. ■

Since condition (iv) is the same as condition (ii) with the sign reversed, in view of (14), condition (iv) becomes:

$$(19) \quad y_R - \rho > y_B - \pi \quad \text{or} \quad y_R - \gamma > y_B$$

Condition (19) indicates that when the father is choosing between household migration and sending his child to the urban area, he only needs to compare what he can consume in each case because the son's expected income will follow the same schedule regardless of the father's decision.

C. Viewpoint of the Younger Generation

(a) Conditions for Migration of the Household

The child wants to migrate with his father when (v) $V_{i+1,1} - Z_{i+1,1} > 0$ and (vi) $V_{i+1,1} - W_{i+1,1} > 0$.

From (13) and (15), condition (v) becomes:

$$(20) \quad K' \{ [(y_B - \pi)^{1-\sigma} - y_R^{1-\sigma}] + \frac{\alpha\beta}{(1 - \alpha\hat{\alpha} - \alpha\beta)} \frac{(1 + \alpha^{-1/\sigma})}{(\hat{\alpha} + \alpha^{(\sigma-1)/\sigma})} [(y_W - \pi)^{1-\sigma} - y_R^{1-\sigma}] \} > 0$$

From (20), the equilibrium y_R for the son to be indifferent between household migration and staying on the farm is:

$$(20)' \quad \tilde{y}_{RS} = \left[\frac{(y_W - \pi)^{1-\sigma} + (y_B - \pi)^{1-\sigma} \Theta_S}{1 + \Theta_S} \right]^{1/1-\sigma}$$

where $\Theta_S = [(1 - \alpha\hat{\alpha} - \alpha\beta) (1 + \alpha^{(\sigma-1)/\sigma})] / [\alpha\beta (1 + \alpha^{-1/\sigma})]$

This is similar to the father's equilibrium condition except Θ_S is Θ_F multiplied by $[(1+\hat{\alpha}\alpha^{(\sigma-1)/\sigma})/(1+\alpha^{-1/\sigma})]$. Because $\alpha\hat{\alpha}$ is smaller than one, the son's multiplier Θ_S is less than that of the father Θ_F , i.e., the son gives less weight to his father's income after migration.

PROPOSITION 3.7 (i) When $\sigma > 1$, the equilibrium rural income that can bind the son to the rural area should increase as the father's altruism towards his son increases.
(ii) When $\sigma < 1$, the effect is not uniformly determined.

Proof (i) & (ii)

$$\frac{\partial \tilde{Y}_{RF}}{\partial \Theta_S} = \frac{1}{1-\sigma} \left[\frac{(y_B - \pi)^{1-\sigma} - (y_W - \pi)^{1-\sigma}}{(1 + \Theta_S)^2} \right] \tilde{Y}_{RF}^\sigma < 0,$$

$$\frac{\partial \Theta_S}{\partial \alpha} < 0 \quad \text{if } \sigma > 1 \quad \text{and} \quad \frac{\partial \Theta_S}{\partial \alpha} > 0 \quad \text{if } \sigma < 1.$$

$$\text{Therefore, } \frac{\partial \tilde{Y}_{RF}}{\partial \alpha} = \frac{\partial \tilde{Y}_{RF}}{\partial \Theta_S} \frac{\partial \Theta_S}{\partial \alpha} > 0 \quad \text{if } \sigma > 1,$$

and it can be negative or positive if $\sigma < 1$. ■

PROPOSITION 3.8 (i) When $\sigma > 1$, the equilibrium rural income that can bind the son to the rural area should increase as the son's altruism towards his father increases.
(ii) When $\sigma < 1$, the effect is not uniformly determined.

