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Role of rural-urban migration in explaining economic growth: Evidence from the least developed countries

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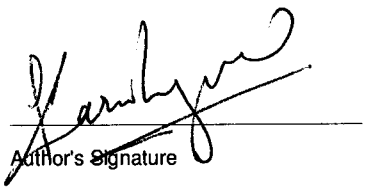

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ROLE OF RURAL-URBAN MIGRATION IN EXPLAINING ECONOMIC GROWTH

EVIDENCE FROM THE LEAST DEVELOPED COUNTRIES

(TITLE)

BY

KARUN GYAWALI

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ABSTRACT

Rural-urban migration plays an important role in affecting population and labor composition in a country. In the least developed countries, population moving from a relatively low productive, rural, agricultural sector to a more productive, urban sector can affect overall economic productivity.

This paper investigates the relationship between rural-urban migration and economic growth in least developed counties. Using Dao's 2002 paper on determinants of internal migration, the modified model for migration is formulated in this study. The result from the modified migration model is then used in the GDP growth model to study the effect of rural-urban migration on GDP growth.

The first section of this study analyzes the Dao's 2000 model using panel data from least developed countries from 1960-2010 (various years). Results from Dao's model improved substantially when panel data was used. The modified migration model includes an internal armed conflict variable, an economic structural change variable, an agricultural value added variable, and a density variable. All variables are significant in explaining migration growth rate in least developed countries.

The second section investigates the effect of rural-urban migration on economic growth. The second model includes the following variables: gross fixed capital formation, education, trade openness, rural-urban migration, and polity variables. Except for gross fixed capital formation and openness growth rate, all other variables are highly significant in explaining GDP growth. The result supports the hypothesis that rural-urban migration is important in explaining economic growth in the least developed countries.

Dedicated to my Father

Prem Nidhi Gyawali

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Chapter 1

Introduction

Economic growth is the process that involves sustained qualitative and quantitative improvement of a society. The transformation of the rural, agrarian society to the complex urban and industrial economy is one of the fundamental characteristics of a developing nation. Labor and land intensive agricultural production tends to be situated in the land abundant rural areas whereas industrial production tends to require relatively less land and thus is concentrated in an urban area or its periphery. As a country develops, fundamentally changing the structure of its economic sector (agricultural to industrial), we can expect substantial migration from rural to urban areas. With cities growing and urban population growing at an ever-increasing rate, it is interesting to examine the effect of rural to urban migration on economic growth. The World Bank Urban and Local Government Strategy[1] published in November 2009 states that, "for the first time in history, more than half the world's population live in cities. Over 90 percent of urban growth is occurring in the developing world, adding an estimated 70 million new residents to the urban areas each year. During the next two decades, the urban population of the world's two poorest regions—South Asia and Sub-Saharan Africa—is expected to double." Given the pace of urbanization, it is necessary to devise a practical solution to the problem of rural-urban migration and growing urban unemployment.

Rural-urban migration and urban unemployment have been an interest of many researchers in the area of development economics. Migration allows the movement of labor, which is a critical factor of production responsible for the economic growth. It can

[1] http://go.worldbank.org/VUQXUX66K0

be either voluntary (where people move in search of economic and social betterment) or forced (where natural disaster, conflict, oppression or prosecution forces people to migrate). Many factors can cause migration. However, in development economics literature, we consider migration to be a phenomenon where an economic agent in search of better economic prospect chooses to move from one place to another. Lynn (2003) states that people in search of brighter economic prospects move from a rural to an urban area. This human desire for betterment of economic state leads to migration (Basu, 2000). Migration is considered particularly desirable as it is a movement of the economic factor of production (labor) from areas where marginal productivity is low (due to diminishing marginal return to labor in the agricultural sector) to the area where marginal productivity is high and rapidly increasing (due to technological advancement). However, Dao (2002) argues that the rates of rural-urban migration have consistently exceeded the rates of urban job creation in the developing world. This not only has contributed to higher unemployment rates but also contributed to higher social cost of housing and social services, and has increased crime, pollution, and congestion.

