勞 動 經 濟 論 集
第17卷(2), 1994. 12. pp.319~356

Alternative Models on the Rural-Urban Migration and the Growth of a Primate City : Critiques on Todaro's and Krugman's View

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I. Introduction

During the past two decades, the Todaro model has been widely accepted as the theoretical framework used to explain the rapid rural-urban migration in the face of sizeable urban unemployment observed in most LDCs 「Todaro (1969, 1976, and 1986 and Harris and Todaro (1970)」. However, the Todaro model has been criticized on three fronts by Stiglitz, (1974, 1982, 1986, and 1987), Harris and Sabot (1982), Mazumdar

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The authors acknowledge very helpful comments of an anonymous referee.

(1976a, 1976b, 1987, 1989) and Cole and Sanders (1985 and 1986).

First, the Todaro model assumes that the wage level in the urban informal sector is significantly lower than that in the rural sector, and that all rural-urban migrants come to urban area with the intent of finding permanent jobs in the modern sector. Therefore, in the Todaro model, migrants take informal sector jobs only before they find jobs in the modern sector. Hence, employment in the informal sector is considered to be underemployment. However, recent evidence from Mazumdar (1976a and 1976b) and Cole and Sanders (1985) shows that the wage level of the urban informal sector is significantly higher than the rural wage level and that a large proportion of the rural- urban migrants come to the urban areas with the intent of finding permanent jobs in the urban informal sector.

Second, the Todaro model assumes that the labor force is homogeneous. Harris and Sabot (1982) argue that migration behavior and the unemployment problems of the educated migrants are significantly different than those of the uneducated migrants. Finally, Stiglitz (1982, 1986, and 1987) and Mazumdar (1976a, 1976b, 1987, and 1989) criticize the assumption by Todaro model that the urban wage is set above the market-clearing wage because of institutional factors such as labor unions and minimum wage laws. Their recent models recommend the replacement of the institutional sticky wage hypothesis with the efficiency-wage hypothesis, which argues that firms pay wages above the market-clearing wage in order to minimize the cost per worker by inducing workers to increase their productivity.

Although the studies by Stiglitz, Harris and Sabot, Mazumdar, and Cole and Sanders have significantly improved our understanding of rural-urban migration problems in the LDCs, they suffer from some major deficiencies. First, none can explain theoretically why the wage level in the urban informal sector is higher than that of the rural sector. Second, the model suggested by Cole and Sanders does not explain why the decline in rural population, which increases the rural subsistence sector wage, do not slow down rural- urban migration. For example,[1] from 1966 to 1985 Korea's rural population declined by 28 percent from 19.4 million to 14 million. And, rural-urban migration in Korea does not show any evidence of slowing down. The proportion of the rural popula-

1) The data presented in this section comes from the study by Lee(1991).

tion migrating annually from rural areas to urban areas has increased from about 1.9 percent (an average of 360,000 rural residents) for 1965-75 to about 2.8-3.0 percent (an average of 500,000) for 1975-85. Finally, the traditional migration model is deficient because it concentrates exclusively on the urban/rural wage differential and pays no attention to the consumption motives underlying rural-urban migration.

In order to resolve these shortcomings, an alternative rural-urban migration model is developed in this paper.[2] In this new model, two different theories of international trade are introduced with relation to migration. First the "Dutch Disease" in the four sector specific-factor trade model to explain the lower profitability of farming due to increasing rural wages and higher wage rates in the urban informal sector. "Dutch Disease" refers to the rapid development in the Netherlands of the sector producing natural gas, which resulted in the squeezing of other traditional export sectors within the Dutch economy. Much less disruption was brought about in those economic sectors servicing purely local markets–the non–traded goods sector. With this model, it can be explained why the decline in rural population, which increases the rural subsistance sector wage, do not slow rural-urban migration in Korea. The second model explains whether the urban-rural migration for the primate cities would continue in the future.[3] In order to develop such a model, Krugman's monopolistic competition trade model is borrowed to explain the consumption motives for rural-urban migration. We generally agree with Krugman arguing that the consumption variety plays an important role of inducing urban growth. However, we stand against Krugman with respect to the feasibility of the eternal growth. In Krugman's model, the city is allowed to grow eternally because only consumption variety is considered as a key factor of growth but the possibility of cross-devastation is never seriously considered. In this paper, we theoretically incorporate a learning process of cross-fertilization and a process of cross-devastation. It is conjectured that once the

2) In the two theoretical frameworks developed in this paper, a certain degree of urbanization is prerequisite in order to induce the viable rural-urban migration. We accept that our framework may not be suitable in explaining the migration of a less developed country where the labor force is abundant and the urban sector has not been developed enough to have the absorption of labors from the rural sector. In this case, the classical models may be more appropriate to explain the migration.

3) The natures of two models developed in this paper are distinguished with each other in terms of their time periods discussed. The first model is to explain why the rural-urban migration continues even if the wage gap in the rural and urban sector vanishes. On the other hand, the second model explains whether such migration would continue in the future.

growth of one industry requires the sacrifice of the other industries, the cross-devastation starts to work, which prevents the city from growing permanently.

II. The Todaro Model

The Todaro model assumes the minimum urban wage rate is determined politically and is substantially higher than agricultural earnings 「Harris and Todaro (1970)」. Reasons why the urban wage is fixed institutionally above the rural wage include the existence of labor unions, legally decreed minimum wages, government employment in which wages are set through a political or negotiating process, and situations in which foreign corporations may decide for a number of reasons to pay more than the market-clearing wage 「Tolley (1987)」.

In the Todaro model, rural-urban migration is assumed to take place until the actual rural wage is equalized to the expected urban wage, which is the actual (sticky) urban wage times the probability of being unemployed in the urban modern sector. Urban unemployment resulting from the sticky minimum urban wage is thus consistent with the equilibrium in this model. The existence of urban unemployment makes the sticky minimum wage set above the market-clearing level in the modern urban sector an equilibrium wage rate in the Todaro model.

Following the notations used by Stiglitz (1982), we can explain the Todaro model as follows :

Migration would continue until the expected wage in the urban sector, W_u^e, would equal the rural wage, W_r

$$W_u^e = W_u (1-u) \quad \cdots\cdots (1)$$

$$W_u^e = W_r \quad \cdots\cdots (2)$$

Where W_u is the urban sticky wage, and u is the urban unemployment rate.

$$1-u = \frac{L}{N} \quad \cdots\cdots (3)$$

L is the size of urban employment , and N is the size of the urban labor force, Combining equations (1) and (2), we obtain

$$\frac{W_u}{W_r} = \frac{1}{1-u} \quad \cdots\cdots (4)$$

or combining equations (3) and (4),

$$\frac{W_u}{W_r} = \frac{N}{L} \quad \cdots\cdots (5)$$

Equation (5) implies that if there are large differentials in wage rates between the urban and rural sectors, labor will migrate from the rural to the urban sector. More individuals migrate than can find jobs, leading to an increase in unemployment. Unemployment acts to discourage further migration. There will be a relationship between the magnitude of wage differentials and the equilibrium rate of unemployment. The greater the wage differential, the greater the equilibrium level of unemployment.

The Todaro model treats all labor as homogeneous. The model therefore assumes a random turnover in the modern urban sector labor force, with each member of the total urban labor force having an equal chance of being employed on any given day, as if jobs were allocated by lottery or a game of musical chairs 「Corden and Findlay (1975)」. This kind of rationing mechanism is needed in the Todaro model to maintain the distortion in the urban labor market. Only on this assumption will the creation of one extra job induce rural-urban migration of 1/(1-u) new job seekers.

The policy implication of the Todaro model is that if one additional job is created in the industrial sector at the urban minimum wage, the expected urban wage will rise and rural-urban migration will be induced. It is shown that more than one agricultural worker will likely migrate in response to the creation of one additional industrial job. Thus, investments generating urban modern employment opportunities may be counterproductive, according to the model, since they add to urban unemployment. The converse policy of investing in rural employment generation is unambiguously good, because it reduces the urban-rural wage gape, promotes reverse migration, and reduces urban unemployment.

Since Todaro assumes the existence of urban unemployment and the full employment of agricultural labor, the opportunity cost of an industrial job is higher than the opportunity cost of an agricultural job. Todaro argues that the creation of an additional job in the agricultural sector will induce reverse migration without reducing industrial output (i.e., zero opportunity cost) because reverse migrants will come from an urban pool of the unemployed and underemployed. However, the creation of an additional job in the urban area will induce the migration of more than one agricultural worker. Hence, the opportunity cost of an industrial worker will exceed the marginal product of an agricultural worker.