Proof (i) & (ii)

$$\frac{\partial \tilde{Y}_{RF}}{\partial \Theta_S} = \frac{1}{1-\sigma} \left[\frac{(y_B - \pi)^{1-\sigma} - (y_W - \pi)^{1-\sigma}}{(1 + \Theta_S)^2} \right] \tilde{Y}_{RF}^\sigma < 0,$$

$$\frac{\partial \Theta_S}{\partial \hat{\alpha}} < 0 \quad \text{if } \sigma > 1 \quad \text{and} \quad \frac{\partial \Theta_S}{\partial \hat{\alpha}} > 0 \quad \text{if } \sigma < 1.$$

$$\text{Therefore, } \frac{\partial \tilde{Y}_{RF}}{\partial \hat{\alpha}} = \frac{\partial \tilde{Y}_{RF}}{\partial \Theta_S} \frac{\partial \Theta_S}{\partial \hat{\alpha}} > 0 \quad \text{if } \sigma > 1$$

and it is not uniformly determined if $\sigma < 1$. ■

Condition (vi) that makes the son prefer household migration to his individual migration becomes, using (14) and (15) and after cancellation, $y_B - \pi > y_R - \rho$ (or $y_B > y_R - \gamma$), which is the same as the father's condition, showing that the preference of the son for household migration over his individual migration is the same as his father's.

(b) Conditions for Migration of the Younger Generation

The conditions that must be satisfied for the son to want to go to the urban area by himself are : (vii) $W_{i+1,1} - Z_{i+1,1} > 0$ and (viii) $W_{i+1,1} - V_{i+1,1} > 0$. Condition (vii), which indicates that the son prefers his individual migration to staying, can be rewritten using (14) and (15) as:

$$(21) \quad K' \{ [(y_R - \rho)^{1-\sigma} - y_R^{1-\sigma}] + \frac{\alpha\beta}{(1-\alpha\hat{\alpha}-\alpha\beta)} \frac{(1+\alpha^{-1/\sigma})}{(1+\hat{\alpha}\alpha^{(\sigma-1)/\sigma})} [(y_W - \pi)^{1-\sigma} - y_R^{1-\sigma}] \} > 0$$

which may be compared with (18) giving the condition for the father's preferring the son's individual migration to staying. We can get the rural income making the son indifferent between his individual migration and staying on the farm:

$$(21)' \quad \tilde{Y}_{RS} = [1 + \Theta_S - \Theta_S(1 - \rho')^{1-\sigma}]^{1/(\sigma-1)} (y_W - \pi)$$

PROPOSITION 3.9 The more altruistic the father and the son are, the more likely to migrate is the son given y_W , y_B and π .

$$\begin{aligned} \text{Proof} \quad \frac{\partial \tilde{Y}_{RS}}{\partial \alpha} &= \frac{\partial \tilde{Y}_{RS}}{\partial \Theta_S} \frac{\partial \Theta_S}{\partial \alpha} \\ &= \left\{ \frac{1}{\sigma-1} (1 - (1-\rho')^{1-\sigma}) [1 + \Theta_S - \Theta_S(1-\rho')^{1-\sigma}]^{\sigma-2/(1-\sigma)} (y_W - \pi) \right\} \frac{\partial \Theta_S}{\partial \alpha} \\ &> 0 \quad \text{as } \partial \Theta_S / \partial \alpha < 0. \end{aligned}$$

The same logic can be applied to $\partial \tilde{Y}_{RS} / \partial \hat{\alpha} > 0$ as $\partial \Theta_S / \partial \hat{\alpha} < 0$. ■

Condition (viii) can be rewritten using (14) and (15) which after cancellation shows:

$$(22) \quad y_B < y_R - \gamma \quad \text{or} \quad y_B - \pi < y_R - \rho$$

which is the same condition as (19). As long as $(y_R - \gamma)$ is larger than y_B , both generations have higher utility if the father stays in the rural area and the son migrates to the urban area.

When dynastic utilities from all alternatives are the same, the son does not have any motive to migrate. The equilibrium rural income for the son can be obtained from (21) and (22) by inserting $(y_B = y_R - \gamma)$ into $(y_R - \gamma)$ in (22), which is exactly the same as (20)'.

IV. CONFLICTS BETWEEN GENERATIONS

As they have different dynastic utility functions, the father and his son possibly have different opinions on migration. In this section, it will be depicted how their conflicts on the household or the son's individual migration look like and how they are related to the degree of altruism.