The classical theory of migration by Lewis (1955) sees rural-urban migration as an equilibrium mechanism for surplus labor. In this model, labor is withdrawn from the rural sector which has almost zero marginal productivity to the modern sector that is approaching full employment. The likely outcomes of this labor surplus model are output growth, trend acceleration, and rising migration (Ma and Lian, 2011). On the other hand, Michael Todaro (1969) and later Harris and Todaro (1970) came up with a theory of migration which argues that the migration takes place partly due to the difference in expected wage in urban areas and existing wage in the rural, agricultural sector.

Therefore, any attempt to reduce urban unemployment through urban job expansion only exacerbates the problem. For example, Todaro (1969) reports the case of Kenyan government which aimed to reduce urban unemployment by entering in pact with private and public sector to increase employment by 15 percent saw an effect that was opposite of what was expected. The increased job opportunity in urban sector made rural to urban migration more appealing thereby aggravating the urban unemployment problem. Meier and Rauch (2000) state that the one difference between the Lewis and Harris-Todaro models is that agricultural output must fall in the Harris-Todaro model but not for the Lewis model. Dao (2002) uses the Harris-Todaro model where a decrease in output in the agricultural sector puts pressure on rural worker to move to more productive sector of the economy thereby causing rural-urban migration.

With the rapidly growing pace of urbanization in developing countries that are growing rapidly, it is necessary to re-examine the effect of the rural-urban migration on economic growth. This thesis aims to examine the relationship that may exist between rural-urban migration and economic growth. This research consists of three steps:

1. Firstly, I will extend the study done by Dao (2002) by using panel data from 1960-2010 (various years). I will use U.N. classification of the least developed countries instead of the Low Income Countries used by Dao[2].
2. Secondly, I will expand the model by including the *conflict* (armed civil conflict), and *economic structural change* variables. I will also use *agricultural value added per capita* instead of *agricultural value added per worker*[3]. The *Education* and *road* variables will be excluded from the modified model to avoid

[2] Reasoning for using LDC over LIC will be given in a subsequent chapter.
[3] Rationale for using agricultural value added per capita instead of agricultural value added per worker will be given in a subsequent chapter.

endogeneity problem in the second stage regression that seeks to explain economic growth. The dummy variable *Colony* will also be excluded as almost all countries in the dataset were colonized. Reasoning for inclusion and removal of the various variables will be explained in subsequent chapters.

3. Thirdly, I will use the predicted value of migration as the instrumented variable to explain economic growth in the linear growth model.

The structure of this study is as follows. Chapter 2 consists of a review of the literature concerning various studies done in rural-urban migration, urbanization, and economic development. The hypothesis will also be discussed in this chapter. Chapter 3 will include introduction to the classical rural-urban migration model, the framework for the current model, rationale for including variables, and description of the data and data sources. Chapter 4 will include result of the regression and analysis of the result. Final chapter will include the summary of the study, conclusion, and suggestion for the further studies. In this paper, I will seek to find how influential the rural to urban migration is in explaining economic growth. We hope the finding from this study will be helpful in providing policy recommendations to less developed countries with respect to rural and urban development programs.

Chapter 2

Review of the Literature

In this chapter, I will provide an overview of studies on rural-urban migration and concerns that are relevant to this area of study. I will also investigate the effect of rural-urban migration on economic growth.

2.1: Background

A majority of the literature deals with rural-urban migration and unemployment separately; however, the link between these two factors and economic growth has not been seriously studied. One of the pioneers of the migration study, Lee (1966) divides factors causing migration into two distinct groups: Push factors, and Pull factors. Push factors are those factors that drive people away from their existing place of residence due to reasons such as wars, lack of economic opportunity, lack of political or religious freedom, pollution, and discrimination. Pull factors, on the other hand, are those that attract people to a new place due to reasons such as job opportunities, better living conditions, political and religious freedom, security, and family links. The migration literature provides with the too general cause of migration meaning, reasons for migration is such as political, religious, and social reasons, are numerous. However, one cause that is of interest to economists is the inherent desire for the betterment of one's economic state (Basu, 2000).