Again, following Stiglitz (1982), the opportunity cost of one additional worker in the urban sector can be explained more clearly. If the creation of one additional urban job by the government does not increase the urban wage, the urban unemployment will remain the same according to Equation (4). In this case, the creation of one additional urban job will cause a migration of 1/(1-u) workers from the rural sector. For example, if the urban wage is three times the rural wage, $((W_u/W_r)=3$ in equation (4)), the rate of unemployment, u, in Equation (4) will be 67 percent and the creation of one extra urban job will induce three workers to join the urban labor force.

Thus, the opportunity cost of one additional worker in the urban sector is $(1/(1-u))$ W_r, which equal to the urban market wage. On the other hand, if the creation of one additional urban job by the government increases urban wages, then a migration of workers greater than 1/(1-u) from the rural sector will be induced. In this case, the urban unemployment rate will increase and the opportunity cost of one additional urban worker is greater than $(1/(1-u))W_r$, and hence, greater than the urban market wage. In either case, the opportunity cost of an additional urban worker will exceed the marginal product of an agricultural worker. Todaro believes the latter case is true for most LDC's.

In the Todaro model, the wage level in the urban informal sector is assumed to be lower than the rural wage. Therefore, no rural-urban migrants are intent upon the permanent urban informal sector employment. In his model, those migrants not obtaining the urban modern sector employment in the immediate period are assumed to accept temporary employment in the urban informal sector. Therefore, the addition to the Todaro model of an urban informal sector providing a subsistence wage until a modern wage is drawn is merely a means to square the model with the fact that the urban unem-

ployment rate is not 50% as predicted by his model, given an urban wage of twice the rural one.

III. The Introduction of the "Dutch Disease" in the Four-Sector Specific-Factor Trade Model to the Issue of Migration

To develop an alternative rural-urban migration model, the theory of the "Dutch Disease" in the four-sector specific factor trade model developed by Corden and Neary (1982) and Caves and Jones (1985, pp 102-105) is introduced in the context of migration. We assume that an economy has four sectors- agriculture (rural trade goods), and rural nontraded goods (rural services), manufacturing (urban traded goods), and urban nontraded goods (including services produced in both the urban modern and informal sectors). In addition, manufactured goods produced by small enterprises in the urban informal sector are also included in the urban nontraded goods sector, because there is no national distribution system for goods produced in the informal sector.

Following Jones(1971) and Corden and Neary (1982) we assume that each of the four sectors uses specific factors that can only be used in one sector as well as mobile factors which are mobile between sectors. A specific factor for agriculture may be rural farm land; for manufacturing urban land and physical capital specific to manufacturing; and for both the urban and rural nontraded sectors land and physical capital specific to each of those sectors. Labor is a mobile factor in each of the four sectors. Though these assumptions about factor mobility simplify reality, relaxing them should not change the short to medium term implications of the model for most LDCs.

The resulting production functions for these four sectors are:

$$Q_a = Q_a (T_a \cdot L_a)$$
$$Q_m = Qm (T_m \cdot L_m)$$
$$Q_s = Q_s (T_s \cdot L_s)$$
$$Q_n = Q_n (T_n \cdot L_n)$$
$$L_a + L_m + L_s + L_n = L$$

where Q_i is the economy's output from the agriculture (a), manufacturing (m), urban nontraded goods (s), rural nontraded goods (n) sectors, respectively. L_i is the labor force that is employed in the sector i, L is the total labor supply, and T_i is the supply of the specific factor used in sector i.

Drawing on Corden and Neary (1982), Figure 1 illustrates the labor market, with the wage rate found on the vertical axis and the economy's total labor supply is represented on the horizontal axis as O_uO_r. Labor input in the urban manufacturing and nontraded goods sectors are combined and total urban labor input is measured by the distance from O_u while total labor input in agriculture and the rural nontraded goods sectors is measured from O_r. V_u^1 is the initial labor demand curve for the urban manufacturing and nontraded goods sectors combined. V_a is the initial labor demand curve for the rural agricultural sector and V_r^1 is the initial labor demand curve for the agricultural and rural nontraded goods sector. Initial equilibrium is at E_1, where V_u^1 intersects V_r^1; so the initial wage rate is W_1. Labor initially employed in the rural nontraded goods sector is measured by $O_rL_u^1$-$O_rL_a^1$.

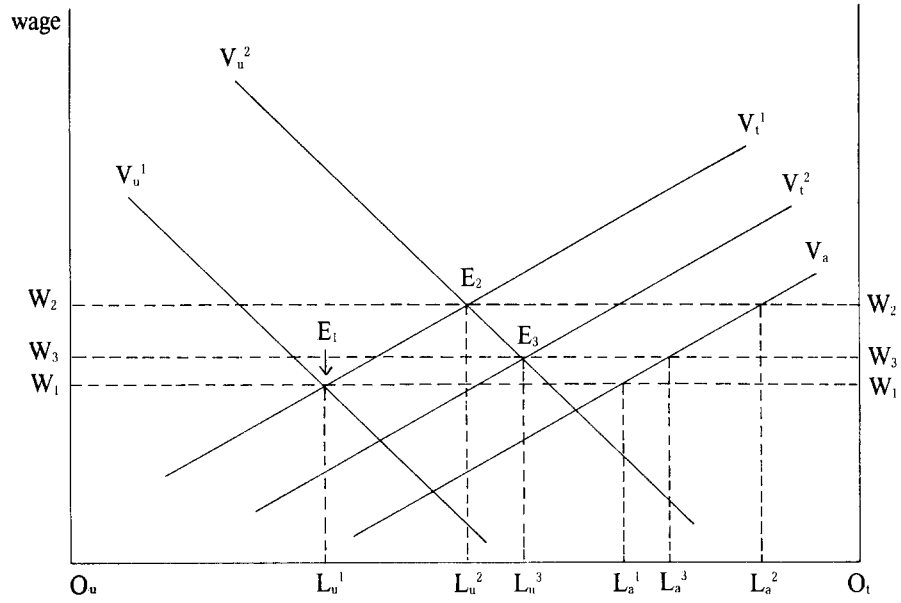
In an industrializing LDC such as Korea, the manufacturing sector is expected to grow faster than the agricultural sector for two reasons. First, because manufacturing technology is generally applicable anywhere while agricultural technology is often location specific, technological change in LDCs that rely heavily on imported technology is usually much more rapid in the modern, urban based manufacturing sector than in traditional, rural based agriculture (Kelley and Williamson, 1984). Thus, technological change is assumed to be more rapid in the manufacturing sector than in the other three sectors. Second, the income demand elasticity for manufactures is higher than that for agricultural products. The rapid change in manufacturing technology should shift the supply curve of manufacturing of S_m^1 to S_m^2 in panel (a) of Figure 2; the high income demand elasticity for manufactures will lead to a large rightward shift of the demand curve from D_m^1 to D_m^2 as the income level of the economy increases. To the extent that manufactured goods are internationally tradeable, world income growth should result in increased export demand for manufactures and give further impetus to demand. The rightward shifts of both the demand and supply curve for the manufacturing sector will cause an unambiguous increase in the quantity of manufactures produced(from Q_m^1 to Q_m^2) while the effect on equilibrium price is ambiguous as shown in panel (a) of Figure 2.

The increase in manufactured output from Q_m^1 to Q_m^2 will increase that sector's demand for labor assuming the technological progress is not labor saving. This is shown as an upward shift of the composite urban labor demand curve from V_u^1 to V_u^2 with the wage rate rising to W_2 in Figure 1. The increase in the wage rate causes labor to move out of the urban and rural nontraded goods sectors and the agricultural sector. This is what Corden and Neary describe as the resource movement effect. The increase in wages causes the urban nontraded goods supply curve to shift from S_s^1 to S_s^2 in panel (b) of Figure 2. The equilibrium output of urban nontraded goods declines from Q_s^1 to Q_s^2.

The increased output in the manufacturing sector due to technological improvement and/or increased demand will raise income for the sector. This increased income should increase demand for urban nontraded goods, shifting the demand curve from D_s^1 to D_s^2 if income elasticity of demand for urban nontraded goods (which cannot be purchased from rural areas or foreign countries) is high enough, equilibrium output may increase beyond the initial output level OQ_s^1 to OQ_s^3, as shown in equilibrium S_3 on panel (b) of Figure 2. In this case, the spending effect outweighs the resource movement effect; output in the urban nontraded goods sector ends up higher as a result of the boom in the manufacturing sector. This should result in an increase in the demand for labor by the more labor- intensive urban nontraded goods sector. This will cause an additional rightward shift of the urban labor demand curve and can be considered part of the shift from V_u^1 to V_u^2 in Figure 1. The increase in wages to W_2 reflects both the boom in the manufacturing sector and in the urban nontraded goods sector.