Conditions (16)' and (20)' indicate that the rural income at which the economic agent does not want to migrate is not the same for the father and the son. The difference arises from the weights Θ_S and Θ_F , which are the functions of α , $\hat{\alpha}$ and β .

PROPOSITION 4.1 *The equilibrium rural income that makes the son prefer staying on the farm to household migration is always greater than that of the father.*

Proof From (16)' and (20)', the ratio of the father's equilibrium income to the son's is calculated as:

$$\frac{\hat{Y}_{RF}}{\hat{Y}_{RS}} = \left[\frac{(1 + \Theta_S) [(y_W - \pi)^{1-\sigma} + \Theta_F (y_B - \pi)^{1-\sigma}]}{(1 + \Theta_F) [(y_W - \pi)^{1-\sigma} + \Theta_S (y_B - \pi)^{1-\sigma}]} \right]^{1/(1-\sigma)}$$

$$= \left[1 - \frac{(\Theta_F - \Theta_S) [(y_W - \pi)^{1-\sigma} - (y_B - \pi)^{1-\sigma}]}{(1 + \Theta_F) [(y_W - \pi)^{1-\sigma} + \Theta_S (y_B - \pi)^{1-\sigma}]} \right]^{1/(1-\sigma)} \\ < 1 \quad (\Leftrightarrow \hat{Y}_{RF} < \hat{Y}_{RS}) \quad \text{because} \quad \Theta_S < \Theta_F \quad \text{and} \quad y_B < y_W \quad \blacksquare$$

If the rural income is lower than $\hat{Y}_{RF}$, both the father and the son want to migrate. If the rural area income is greater than $\hat{Y}_{RS}$, neither the father nor the son wants to migrate. When the rural income lies between $\hat{Y}_{RF}$ and $\hat{Y}_{RS}$, they have different opinions on migration. The father prefers to stay in the rural area while the son wants to move to the urban area. The range between $\hat{Y}_{RF}$ and $\hat{Y}_{RS}$ is the 'conflict range' of household migration decision.

As y_B approaches y_W or Θ_S approaches Θ_F (these mean the son's expected dynastic income converges to the father's), $\hat{Y}_{RF}$ and $\hat{Y}_{RS}$ asymptotically have the same value. Therefore the conflict range is an increasing function of $(\Theta_F - \Theta_S)$ while $(\Theta_F - \Theta_S)$ is the function of altruism. The more altruistic is each generation, the smaller is $(\Theta_F - \Theta_S)$.

PROPOSITION 4.2 *The family with higher altruism has a smaller conflict range.*

$$\text{Proof} \quad \Theta_F - \Theta_S = \frac{1 - \alpha\hat{\alpha} - \alpha\beta}{\alpha\beta} \left[1 - \frac{1 + \hat{\alpha}\alpha^{(\sigma-1)/\sigma}}{1 + \alpha^{-1/\sigma}} \right] \\ = \frac{(1 - \alpha\hat{\alpha} - \alpha\beta)(1 - \alpha\hat{\alpha})}{\alpha\beta(1 + \alpha^{1/\sigma})}$$

$$\text{Therefore,} \quad \frac{d(\Theta_F - \Theta_S)}{d\alpha} < 0 \quad \text{if} \quad -1 < \sigma^6$$

⁶ This is sufficient condition for $d(\Theta_F - \Theta_S)/d\alpha$ to be negative, which should always hold because the concavity of the utility function requires $\sigma > 0$.

$$\text{and } \frac{d(\Theta_F - \Theta_S)}{d\hat{\alpha}} = \frac{\alpha(2\alpha\hat{\alpha} + \alpha\beta - 2)}{[\alpha\beta(1 + \alpha^{1/\sigma})]^2} < 0 \text{ because } \alpha\hat{\alpha} < 1 - \alpha\beta. \quad \blacksquare$$

The same logic can be applied to the case of the son's single migration to his staying on the farm. It can be shown that $(\tilde{Y}_{RF}/\tilde{Y}_{RS})$ is always smaller than 1.