Using the difference in rural-urban wages or the difference in rural-urban productivity, economists have attempted to construct a model of rural-urban migration to explain the migration decision of labor and its effect on the economy. The Lewis (1954) classical structural-change model assumes a dual economy; an overpopulated rural

subsistence sector that has zero marginal productivity and a high-productivity modern urban, industrial sector. The labor from the rural sector can be transferred to the urban sector thereby increasing total output. Todaro (1969), however, argued that the labor movement from rural to urban areas is due to expected wage differential rather than real wage differential. Several attempts to curb urban unemployment by creating more jobs (as observed by Torado, 1969) have had an opposite effect. Therefore, it is essential to construct realistic policy that is based on a valid hypothesis of migration (Basu, 2000).

2.2: Review of the Literature

The shift in population from rural to urban areas usually accompanies the rapid population growth. The growth of the urban population is largely accounted for by the process of rural-urban migration (as opposed to the natural rate of increase in birth over deaths) as presented by the Harris-Todaro model. The Harris-Todaro model (Todaro, 1969, Harris and Todaro, 1970) has been a foundation for the rural-urban migration framework. It uses economic motivation of an individual to explain and analyze rural-urban migration and unemployment issues in less developed countries. The Harris-Todaro model assumes that the migration decision of an individual is based on expected income differential rather than actual wage differential. It states that the high urban unemployment can be explained as the difference in expected urban income and expected rural income. Primarily rural sector employment is in the agricultural sector (no unemployment in rural agricultural sector is assumed). The equilibrium is reached when expected urban income equals the value of the marginal product of an agricultural worker. At equilibrium, expected income in both rural and urban sectors are the same therefore, rural to urban migration will be zero. The Harris-Todaro model infers that if

the workers have perfect information regarding rural and urban income and the probability of getting employed, workers will make the income-maximizing decision (even if rural to urban migration exceeds the rate at which urban jobs are created or causes overcrowding in an urban area).

Cole and Sanders (1985) argue that although the Todaro model is consistent with the data, the theory is inappropriate. They argue that the Todaro model is a unidirectional occurrence while migration is a dual phenomenon. They argue that in the Todaro model, urban unemployment problem is exacerbated. This happens when creation of work in the Urban/ Modern sector will increase the probability of employment there which in turn increases migration. Solution is to be found in rural areas by creating programs for rural development and taking incentives away for rural-urban migration. Cole and Sanders, however, argue that migration itself improves the overall productivity of the economy. This enhances the welfare of both those who migrate to the urban subsistence sector and those who remain in the rural subsistence sector.

Gupta (1993), using a model similar to that of Harris-Todaro, found that the open urban unemployment still exists in migration equilibrium despite the existence of the informal sector. The economy in the model is considered an internationally closed dual economy consisting of an urban sector and a rural sector. This model explains simultaneous existence of the informal sector and open unemployment in the urban areas. Gupta shows that a rural development policy cannot mitigate the problem of rising unemployment in the urban sector resulting from rural-urban migration. An increase in a wage or price subsidy to the urban sector lowers the urban unemployment level (which is opposite to the result in the Harris-Todaro model). Here, the author assumes that the

government can effectively control the availability of food in the urban sector. Gupta states,

> "A subsidy to urban formal sector employment raises the demand for labor. The subsidy does not affect availability of food hence the urban labor force. So the urban unemployment is reduced."