The increase in the wage rate from W_1 to W_2 causes a decline in employment in the rural sector from $O_r L_u^1$ to $O_r L_u^2$ in Figure 1. The fall in rural labor supply causes the agricultural supply curve to shift left from S_a^1 to S_a^2 in panel (c) of Figure 2 and the rural nontraded goods supply curve to shift from S_n^1 to S_n^2 in panel (d). Equilibrium in the agricultural sector moves from A_1 to A_2 and output declines from OQ_a^1 to OQ_a^2. Following Caves and Jones (1985) the demand curve for farm output faced by farmers is perfectly elastic. This is characteristic of "Dutch Disease" and illustrates that agricultural producers are unable to raise prices because of competition from other producers and foreign countries. In the rural nontraded goods sector equilibrium moves from N_1 to N_2, with output falling from OQ_n^1 to OQ_n^2.

Figure 1. Allocation of Labor Among Sectors



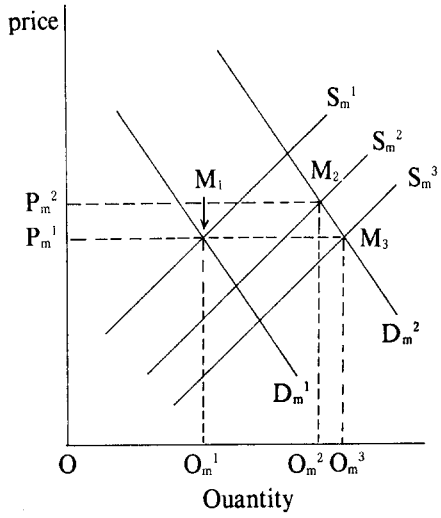
The migration of labor out of rural areas should also result in a decrease in the demand for rural nontraded goods since this sector's demand is location specific. Although rural wages have risen, the loss of rural population and farm profits outweigh any positive impact higher rural wages may have on the demand for rural non-traded goods. This is shown in panel (d) of Figure 2 as a shift from D_n^1 to D_n^2, with the result being an unambiguous drop in output from OQ_n^1 to OQ_n^3 and a possible price increase or decrease from P_n^1. Such a fall in output would result in a decrease on the rural nontraded goods sector demand for labor, shifting the labor demand curve downward from V_r^1 to V_r^2 in Figure 1, with final equilibrium at E_3. Employment in the rural nontraded goods sector falls from $L_u^2L_a^2$ to $L_u^3L_a^3$. This lowers the wage rate from W_2 to W_3, which further increases urban employment from $O_uL_u^2$ to $O_uL_u^3$, causing an additional rightward shift of the manufacturing supply curve to the right from S_m^2 to S_m^3. Manufacturing output increases from O Q_m^1 to OQ_m^3 and urban nontraded goods output increases from OQ_s^1 to OQ_s^4.

The fall in both output and employment in the rural nontraded goods sector will also increases labor supply to the agricultural sector, shifting the agricultural supply curve to the right from S_a^2 to S_a^3 in panel (c) of Figure 2. Assuming that the low income

Figure 2.

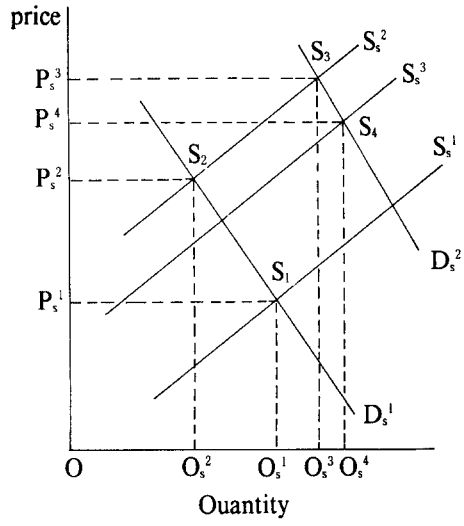
(a)

Manufacturers



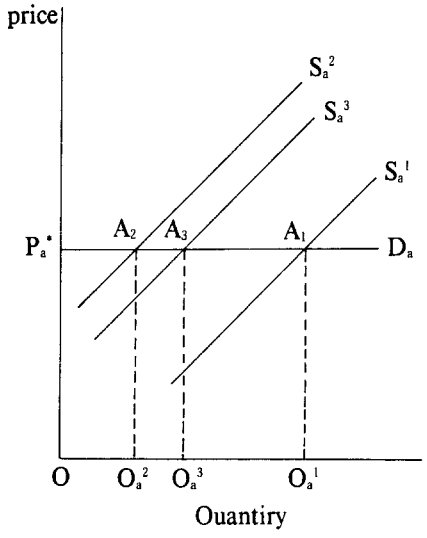
(b)

Urban Nontraded Goods



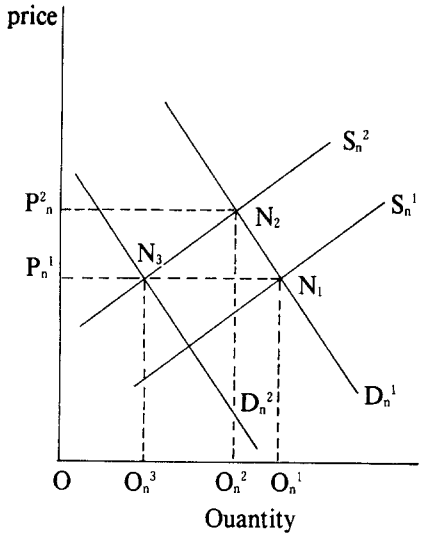
(c)

Agriculture



(d)

Rurak Nontraded Goods



demand elasticity for farm products prevents the boom in the urban manufacturing and nontraded goods sectors from causing a significant shift in the demand for agricultural products, agricultural output declines from OQ_a^1 to OQ_a^3 as a result of the boom in the urban sector as shown in panel (c) of Figure 2. The decline of agricultural output is due to the fact that the increases in rural wages increases the production costs of farming and squeezes the profitability of farming because farmers cannot shift the cost increases to consumers by raising prices. Hence, the resource movement effect dominates the spending effect. This is in contrast to the impact of the boom in the manufacturing sector on the urban non-traded goods sector where prices increase unambiguously, while the effect on output remains ambiguous depending upon the relative strength of the spending effects and the resource movement effects. Panel (b) in Figure 2 illustrates the case where the spending effect is stronger and output of the urban nontraded goods sector increases.

Unless the rural counties experiencing rapid outmigration shift their production structure to income-elastic products such as fruits, vegetables, meat and dairy products, and away from the income-inelastic items such as rice (which would shift upward the demand curve for farm output), and/or the mechanization of farming and agricultural technology improvement are rapid (which would shift the agricultural supply curve to the right), the profitability of farming will decline, and employment in agriculture will fall as a result of the boom in manufacturing. It is likely that such structural changes in farming will be extremely slow without government intervention. The current government policy of providing heavy protection and price supports for rice will discourage the switch from rice farming to other income-elastic items. It is also unlikely that agricultural technology will improve fast enough to reverse a downward trend in traditional agriculture. Because of the public good nature of agriculture technology , individual farmers will underinvest in agricultural research and development. Moreover, with the declining profitability of farming, farmers will not be able to afford the lump-sum expenditures necessary for mechanization.

Corden and Neary(1982) point out that a boom in manufactured goods necessarily causes a decline of the agricultural sector when the decline is defined as a fall in output and employment in agriculture. They agree that the decline of the agricultural sector in the sense of a decline in relative profitability need not take place if the share of labor in the value of agricultural output is smaller than that in either of the other sectors. In such

a case it is less vulnerable than other sectors to the squeeze on profits induced by the rise in wages. However, with most LDCs it is safe to assume that the share of labor in the value of agricultural output is not smaller than that in manufactured or the urban nontraded goods sector. In this case, then, the boom in manufacturing necessarily causes a decline in relative farm profitability. Moreover, this declining profitability will prevent farmers from substituting farm machinery for labor input.

This model thus concludes that rural outmigration can have a negative impact on the rural sector. Growth in manufacturing raises wages and shifts labor from the rural sector to manufacturing and urban nontraded goods sectors, causing labor migration from rural areas. Increasing rural wage increases farm costs but farmers cannot pass on higher costs to consumers because the income elasticity of demand for farm products is low, and/ or farmers in the rural area cannot raise their output prices because of competition. This reduces the profitability of agriculture and makes farm owners in the rural area losing population worse off.

A similar or even more adverse situation can be expected for the rural nontraded goods sector. Rapid outmigration will reduce demand for rural services. The rural nontraded goods sector will suffer even more than that of rural agriculture.