PROPOSITION 4.3 *The equilibrium rural income that makes the son prefer staying on the farm to his individual migration is always greater than that of the father.*

Proof

$$\begin{aligned} \frac{\tilde{Y}_{RF}}{\tilde{Y}_{RS}} &= \left[\frac{1 + \Theta_F - \Theta_F(1 - \rho')^{1-\sigma}}{1 + \Theta_S - \Theta_S(1 - \rho')^{1-\sigma}} \right]^{1/\sigma-1} \\ &= \left[1 + \frac{(\Theta_F - \Theta_S)(1 - (1 - \rho')^{1-\sigma})}{1 + \Theta_S - \Theta_S(1 - \rho')^{1-\sigma}} \right]^{1/\sigma-1} \\ &< 1 \text{ because } \Theta_S < \Theta_F. \quad \blacksquare \end{aligned}$$

$\tilde{Y}_{RF}$ and $\tilde{Y}_{RS}$ are asymptotically the same as Θ_S and Θ_F approach each other. Therefore $(\tilde{Y}_{RF}/\tilde{Y}_{RS})$ is a function of which value approaches one as the gap between Θ_S and Θ_F reduces. Taking the same step as the proof of **PROPOSITION 4.2**, it can be shown that the conflict range of the son's individual migration decision becomes smaller as the family has higher altruism.

PROPOSITION 4.4 *The conflict between generations on the son's individual migration decreases as they are more altruistic towards each other.*

V. PUNISHMENT AND THE YOUNGER GENERATION'S INDEPENDENT MIGRATION

When they have different views over the move or stay decision, the father, who is the migration decision maker, will not allow his son to act to maximize son's utility

because it can hurt his own utility. In this situation, the son considers independent migration because his dynastic utility will be reduced by following the father's wishes when y_R falls in the conflict range. The economic strategy of the father, who is the earner and allocator, is to bind his son to the farm in case of 'conflict' by threatening his son that he will not support him financially if the son migrates contrary to the father's decision. Throughout this section, it will be shown how effective the father's threat is and how the son reacts to the threat. The high mobility of the younger generation will be theoretically proved while we examine the mechanism of each generation's best strategies in a dynastic utility model.

A. Punishment and Credibility

Regardless of whether the son follows the father's decision or not, the best policy of the father is just to maximize his dynastic utility. In this sense, it is possible that the father's threat is not realized and that he will financially support the son migrating disobediently. The son who anticipate this fact may calculate out his father's dynastic utility and detect whether his father will actually stop financial support when he migrates independently without the father's permission. If the father has a higher dynastic utility from sharing his income than punishing his son, his threat of punishment will not be effective.

The father's dynastic utility when he does not support his migrating son is (as $c_{i,2} = y_R$, and $c_{i+1,1} = 0$), from (5) and (9):

$$(23) \quad Z_{i,2}' = K \left[\frac{1}{\alpha} (1 + \alpha^{-1/\sigma})^{-\sigma} y_R^{1-\sigma} + \frac{\alpha\beta}{1 - \alpha\hat{\alpha} - \alpha\beta} (y_{W-\pi})^{1-\sigma} \right]$$

Even though he quits supporting his son as punishment, he still has altruism towards descendants and therefore the utilities of descendants still come into his dynastic utility.

The son concludes that the threat will not be effective if utility in $Z_{i,2}'$ is smaller than in $W_{i,2}$ which is the utility of the father when he supports his migrating son. By subtracting (23) from (11), the condition under which the threat is not effective is:

$$W_{i,2} - Z_{i,2}' = K [(y_R - \rho)^{1-\sigma} - \alpha^{-1} (1 + \alpha^{-1/\sigma})^{-\sigma} y_R^{1-\sigma}] > 0$$

which is the same condition as:

$$(24) \quad y_R > \rho / [1 - (1 + \alpha^{1/\sigma})^{\sigma/(\sigma-1)}]$$

From inequality (24), the relation between the effectiveness of the threat and some parameters including the parent-to-child altruism can be found.