Following Gupta (1993), Chaudhuri (2000) develops a theoretical model to show the simultaneous existence of an urban informal sector and open unemployment in the urban sector. As aggregate demand plays a crucial role in determining output and employment in each of three sectors (formal, informal and rural) of the economy, the role of aggregate demand is not ignored in his paper. Therefore, the policy conclusion is different from that of Gupta. Chaudhuri (2000) shows that the solution to the urban open unemployment problem lies in the rural sector instead of in the urban sector. A price subsidy or a wage subsidy policy to the rural sector raises aggregate income of all workers in the economy increasing the demand for all three sectors. Export promotional scheme in manufacturing industry, an example of a demand management policy, raises the level of employment in each of three sectors of the economy. Thus, the urban unemployment level falls through the export promotional scheme. On the other hand, an increase in the capital subsidy to the urban sector increases aggregate income of the workers and leads to an increase in the employment levels in both the rural sector and the urban formal sector. This policy, however, raises the informal sector wage rate and lowers the product price, causing the employment level in the informal sector to fall. Therefore, the net effect of this policy is unknown on urban employment.

Zenou (2011), using an efficiency wage model, characterizes the steady-state rural-urban migration equilibrium. He then investigates the aggregate supply side and aggregate demand side policy. On the supply side policy, the government reduces the level of unemployment benefits, which is paid to the unemployed workers in the city. The second policy consists in subsidizing urban jobs to stimulate employment. Both policies seek to subsidize urban jobs to stimulate employment and are financed by a tax on the firms' profit. In the first case, the policy has direct and positive impact on job creation as efficiency wages decreases following a cut in unemployment benefits. Now that utility of urban unemployed workers is reduced, it will cause incentive for rural worker not to migrate to an urban area. The employment subsidy policy only increases job creation in the city without directly affecting the rural-urban migration as it is "only" subsidizing urban jobs. However, this increase in the job creation in city will increase expected utility of moving to urban areas. This will negatively affect urban unemployment. So this policy will raise both employment and unemployment in urban areas.

Studying the cause of migration is as important as studying social and economic effect of rural-urban migration. Following the Harris-Todaro framework, Dao (2002) investigates the determinants of rural-urban migration in developing countries. He uses three samples of Low income, Lower-Middle income, and Upper-Middle income countries. The variables he uses to explain the migration growth rates are: *Agricultural value added per worker*, *Education, Population, Area, Density, Roads*, and *Colony*.

Here, *agricultural value added per worker* is used as the proxy variable for rural wages. This paper argues that the level of urban wages is constant as it is determined by institutional factors such as politically motivated legislation, efficiency wage practice by

multinational corporations, and labor union pressure. *Agricultural value added per worker* is strongly significant in explaining rural-urban migration rate variations among low-income and upper-middle income developing countries. This suggests that government programs to improve rural-urban balance may work. Although the coefficient for *education* has the opposite sign, it seems to play a vital role in internal migration process. The effect of *population* and *population density* is strongly significant and positive in low-income countries (also middle income countries in the case of population density). This suggests that curbing population in a rural area will help urban-rural balance. However, such discriminatory policy (aimed to reduce population in a rural area) can have unintended consequences such as political or social unrest. According to the economic literature, surface area alone may not be critical in influencing internal migration decision but other factors such as the extent of isolation and the degree of self sufficiency of rural areas that have a bearing on migration decisions. This may suggest the coefficient estimate of *area* variable having wrong sign in all three samples. Length of the *road* is only relevant in explaining variation in internal migration rates among lower-middle income developing countries. *Colonization* is strongly significant and positive only in the case of low-income countries. Dao's (2002) study as well as the current study differs from works on migration in two respects:

1. The study while incorporating theory also includes empirical analysis on rural-urban migration. This is a deviation from the current trend which seems to be strictly a theoretical formulation of the problem.

2. Both studies seek to explain the differences in migration rates among developing countries, rather than studying internal migration within a specific country.