This analysis yields the surprising implication that rural-urban migration is not necessarily triggered by the wide wage gap between the rural agricultural sector and the urban formal (manufactured and service goods) sector, as postulated by all the previous models, but is brought about by the decrease in the wage gap between the two sectors. The increase in the rural wage rate causes the decrease in returns to factors specific to agricultural sectors and the reduction of agricultural output.

The model presented above explains why the self-employed farm family as a whole moves from rural to urban areas better than other models. The farm family movement should be triggered by the deterioration of profitability of farm operations, rather than by low rural wage rates. Since the profitability of farming is the major reason for migration, the reduction of rural population should not slow down the rural exodus as long as the agricultural output price is fixed while wage costs increase. The increase in rural wages and the difficulty in hiring farm workers, brought about by the decline of the rural population, further squeezes the profitability of farming. So, it is possible for the rural population decline to actually increase rural-urban migration of the self-employed farm

families. This is a very accurate description of what happened in many Korean rural areas. Korean farmers always complain that hired hands for farming are very expensive and difficult to be found in season. But rural-urban migration does not slow down at all. According to the 1983 Korean National Migration Survey, only 8 percent of the household heads in the farm sector are farm employees and 92 percent are farm owners.

The Cole-Sanders(1985 and 1986) model, like the Todaro model, predicts that the decrease in rural population growth slows rural-urban migration. The model presented above appears better able to explain the reality of the Third World than does the Cole-Sanders model.

The Cole-Sanders model assumes that the main cause of mass rural-urban migration in the Third World is population pressure in rural areas. However, Kelley and Williamson (1984) reject this claim. Their simulation analysis shows that had the Third World experienced the much lower population growth rates that prevailed in industrialized countries in the 1960's, then the rate of rural-urban migration would still have been very high. They argue that population pressure has been overemphasized as a source of Third World urban growth in the recent past. As noted in section 1, the Korean migration experience strongly indicates that a decline in rural population growth does not slow rural-urban migration.

When the urban formal traded goods sector expands, raising wage rates, the urban informal sector also experiences a rise in costs. However, the price to consumers can be raised, passing the increase in costs, at least partially, to consumers. If there was no shift in demand, these cost increases could be partially passed on to consumers. Thus the effect on the urban informal nontraded goods sector when the urban formal sector experiences boom conditions is less adverse than on the rural agricultural sector, which is tied to world markets and faces an inelastic income demand for its products, and is thus unable to pass on cost increases to consumers. Furthermore, the demand curve for the urban informal sector outputs may shift to the right. With the boom of the urban formal sector caused by a price increase and output expansion, the urban areas' real income and population density expand with the increasingly favorable terms of trade. This will partially spill over to increase the demand for the urban informal sector output. In addition, urban demand for the urban informal sector goods might rise as a consequence of the substitution effect away from the manufacturing and service goods produced in the

urban formal sector, which have risen in price relative to other goods such as the inferior but cheap good and services produced in the urban informal sector.

The above analysis of the urban informal sector clearly implies that the earnings in the urban informal sector must be substantially higher than the earnings in the rural agricultural sector.

Our migration model is unique in solving the paradox of Mazumdar. While the theoretical reasoning of Mazumdar (1976a and 1976b) suggests that wages in the urban informal sector are lower than in the rural sector, all of his empirical evidence pointed to the converse. The Cole-Sanders (1985) model assumes that the wage level in the urban informal sector is equal to the rural subsistence sector wage level. In their model, the wage level in the informal sector will be higher than that in the later sector only when the rapid increase of rural population depresses rural subsistence wage levels. Therefore, the Cole-Sanders model cannot satisfactorily explain the paradoxes of Mazumdar, observed in many developing countries, including Peru, Malaysia, and Korea, which did not experience rapid rural population increases during the 1960s and 1970s. Our model is the one which explains why the wage level in the urban informal sector must be substantially higher than the rural wage level.

The perspective on the uneducated migrant's job search behavior in our migration model appears to be similar to the approach taken by Todaro(1969) and Harris and Sabot (1982), but this is not the case. It is true that in both their models and ours, the uneducated migrants decide to move to the urban areas because residency in the urban areas will substantially improve the probability of finding an urban modern-sector job. However, in their models, the wage levels of the urban informal sector are significantly lower than the rural wage levels. Therefore, the movement from the rural to the urban informal sector reduces migrants' real income substantially, and if the probability of finding an urban modern-sector job is very low, their movement turns out to be a mistake. The migrant's need to find an urban modern-sector job becomes a desperate one.

On the other hand, in our model the wage levels in the urban informal sector are assumed to be substantially higher than the rural subsistence wage levels. Therefore, the movement from the latter to the former increases migrant's real income. Even if the probability of finding an urban modern sector job is very low, the movement turns out to be beneficial. Finding a modern sector job is desirable but not an absolute necessity.

In other words, it might be true that uneducated migrants come with the hope of finding a modern sector job and search for one from time to time. But even had they known that the probability of finding a modern sector job was very low, they would have moved to urban areas because of the increase in their real income with a job change from the rural subsistence sector to the urban informal sector.

Our model seems in greater accord with the real situations in the LDCs' urban labor market than the previous models of Todaro(1969), and Harris and Sabot(1982). Cole and Sanders (1985) show that the proportion of Calcutta's urban labor force relegated to the urban subsistence sector is 43 percent; for Bogota, 45 percent; for Lagos, 50 percent, and for the Federal District of Mexico City, 34 percent. It is difficult to accept the claim by the previous studies that these large populations came to urban areas under the mistaken illusion of finding a modern sector job, and then continue to pay indefinitely the extended job search costs by cutting their incomes from high rural wage with full employment to the low urban informal sector wages.

Mazumdar (1989) claims that the labor mobility from the informal sector to the formal sector is very limited because of the practice of large firms of hiring directly from rural areas and the internal labor market which implies that employers choose to fill most vacancies by internal promotion rather than outside recruitment. When one accepts his claim, it is important to emphasize that rural-urban migrants improve their real incomes by changing jobs from the rural farm sector to the urban informal sector.

Ⅳ. Monopolistic Competition in the Service Goods Market and Rural-Urban Migration

Traditional migration models are deficient because they concentrate exclusively on the urban/rural earnings differential and ignore the consumption factors underlying rural-urban migration. Without considering the consumption factor, one cannot explain why the higher-income rural residents are more likely to migrate to urban areas than those with lower income. One could argue that compared to poor migrants richer migrants are better able to afford high migration costs. But this cost factor explanation is not very convincing because the direct costs of migration are not very high, and the op-

portunity cost of moving should be proportional to the income level in rural areas. Of course, one could argue that the poor cannot afford the risk of losing a few days earnings even though the lost earnings are relatively small. But when one considers that many migrants are young and single and that most poor migrants can get a job in the urban informal sector without wasting many days, cost does not emerge as a major factor in the migration decision. Furthermore, without considering the consumption factor in the migration decision, one can not explain why rural development projects that aim to increase both on-farm and off-farm earning opportunities are not successful in slowing down the rural-urban migration. This is the case even when the off-farm job opportunities do not conflict with the farm labor demand by being only the off-season periods.

Krugman (1979) developed an extremely important rural- urban migration model which introduces an analysis of monopolistic competition and trade. He shows that if there are impediments to trade in an industry in the presence of increasing returns, there will be an incentive for workers to move to the region already having a larger population. The more populous region will offer both a higher real wage, W/P, and a greater variety of goods, inducing migration. He shows that in equilibrium, all workers will have concentrated in the region which initially had the larger labor force.

Krugman's model shows that people migrate to the city in part because of the greater variety of consumption goods, the so called "city lights," it offers. This model explains the growth of metropolitan areas by showing that in the presence of increasing returns, labor migration produces a process of agglomeration.

Krugman's model does not confine the variety of consumption goods to the service sector. But because of the following special characteristics of the service sector the "city lights" in our model are limited to the service sector.

(A) Service sectors involve natural non-traded goods. The demand for many service sectors' outputs is local. Therefore, the quantity produced is likely to be equal to the quantity consumed in the local area. There are non-natural non-traded goods caused by impediments to trade such as high transportation costs and trade barriers.

(B) The service sectors have a market structure characterized by monopolistic competition. The service industry is competitive in that there are a large number of firms, but each of them is also monopolistic because it is producing a somewhat unique product. The latter feature implies that the firms face downward-sloping demand curves.

However, if firms in the industry are seen to be making above- normal profits, additional firms will enter. By offering alternative products, these new entrants will draw off demand from existing firms, reducing their profits to normal levels. Therefore none of the firms in this industry earns any monopoly profits. Service sectors such as restaurants, movie theaters, and medical facilities fit the description of a monopolistically competitive market structure well.

(C) Since many service sectors incur a large amount of fixed costs in addition to variable costs, these sectors enjoy increasing returns to scale in production. As the firm's output increases, the average cost goes down.