PROPOSITION 5.1 (i) *The threat is always ineffective if $\sigma > 1$.*

(ii) *The threat is either effective or ineffective depending on y_R , ρ and α if $\sigma < 1$. In this case, the threat is the more likely to be ineffective the more altruistic is the father.*

Proof (i) The denominator in the right side of (24) is

$$[1 - (1 + \alpha^{1/\sigma})^{\sigma/(\sigma-1)}] < 0 \quad \text{if } \sigma > 1.$$

Therefore, if only y_R is greater than zero, sharing will give higher utility to the father and he will support his son migrating without the father's permission.

(ii) The denominator of the right side of (24) is positive if $\sigma < 1$, and

$$\frac{\partial [1 - (1 + \alpha^{1/\sigma})^{\sigma/(\sigma-1)}]}{\partial \alpha} = \frac{1}{1 - \sigma} \alpha^{1-\sigma/\sigma} (1 + \alpha^{1/\sigma})^{1/\sigma-1} > 0$$

Therefore, the right side of inequality (24) is a decreasing function of α . ■

B. Migration in The Face of Effective Threat

The credibility of punishment does not necessarily mean that the son never moves without his father's permission. Even if the father's threat is believed to be credible⁷, the son would migrate as long as his dynastic income in the urban area without his father's support is larger than that in the rural area. The son's dynastic utility without his father's help is, from (13) and (14)⁸:

$$W_{i+1,1}' = K' [\frac{\hat{\alpha} (1 + \alpha^{-1/\sigma})^{1-\sigma}}{(1 + \hat{\alpha}\alpha^{\sigma-1/\sigma})} y_R^{1-\sigma} + \frac{1}{\Theta_S} (y_W - \pi)^{1-\sigma}]$$

If $W_{i+1,1}'$ is greater than $Z_{i+1,1}$, the son independently migrates even without his father's support. From (13) and (25), that condition becomes:

$$(26) \quad y_R < [1 + \Theta_S - \Lambda \Theta_S]^{1/\sigma-1} (y_W - \pi)$$

$$\text{where } \Lambda = \frac{\hat{\alpha} (1 + \alpha^{-1/\sigma})^{1-\sigma}}{(1 + \hat{\alpha}\alpha^{\sigma-1/\sigma})}$$

The low level of rural income, the low level of tuition, and the high level of expected earnings in the urban area all make the son more likely to migrate by himself even when his father does not approve. When $\sigma > 1$, two propositions can be obtained

⁷ It might be also possible in the real world for the father to quit support even if $\sigma > 1$ when he has more than one child and needs to demonstrate the effectiveness of his threat.

⁸ The question can be raised how the child can survive in the urban area without his father's financial support. It is a widely observed phenomenon that many of the young independent migrants to the urban area fail to get higher education or job skill training. They start to make money in the first period of life in the informal sector, thereby loose opportunities to be employed in the formal sector in the second period. But when he decides to migrate, he is assumed ex ante to expect to get higher education or job skill training in the urban area and enjoy higher income ('success') in the second period.

about the effects of altruism on son's independent migration.

PROPOSITION 5.2 (i) *The more altruistic is the father to his son, the less likely to migrate by himself is the son.*

(ii) *The more altruistic is the son to his father, the less likely to migrate by himself is the son.*

Proof (i) Differentiation of the right hand side of (26) with respect to α gives

$$\frac{1}{\sigma - 1} [1 + \Theta_S - \Lambda \Theta_S]^{2-\sigma/\sigma-1} \left[\frac{\partial \Theta_S}{\partial \alpha} (1 - \Lambda) - \frac{\partial \Lambda}{\partial \alpha} \Theta_S \right] (y_W - \pi)$$