2.3: Hypothesis

As mentioned in chapter 1, this study is divided into three steps. First, I will extend Dao's model by using panel data from 1960-2010 (various years). I will use U.N. classification of the least developed countries instead of the Low Income Countries that was used by Dao. Second, I will add more variables that were omitted by Dao. Third, I will use rural-urban migration to predict economic growth.

Since, I am using the same model, but with a different dataset, I hypothesize that the agricultural value added per worker still has a negative relationship to the growth rate of migration. All else equal, higher agricultural wage makes migration from rural to urban areas (in search of better economic opportunities) less attractive.

In the second phase, I hypothesize that the explanatory variables such as *conflict* and *density* will have a positive relationship with the dependent variable *migration* whereas *structural change*, and *agricultural value added per capita* will have a negative relationship with *migration.*

Finally, I hypothesize that economic growth is linearly related to investment, openness to trade, population, political condition in the country, and education level. Populations living in the urban areas tend to be more educated, and career oriented. Also the cost of having a family in urban areas is substantially higher than in rural areas. Therefore, in developing countries, the growth rate of urban population tends to be less than the growth rate of total population (before rural-urban migration). This raises the

demand for labor in more productive, urban sector. This demand for labor in the urban sector can be met by the rural-urban migration. I hypothesize that migration growth rate will have significant, positive relationship with the economic growth rate.

Chapter 3

Modeling Framework

3.1: Introduction to the Harris-Todaro Model

In the migration literature, no other model has been as dominant as the Harris-Todaro model. It states that the rural-urban migration despite high urban unemployment is economically rational if expected urban income exceeds expected rural income. Bardhan and Udry (1999) in their book "Development Microeconomics" lay out the key institutional assumptions of the Harris-Todaro model in a very clear and concise way. The assumptions for the Harris-Todaro model are;

1. The rural market is competitive.
2. Modern firms hire labor in the city and the wage they pay are fixed over market-clearing level, either by restrictive union activity or governmental policy on wages.
3. Only urban residents can apply for jobs in modern firms, and if modern firms are faced with more applicants than they have jobs, jobs are allocated by lottery.
4. There is an "informal sector" in which urban residents not otherwise employed can eke out subsistence living using labor power alone.

This simple yet powerful model of rural-urban migration can be explained as following; Here let us assume,

Rural population employed in agriculture on fixed amount of land = L_r

Production function that determines agricultural output = $g(L_r)$

At the competitive rural labor market, rural wage $W_r = g'(L_r)$ .....(1)

The urban population is either employed in manufacturing (L_m) or is unemployed (working in the informal sector) (L_u). Normalizing population to 1, $L_r+L_m+L_u = 1$. Urban subsistence wage is normalized to zero.

W_m is institutionally fixed manufacturing wage. Manufacturing employment L_m is implicitly defined as a function of fixed manufacturing wage so that,

$$W_m = f'(L_m) \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

From equation 2, manufacturing demand for labor = $L_m(W_m)$. Since only urban residents can apply for manufacturing employment and probability of finding a job is the number of available jobs divided by the number of urban residents. Therefore, the expected wage of urban resident is $[L_m/(L_m+L_u)]W_m$.

Since, rural-urban migration is due to expected differential in income; the migration equilibrium takes place at :

$$W_r = \frac{L_m(W_m)}{L_u + L_m(W_m)} Wm \quad \ldots\ldots\ldots\ldots\ldots (3)$$

Figure 3.1: H-T Equilibrium.

Probability of finding employment in rural area is 1. Therefore, the expected rural wage is equal to actual rural wage.