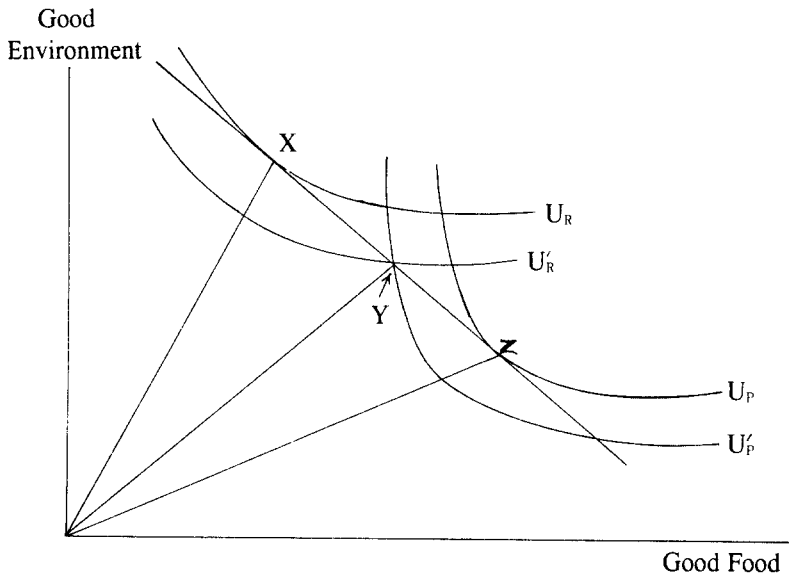
It is important to note that only service sectors or nontraded goods sectors fit the requirements of the extreme case in Krugman's migration model in which trade is not allowed but labor is completely mobile. When the trade can be conducted freely, the market size for that industry should not necessarily increase the demand for traded goods produced in the urban areas because the market for traded goods is the whole nation.

The increase in urban population due to rapid rural-urban migration, especially the population increase in primary cities such as Seoul, and a rise in per capita income in urban areas will increase the market size in the urban service sectors that have a monopolistically competitive market structure. The initial effect will be a rise in the demand facing each individual firm. This in turn will lead to market entry by new firms, pushing the demand curve facing each existing firm back until the monopoly profits have been eliminated.

Thus, an increase in market size brought by rapid rural-urban migration and/ or a rise in per capita income will lead to an increase in the number of firms and thus an expansion in the number of service goods among which consumers can choose.

Following Markusen and Melvin (1988) it can be shown why consumers gain from the rural-urban migrations in terms of increased product diversity. Consumers have different tastes. Consumers, for example, have different views as to what is the ideal restaurant for their taste and income level. Suppose that restaurants have only two characteristics: good environment and good food. Suppose that there is a trade-off between the two characteristics, such that if one wants a nicely decorated restaurant, he or she must sacrifice some quality of food served. Figure 3 shows three possible combinations

Figure 3. Good food vs. Good Environment Trade-Off



of environment and quality of food served by restaurants X, Y, and Z, each corresponding to a different type of restaurant. Suppose that all three types of restaurants could produce at the same average cost for the same volume of production, but due to scale economies the average cost rises steeply as sales fall. Assume that residents in the area consist of only two groups, the rich and the poor, and that the former have a relatively high preference for a good restaurant environment and the latter a relatively high preference for good food. Indifference curves are given by U_R and U_P in Figure 3, respectively. If an area has both X and Z, giving the rich and the poor their ideal restaurant, the volume of each restaurant will be much lower and the average cost much higher than if only a compromised type of restaurant Y was Figure 3 Good food vs. Good Environment Trade-Off available. Restaurant Y sells meals for a modest cost, but the rich are not very happy with the environment of the restaurant and the poor are not very happy with the quality of food served. These groups attain indifference curves $U_{R'}$ and $U_{P'}$ in Figure 3, respectively. Now if this area experiences massive in-migration and the population is doubled, this area could afford two restaurants, X and Z. Restaurants X and Z would serve the same number of customers as restaurant Y did before the in-migration, and consequently, restaurant meals would have the same average cost. Consumers pay the

same price for meals but attain higher indifference curves, U_R and U_P in Figure 3 since each of the rich and poor groups get their most preferred meal. Consumers gain from the in-migration to their area in terms of increased product diversity.

Consumers in urban areas gain from a larger market brought about by the rapid rural-urban migration in two ways. They have a wider range of choice for service goods because more products are available, and they pay lower prices because urban firms now produce lager output at lower average costs. These two gains from a larger market size brought by the rapid rural-urban migration represent new sources of gains from rural-urban migration above those arising from the higher earning opportunities in urban areas. This attraction of the so called "city lights" in the urban areas induces rapid rural-urban migration.

While further migration to urban areas increases the variety of services and reduces the prices of service goods in urban areas, a further rural outmigration decreases the market size of service goods in the rural areas and thus reduces the variety of service goods available. It also increases the prices of service goods in rural areas. Therefore, according to this model, rural-urban migration will not slow even though rural income increases and the gap between urban and rural earnings narrow. This is because the enjoyment of scale economies in service sectors is more heavily influenced by the number of consumers than by the increase in per capita income. For example, the demand for barber service will depend more on the size of the population in that area than on the per capita income of the local population. Thus an increase in the rural per capita income alone cannot stop the deterioration of rural service sectors. When one also considers that the rich value the variety of consumption more highly than the poor it is clear that increases in rural income will not slow rural-urban migration unless the availability of services to rural areas is substantially improved.

The above analysis implies that a rural development project which helps the agricultural sector does not necessarily slow rural-urban migration. For example, the mechanization of farming will increase the productivity of farming and thus farmers' incomes. However, unless the availability of the variety of consumption goods, particularly services goods, has been improved to the rural residents, the slowdown in rural-urban migration by the improvement of the profitability of farming might be offset largely by the stimulating effect of the increased income on rural-urban migration. The increase in in-

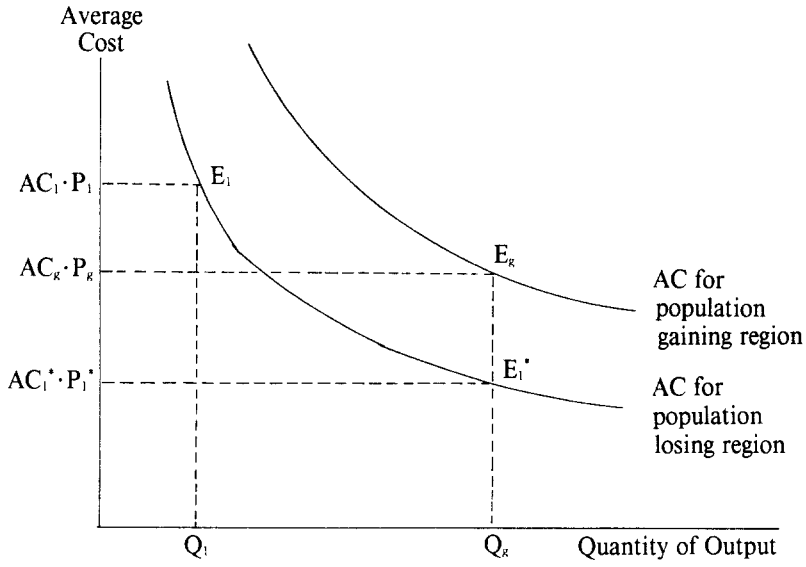
come level might intensify the desire for the variety of consumer goods at the lower price. In other words, the demand for a variety of consumer goods increases with income.

The most important contribution of Krugman's migration model is his explanation that the process of migration in the presence of increasing returns can lead to the wrong outcome because the region that ends up with the population depends on the initial distribution of the population. Consider a case in which both fixed and variable labor costs are higher in one region than in another. Then it is clearly desirable that labor should move to the region having the lower costs. But if the inferior region starts with a large enough share of the population, the migration stream might be in the wrong direction.

This situation is illustrated in Figure 4. Suppose that the average cost for the population-gaining region is always higher than that for the population-losing region for the same level of output. Suppose also that the population-gaining region initially had a larger population than the population-losing region.