where $\partial \Theta_S / \partial \alpha < 0$, $(1 - \Lambda) > 0$, and the numerator of $\partial \Lambda / \partial \alpha$ is
 $(\sigma - 1)/\sigma \bar{\alpha} \alpha^{-1-\sigma/\sigma} (1 + \alpha^{-1/\sigma})^{-\sigma} [(1 + \bar{\alpha} \alpha)^{\sigma-1/\sigma} - \bar{\alpha} \alpha (1 + \alpha^{-1/\sigma})]$
 $= (\sigma - 1)/\sigma \bar{\alpha} \alpha^{-1-\sigma/\sigma} (1 + \alpha^{-1/\sigma})^{-\sigma} [1 + (\bar{\alpha} \alpha)^{\sigma-1/\sigma} + \Re - \bar{\alpha} \alpha + \bar{\alpha} \alpha^{\sigma-1/\sigma}]$
 $= (\sigma - 1)/\sigma \bar{\alpha} \alpha^{-1-\sigma/\sigma} (1 + \alpha^{-1/\sigma})^{-\sigma} [1 - \bar{\alpha} \alpha + \bar{\alpha} \alpha^{\sigma-1/\sigma} (\bar{\alpha}^{-1/\sigma} - 1) + \Re]$
 > 0 because $1 > \bar{\alpha} \alpha$ and $\bar{\alpha}^{-1/\sigma} > 1$ (if $\bar{\alpha} < 1$) where $\Re$ is the positive residuals after expansion of $(1 + \bar{\alpha} \alpha)^{\sigma-1/\sigma}$.

Therefore it is shown that the right hand side is a decreasing function of α , which means the son is less likely to move. ■

$$(ii) \partial \Lambda / \partial \bar{\alpha} = [(1 + \alpha^{-1/\sigma})^{1-\sigma} / (1 + \bar{\alpha} \alpha^{\sigma-1/\sigma})]^2.$$

By the same logic as was used in Proof (i), the right side of (26) is shown to be a decreasing function of $\bar{\alpha}$. ■

The choice of the son whether to stay or to leave and that of the father whether to help his son or not can be summarized in an extensive form game with backward induction assuming perfect information. Figure 1 shows the extensive form game between the father and the son when the income differential falls in the conflict range.

If $\max\{W_{i,2}, Z_{i,2}', Z_{i,2}\} = Z_{i,2}$ and $\max\{W_{i+1,1}, W_{i+1,1}', Z_{i+1,1}\} = Z_{i+1,1}$, both the father and the son stay on the farm without any conflict. However, if $\max\{W_{i,2}, Z_{i,2}', Z_{i,2}\} = Z_{i,2}$ but $\max\{W_{i+1,1}, W_{i+1,1}', Z_{i+1,1}\} \neq Z_{i+1,1}$ (when the income falls in the conflict range), the father wants to stay with his son while the son wants to migrate. In this case, the son will compare $W_{i,2}$ and $Z_{i,2}'$. If $W_{i,2}$ is greater than

$Z_{i,2}'$, the son guesses his father will help him even if he migrates without the father's agreement. Therefore, the son migrates even though the father threatens to withdraw financial support, and the father ultimately helps his migrating son. The equilibrium is (a) in Figure 1. The condition for this is (24) which was examined before. If $Z_{i,2}'$ is greater than $W_{i,2}$ (condition (24) is violated), the son will get $W_{i+1,1}'$ when he migrates. Therefore, he will compare his two prospective incomes, $W_{i+1,1}'$ and $Z_{i+1,1}$. If $W_{i+1,1}'$ is greater than $Z_{i+1,1}$ (condition (25)), he will migrate independently even without his father's help, and the equilibrium will be (b). If $W_{i+1,1}'$ is smaller than $Z_{i+1,1}$ (condition (25) is violated), i.e., if the father's decision of not sharing his income with his disobedient son gives lower dynastic utility to the son than staying on the farm, then the son will stay. The equilibrium is (c).

Figure 1 -- Father's and son's strategies

VI. SUMMARY

A dynastic model considering altruism between family members can explain why people sometimes migrate to the area with lower expected incomes. The more altruistic

is the father towards his son, the more likely he is to migrate to the area where his descendants are expected to receive higher incomes. From the structural difference of the dynastic utility functions of each generation, it is shown that the son is more likely to migrate, even without father's agreement sometimes. The possibility of inter-generational conflict on migration decision is explained as the difference of their dynastic utility functions and the effect of altruism on the conflict is examined. Degree of altruism towards each other is shown to play a key role in a dynastic model explaining various migration phenomena.

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