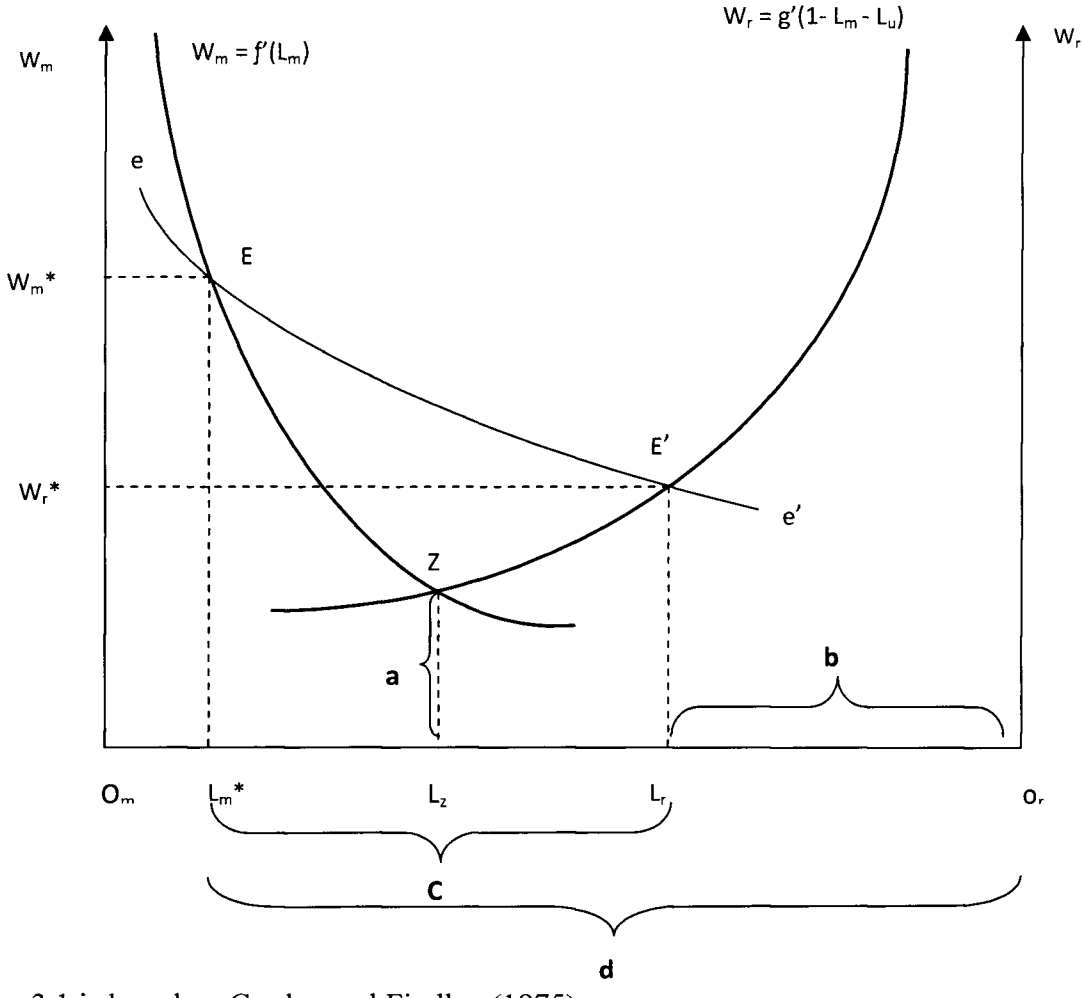

Figure 3.1 is based on Corden and Findlay (1975)

Here,

a = uniform wage in all sectors in the standard competitive model

b = rural employment

c = urban unemployment

d = employment in rural sector with no urban unemployment

W_m^* = institutionally fixed wage

ee' rectangular hyperbola = Harris-Todaro curve

$W_m = f'(L_m)$ and $W_r = g'(1- L_m - L_u)$ = value of labor's marginal product in manufacturing and value of labor's marginal product in agriculture respectively.

Rewriting equation 3,

$W_r(L_u + L_m) = W_mL_m$

Where, the curve ee' is the locus of points such that the rural wage times the amount of labor in the urban sector = $W_m^*L_m^*$.

At points E and E' urban informal sector is of size L_u^* and rural population size of $1-L_m^*L_u^*$. Therefore, rural wage is W_r^*.