Because of scale economies at the large quantity of output, Q_g, the average cost for the population-gaining region, AC_g is lower than that for the population-losing region,

Figure 4. The Effect of Migration on Average Costs



AC_l which produces at a lower level of output, Q_l. Since average cost equals output price in a monopolistic competition market structure, labor migration to the population-gaining region will continue because of the lower price charged for its output. However, from the societal point of view, this labor movement is in the wrong direction. This is because if all the labor moved in the opposite direction, the average cost and price could be lowered to AC_l* and P_l*, which are lower than $AC_g=P_g$. Therefore, when there are economies of scale in production of the service goods, rural-urban migration, particularly migration concentrated to a primary city, cannot be viewed as desirable to society in efficiency terms. There is a strong case for government intervention to slow rural-urban migration and to diversify the destinations of rural-urban migration to urban areas other than a primate city such as Seoul. The case of divergence between private and societal interests in rural-urban migration is particularly strong when one considers the effect of concentrated urbanization on the prices of real estate in the primate city. Concentrated urbanization rapidly increases the price of real estate in urban ares. Therefore, there are strong grounds for arguing that the fixed-costs of service production are substantially higher in Seoul than in other urban areas. But the average cost reduction due to the scale of service production in Seoul is so large that it offsets the fixed-cost disadvantage. On the other hand, the average cost increase due to the small scale of service production in small urban areas is so large that it eliminates the fixed-cost advantage. Therefore, according to private interests it is natural to continue to move from rural areas to Seoul even though the movements to the medium or small- size urban areas are more desirable from society's point of view. This is a clear case of the market failure in concentrated urbanization resulting from the divergence between private and social interests.

V. Critigue on Krugman's Gravity Model With Eternal City Growth

Glaeser et al. (1992) examined the predictions of the various theories of knowledge spillovers and growth using a new data set on geographic concentration and competition of industries within the largest 170 U.S. cities. It focuses on the largest industries because it aims to test the externalities as sources of permanent city growth. It provided

three important empirical observations which are related to the rural-urban migration. The first one is that industries[4] grow at a slower rate in cities where they are overrepresented. The second one is that industries grow at a faster rate when the rest of the city is less specialized. The last is that industries grow faster in cities where firms in those industries are smaller than the size of national average firms in the industry in terms of their employment. Based upon these observations, it concludes that the most important knowledge transfers come from outside the core industry (cross-fertilization), which is consistent with Jacob's argument 'Learning from others' (1984). If this is the case, the variety and diversity of geographically proximate industries and geographical specialization promote innovation and growth. Jacob took an example of the brassiere industry, which grew out of dress makers' innovations rather than the lingerie industry. Jacob's cross-fertilization empirically proved to be very important in explaining city growth.

Relating increasing return to the labor migration, Krugman (1979) argued that if there are impediments to trade (such as tariff and transportation cost) and labor is mobile, there would be an incentive for workers to move to the region which already has the larger labor force. In his paper (1979), the combined market would allow both a greater variety of goods and a greater scale of production. The same gains could be obtained without trade, however, if the population of one region migrate to the other. In his model, trade and growth in the labor force are essentially equivalent.

As discussed in the previous section, Krugman's model (1979) casts many important implications which can be applied to the migration from rural sector to urban non-traded sector even if he did not formally intend to explain such migration. The non-traded goods sector is generally considered to be the informal sector which consists of many small firms with little or no scope for returns to scale. However, the urban modern non-traded goods sector such as hospitals, educational facilities, movie theaters and restaurants are subject to the increasing returns to scale of the Krugman's sort because the large amount of fixed cost is required to initiate such businesses. Therefore, the migration with three gravity factors of Krugman (increasing returns to scale, market imped-

4) The industries the consider are the six largest industries in the five largest cities and the five smallest cities in 1956 and 1987, Which may include both tradable and non-tradable goods. As for non-tradable goods, it includes business services, special trade contractors, food stores and insurance.

iments, mobile labor) is appropriate to explain the educated migration from the rural sector to the urban non-traded formal sector.

However, this paper stands against Krugman's eternal urban growth. It is conjectured that the rural-urban migration towards the urban sector may be weakened and eventually dwindles due to the cross-devastation within urban industries. The cross-devastation takes place because the urban industry cells would collide at the fully matured stage where the growth of one industry cell must sacrifice the other industry cell. In this case, the procurement of space necessary for the eternal growth is infeasible and the collisions of the cells are becoming imminent. In the process, the information to be learned from others obviously becomes boring and the growth of one industry cell threatens the survival of the other industry.

In Krugman's (1979) model, the city is allowed to grow eternally because, only consumption variety is considered as a key factor of growth but the possibility of cross devastation is never seriously considered. In comparison with the first model presented in this paper explaining why the rural-urban migration continues even if the wage gap in the rural and urban sector vanishes, the model in this section discusses whether such migration continues in the future. In this paper, we theoretically incorporate a learning process of cross-fertilization and a process of cross-devastation among industrial cells. It is conjectured that the growth of the urban sector is continued at least at the first stage because both the cross-fertilization and consumption variety grow, as the urban sector grows. However, once the growth of one industries requires the sacrifice of the other industries at the later stage, the industry cells bump into each other and the cross-devastation starts to work which prevents the city from growing permanently. The permanent geographical urban expansion may ease the conflicts among the industry cells. However, the following examples demonstrate why this is unlikely.

> *Bombay is one of India's economic center. Its non-traded formal sector, especially financial sector, has been well developed. However, it is in an awkward shape. The city is built on a hook of land protruding into the Arbian Sea and its commercial district, Nariman Point, lies on reclaimed land at the southern tip. There is not much farther, or higher, that is cramped skyscrapers can go.*
>
> *Foreigners are fighting to get into Bombay, eager to take part in an expected*

Indian boom. The state government of Maharashtra says it has had $30 billion-worth of investment proposed in the past 15 months, much of it for Bombay. But it fears that shortage of space may stifle Bombay's boom.

Prices of commercial property in Bombay have risen by around 50% since the beginning of the year. Space-seekers have been driven to the suburbs, inconveniently far from the business district, but even there prices are rocketing.
(The Economist July 30th-August 5th, 1994)

In the above example, there is no doubt that the existence of textile mills nourished the prosperity of the Nariman point as a commercial sector in the first stage. However, as the Nariman point grew fully and the soaring demand from the side of Arbian Sea demands the Nariman point to grow more, the further growth of Nariman point requires the sacrifice of the old textile mills.

An empirical evidence of cross devastation within an industry has been reported by the Korean Research Institute of Human Settlements which uses the Korean manufacturing data, even if it did not intend to analyze the existence of cross-devastation. They examined the relationship between industrial density (an industrial employment divided by the total employment in a given region) and worker's productivity (the per worker output). They divide Korea into 9 different regions including Seoul, its metropolitan area, mid and small sized cities. Of course, Seoul and its Metropolitan area are highest in terms of the industrial density and the industrial cells are more likely to collide with each other. In many industries of those two regions, the negative effect of the industrial density on worker's productivity was observed while the positive effect was not. On the other hand, a prominent positive effect was observed in mid and small sized cities where the industrial density is relatively low and the cells are less likely to collide. This empirical findings demonstrate that the cross-fertilization is efficient at least in the mid and small sized cities but the cross devastation becomes effective once it grows fully.

The major goals of our analysis in this last half of our paper are three. First, we will analyze the reasoning why the cross-fertilization is effective in the mid and small cities and why the cross devastation prevails in Seoul and its Metropolitan area. Second, we will analyze why the overrepresentation of one industrial cell hurts the growth rate of the other cells. Third, we will examine the potential impact of the urban expansion projects

in the large cities of Korea, which are recently proposed by the Korean government.

Ⅵ. An Alternative Model of The Growth of a Primate City

Suppose the total costs of a firm take the constant returns to scale form with respect to the output X.

$$TC = c(n)X \quad \cdots\cdots (6)$$

where c(n) is the firm's marginal cost, n is the number of firms in the industry and X is the level of output produced by each firm. We also impose a capacity constraint :

$$X < \Delta \quad \cdots\cdots (7)$$

That is, per firm output cannot be greater than Δ. This will exclude the case where the per firm output goes to the infinity under the CRS technology. In (6), two aspects of the functional form should be noted. The peculiar feature of (6) is that the marginal cost endogenously depends upon n. It is assumed that c(n) takes a quadratic form with respect to n ;

$$c(n) = \alpha(g)[n-\eta(g)]^2 + F \quad \cdots\cdots (8)$$

where g is the growth rate of the other neighborhood industries, F is a constant value. η is the number of firm which a given size of industry cell can accommodate as a maximum. If the number of firm n becomes bigger than η, then the expansion of the industry cell should require the contraction of other industrial cells.

The mechanism of (8) needs to be explained carefully. As Jacob argued, the original idea of innovation is inseminated by the other neighborhood industrial cells (cross-fertilization). The degree of originality or freshness of the idea learned from the other industry is determined by the growth of the other industrial cells, which also determines the degree of cross- fertilization. It is assumed that the degree of cross- fertilization increas-

es with the growth rate of other industrial cells. In (8), $\alpha(g)$ measures the degree of cross-fertilization and $\alpha(g)$ increases with the growth rate of the other neighboring cells. In this case, there is a certain limitation in the number of firms for each industrial cell to be able to accommodate. Of course, the contraction of other industrial cell makes their information boring, which weakens the degree of cross- fertilization.

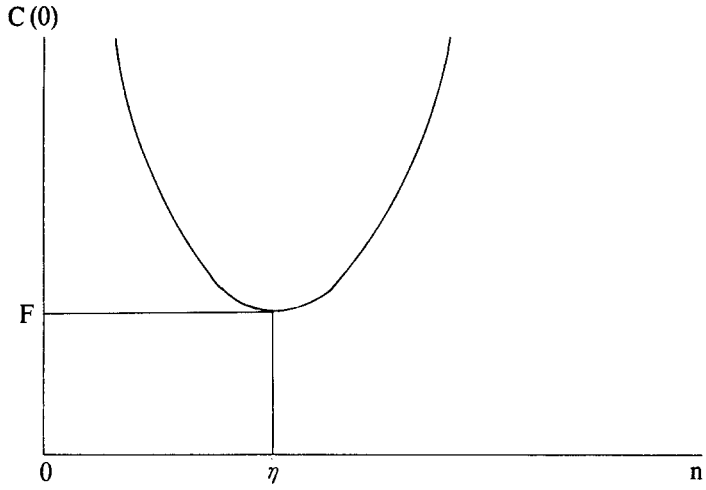
It is also assumed that $\eta(g)$ decreases with g. That is, as the other neighborhood industrial cells grows, the capacity that the industrial cell is able to accommodate shrinks. Once the industrial cells reach the point where they bump with each other, the higher growth rate of the neighbor cells (i.e., the higher g) requires the incumbent cell η to shrink. Therefore, there is a trade-off between getting a more fresh information and the space of the industrial cells.

The insemination of new idea learned from the other cells requires an internal competition within the industry to have the idea incorporated and well developed. We assume that such cost of the internal digestion decreases with the number of firms within the industrial cell. That is, in the industry with more firms, a firm has a higher chance to expose themselves to the new innovative information and is also likely to compete more intensively for the new ideas. In (8), if the number of firms n is less than η, the larger the number of firms is, the more rapidly knowledge learned from others is diffused within the cells.

In association with (8), it is interesting to note that the cell grows and withers more rapidly as the growth rate of the neighborhood cells is higher. The higher growth of the other cells provides a better information which results in a higher degree of cross-fertilization at the first stage. However, as the number of inside firms increases, the industrial cell bump with the outside cells in a shorter time.

It should be emphasized that the specification of (8) is unique in comparison with the other literatures in the industrial organization. Many studies in the industrial organization suggest that a greater number of firms make the monopolistic competition more intense and a higher level of effort to survive induces firms to innovate more frequently and eventually reduce the average cost. In this scenario, the innovation is created purely from the internal struggle. However, in this study, the idea of innovation is inseminated from the outside industries and diffuses internally. Therefore, the sources of innovation are sharply different with each other. On the other hand, compared with the studies

Figure 5.

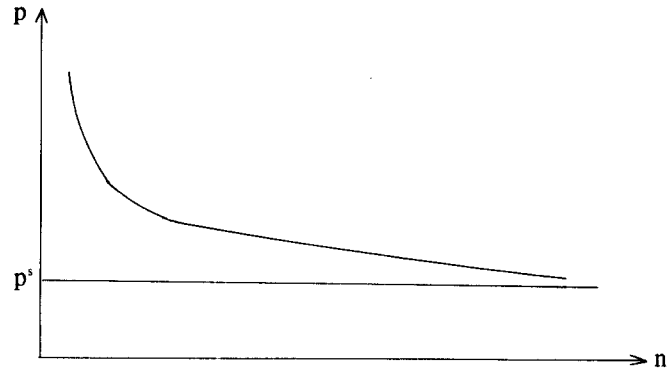


which support 'the more struggles internally, the more innovation' and the average cost falls with the number of firms, the average cost starts to go up once the industrial cells are crowded and bump with each other. Also the specification of (8) is indirectly supported by the findings of Glaeser et al., which suggest that the industry cell grows faster when it is relatively small and grows slower when it is overrepresented. Furthermore, it is supported by the study made by the Korea Research Institute of Human Settlements as explained.

Figure 5 demonstrates equation (8). In Figure 5, the cross- fertilization looks to be effective as the industries grow. However, once it grows up to the full size η, the internal devastation starts to work and the average cost goes up. The speed to reach the internal devastation depends upon the parametric value α which is also determined by the growth rate of the neighborhood cells. With a greater value of α, the cell grows fully, collides and the cross devastation is imminent in earlier time.

We make the assumption that the cost function is identical for all firms. Under the CRS, if the price is greater than the average cost or the marginal cost, the quantity supplied to the market may go to infinity. However, with (7), such case is precluded. If the price is equal to the average cost or the marginal cost, the equilibrium quantity is indeterminate. Of course if the price is less than the average cost and the Figure 5 marginal cost, the market for this industrial product does not exist.

Figure 6.



Meanwhile, the price the typical firm charges also depends on the number of firms in the industry. In general, we would expect that the more firms there are, the more intense the competition will be among them and hence lower the price. We assume the relationship between the charged price and the number of firms as (9).

$$p = 1/(\gamma n) + p^* \quad \cdots\cdots (9)$$

where γ is the parameter and p* is the level of price under the perfect competition. Therefore, the price charged by the firms decreases with the number of firms, which is demonstrated in Figure 6. Parameter γ determines the degree of price competition. As γ increases, the price falls rapidly with the number of firms. Two schedule (8) and (9) may intersect at one point or two. The following two cases include all the meaningful equilibria.

(A) Equilibrium of Metropolitan Area

Figure 7 demonstrates this case. There are two kinds of equilibria. At A, the price happens to be equal to the average cost. Therefore, more firms appear in this industry cell.

However, this equilibrium is unstable in the sense that the entrance of one more firm more efficiently fertilizes the insemination of the new ideas learned from the other industry and thereby makes the average cost smaller than the price under the competition with one more firm. Therefore, more firms will appear and this industry cell grows.

Figure 7.

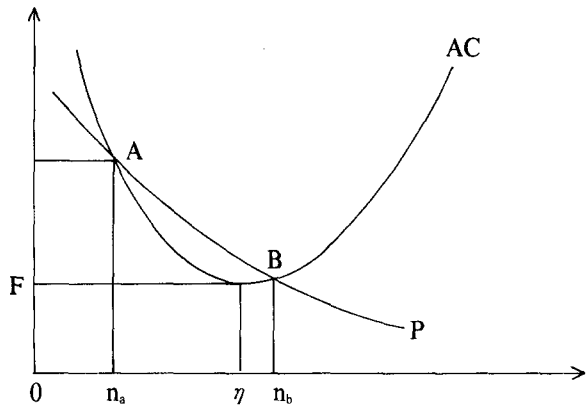
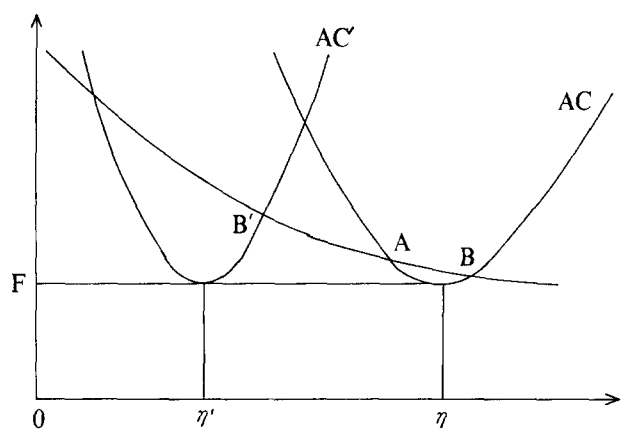


Figure 8,



However, the point B is the stable equilibrium where the cross devastation dominates and the industrial cell bump with each other. That is, at B the entrance of one more firm makes the price competition more intense and makes the industrial cell more overcrowded, which is appropriate to explain the equilibrium in the large city. For example, Seoul is presumed to stay at the sort of equilibrium B where the cross devastation is working and the industrial cells are overcrowded. This observation is consistent with the results obtained by the Korea Research Institute for Human Settlements.

Figure 9.

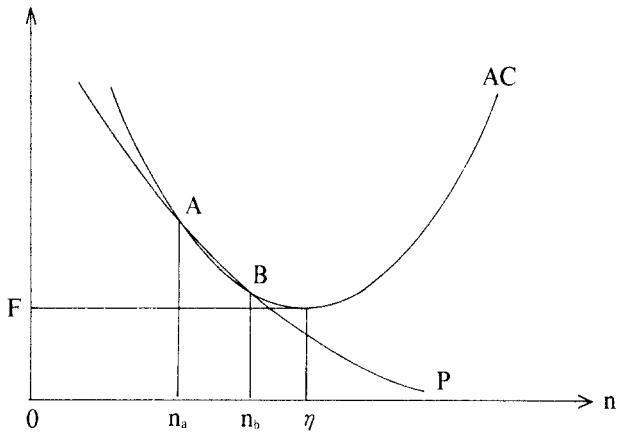
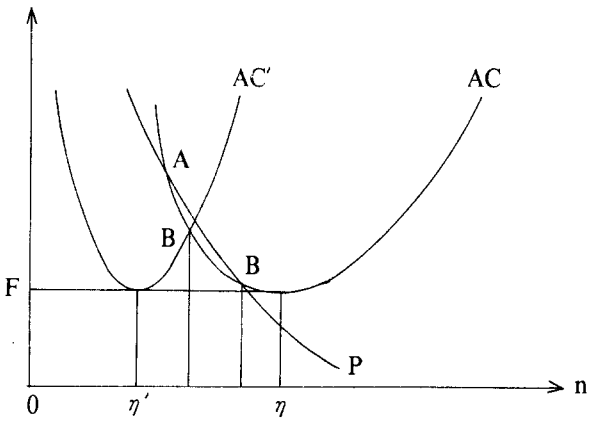


Figure 10.



Now, it is worthwhile to investigate how the growth rate of the other industrial cells affect the equilibrium. Figure 8 demonstrates this. As the growth rate of other industrial cell, g, increases, maximum capacity the industry can accommodate without a bump into one another, η shrinks.

Also, the growth rate of the other cell makes the life-cycle of the industrial cell shorter. In figure 8, the slope of AC′ changes more rapidly than the slope of AC as the value of α increases.

Previously the equilibrium is obtained at B. However, as the industrial cell shrinks, the degree of cross devastation becomes more intense, the price becomes smaller than the average cost and some firms start to leave. The new equilibrium is obtained at B′ where the price level is higher than at B. If the initial equilibrium was at A, the phase of cross-fertilization would turn into the cross devastation at B'. This observation is also consistent with the results obtained by Glaeser (1992) et al. That is, the equilibrium point can explain why the overrepresentation of one industry cell may hurt the growth of the other industrial cells.

(B) Equilibrium of Small and Mid-Sized City

Figure 9 is the case where the industrial cell is not overcrowded even at the steady state. Cross-fertilization is effective and the industrial cells never collide with each other. Point B in Figure 9 demonstrates such equilibrium in small and mid-sized cities. Even at the equilibrium, there is a space for the city to grow more. This can also explain why the cross-fertilization is effective in the small and mid-sized cities which is the result of KRIHS.

Now suppose that other industry cells grow fast and makes the cells bump into each other in the city. This case is demonstrated in Figure 10. In Figure 10, as the other industrial cells are overrepresented, the phase of cross-fertilization at B becomes the cross-devastation at B', which is consistent with the observation made by Glaeser et al. (1992).

Ⅶ. Summary and Policy Implications

In order to resolve the shortcomings of previous rural-urban migration models including Todaro's model, an alternative rural- urban migration model for LDCs was developed. In the new model, theories of international trade were introduced to the migration issue ; the 'Dutch Disease' in the four sector specific -factor trade model suggested by Corden and Neary (1982) and Caves and Jones(1985), and Krugman's theory of monopolistic competition and trade developed in Krugman (1979) and Krugman and Obstfeld (1988).

The rural-urban migration model presented here is based on the contention that the

decline of the profitability of farming is the most important cause of rapid rural-urban migration in developing countries. The profitability of farming declines because rural wage rates increase as a result of an increase in urban wage rates in the booming urban formal (manufacturing and service goods) sector, and because farmers cannot shift the cost increases to the consumers through higher output prices. The latter is because the world prices of farm products are fixed globally, and income elasticities of demand for farm products are very low. Rural-urban migration is not necessarily triggered solely by the wide urban-rural wage gap as postulated by all the previous migration models including the Todaro model, but is also brought about by the decreasing wage gap between two areas.

This approach better explains why the self-employed farm family as a whole moves from rural to urban areas. Farm family movement should be triggered by the deterioration of profitability of farm operations rather than by low rural wage rates. Only 8 percent of heads of households in farm sector are farm employees and 92 percent are farm owners in the Korean data.

Since the profitability of farming is the major reason for migration, the decline of rural population should not slow the rural exodus as long as agricultural output price is fixed while the wage costs increase. The increase of rural wages and the difficulty of hiring farm workers brought about by the decline in the rural population further squeeze the profitability of farming. So, it is possible for the decline in rural population to actually increase rural-urban migration of self-employed farm families. This contradicts the prediction by previous models such as Cole and Sanders'(1985) which assumes that the main cause of mass rural-urban migration in the Third World is population pressure in rural areas. This is a very accurate description of what has happened in many Korean rural areas. For example, during the 1966-85 period, the Korean rural population declined by 28 percent, from 19.4 million to 14 million. But Korean rural- urban migration does not show any tendency to slow. The proportion of the rural population migrating annually to urban areas has increased from about 1.9 percent(an average of 360,000 rural residents) during 1965-75 to about 2.8-3.0 percent(an average of 500,000) during 1975-85.

Unlike the rural agricultural sector, the urban informal sectors experience much less adverse effect when the wage rate increases due to a boom in the urban formal sector.

Since the informal sector services purely local markets, the price to consumers can be raised passing the increase of costs partially to the consumers. Furthermore, the boom in the urban formal sector will partially spill over to increased demand for the urban informal sector outputs. Therefore, the earnings in the urban informal sectors must be substantially higher than the earnings in the rural agricultural sector.

The traditional rural-urban migration models including that of Todaro(1969) are deficient because they concentrate exclusively on the urban/rural wage differential and pay no attention to the consumption motives behind rural-urban migration. They underestimate the attractiveness of cities resulting from "city lights" of consumer agglomeration economies, i.e., product varieties in nontraded goods(services). Consumers in urban areas gain from a larger market brought about by the rapid rural-urban migration in two ways: 1)they have a wider range of choices and 2)they pay lower prices for service goods because urban firms produce larger output at lower average costs.

This insight into the consumption motive of rural-urban migration provides another reason why the rural development project, which , for example, help the mechanization of farming, increases the productivity of farming, and thus increases farm incomes, does not necessarily slow down rural-urban migration. The enjoyment of scale economies in service sectors is more heavily influenced by the number of consumers than by the increase in per capita income. Furthermore, the increase in income levels might intensify the desire for the variety of consumer goods at lower price. Therefore, the slowing of rural- urban migration by improvement in the profitability of farming could be offset largely by the stimulating effect of the increased income on rural-urban migration.

The case of divergence between private and societal interests in rural-urban migration is particularly strong when the effect of the rapid urbanization on the prices of real estate in primate cities are considered. The urbanization heavily concentrated in primary cities increases the prices of real estate in the urban areas very rapidly. Therefore, there are strong grounds for arguing that the fixed costs of service production are substantially higher in, for example, Seoul than in other urban areas. But the average cost reduction due to the scale of service production in Seoul is so large that it offsets the fixed cost disadvantage. On the other hand, the average cost increase due to the small scale of service production in rural or smaller urban areas is so large that it offsets the fixed cost advantage. Therefore, according to private interests, it is natural to continue to move

from rural areas to Seoul even though the movement to other medium or small size urban areas is more desirable from society's point of view. There seems to be a clear case for the market failure in the urbanization heavily concentrated in primate cities resulting from the divergency between private and societal interests.

Krugman's model casts very important implications on the migration from rural sector to urban non-traded sector. However, as far as the manufacturing industry is concerned, this paper stands against Krugman's eternal urban growth model. It is conjectured that the rural migration towards the urban manufacturing sector is likely to be weakened and eventually dwindle due to the cross-devastation within urban industries. The cross-devastation takes place because the urban industry cells would be collide at the fully matured stage where the growth of one industry cell must sacrifice the other industry cell. In this case, the procurement of space necessary for the eternal growth is infeasible and the collisions of the cells are becoming imminent. In the process, the information to be learned from other manufacturing industries obviously becomes boring and the growth of one industry cell threatens the survival of the other industry. Based upon this theoretical conjecture, we concludes that there is not a strong case for the government's intervention in the rural-urban migration as well as in the growth of the primate city, such as Seoul. However, unlike other previous claims, such as Kim and Suh (1994), that government's intervention in retarding the city growth in the primate city is ineffective, we argue that since the size of the primate city will naturally stop growing unlimitedly, government intervention is unnecessary.

As for the rural-urban migration, it is forcasted that the currently on-going rural-urban migration will stop in the future especially in the primate cities.

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