Because E and E' are on ee', $W_r^*(L_u^* + L_m^*) = W_m^*L_m^*$ and expected wage are equalized in the urban and rural sectors.

Here, the graph shows the equilibrium level of expected income in the urban areas and the rural wage level[4]. When there is a distortion in this equilibrium (example: government policy to increase urban jobs), internal migration will take place. Harris and Todaro (1970) argue in favor of maintaining this equilibrium to reduce the problem of urban unemployment. However, as mentioned in the preceding chapter, the rate of urbanization growth is very high in developing countries. The expansion of cities has given many opportunities for rural-urban migration. Therefore, the focus of this study has

[4] Urban unemployment exists even in equilibrium.

been on the cause of internal migration and effect of internal migration on economic growth in the least developed countries[5].

3.2: Empirical Model

3.2.1: Dao's Rural-urban migration model

Following the Harris-Todaro framework, Dao (2002) develops a model that seeks to explain the determinants of the internal migration in developing countries. Assuming a linear relationship between migration rates and explanatory variables we can express the statistical model as follows:

$$m = \beta_0 + \beta_1 ava_{pw} + \beta_2 edu + \beta_3 pop75 + \beta_4 area + \beta_5 dense + \beta_6 rds + \beta_7 col + \varepsilon \quad (4)$$

m = rural-urban migration rate in a country

ava_{pw} = ratio of agricultural value added per worker to GDP per worker, in thousands of dollars, 1960 – 2010.

edu = education index, as calculated in the Human Development Report, 1960 – 2010.

pop75 = population in a country in 1975, at the beginning of the migration period, in millions of people.

area = area of the country, in thousands of square km

dense = population density in a country, number of people per square km

rds = the ratio of the length of the country's total *road* network to the country's land area. Km of road per 100 sq. km of land, 1960 – 2010.

col = a dummy variable taking the value of 1 if the country is a former colony, 0 otherwise.

[5] Presentation of Harris-Todaro model is just to inform the readers about one of the most pervasive model of rural-urban migration in development economics.

Here, assumptions are same as Dao's (2002) study; the expected rural income is equal to actual income, and rural-urban migration rate in a country over a time period can be approximated by the difference between the growth rate of urban population and that of the whole population. I expect results to be similar to those of Dao. That is; *Agriculture value added per worker* is expected to have a negative effect since, higher the agricultural wage, less attractive the migration from rural to an urban area (here, similar to that of Harris-Todaro model, we are assuming full employment in agricultural sector). Education is vital in explaining migration as educated worker related to high skilled workers. Skilled laborers are likely to move in search for high skill jobs that are primarily located in an urban area in developing countries. Henderson (1986) found a high correlation between city size and level of educational attainment in developing countries that may explain the movement of skilled labor to city areas thereby increasing the city size. *EDU* is the proxy for the level of education in a country. The *education* variable is expected to have a positive relationship. More educated people are likely to migrate to cities as they have better probability of finding an urban job. However, as cautioned by Dao, if the discrepancy between educational attainment of total population and that of rural population vary a great deal in developing countries, the regression result may be misleading. Since the data does not discriminate between education level of rural population and urban population, education level of the total population may be misleading in giving a correct representation of education level of the migrants. The *population* variable, which is the size of population of a developing country at the beginning of the migration period (1975) is a measure of pressure on population growth in rural areas on lowering agricultural wages thereby encouraging migration to the city.

The *area* variable is expected to have a negative relationship with migration. The larger the area, the more distance the rural population has to travel to get to urban areas and the higher the cost related to the rural-urban migration, therefore, it may serve as discouragement for rural worker seeking to move to urban areas.

Density of population and *roads* are also used to explain the *migration growth rate*. Density of the population in a country is expected to have a positive sign because as number people increases in a fixed area of land, the pressure for rural-urban migration increases (for better economic opportunities). Kurian (1984) states that, in terms of the intensity of use and serving as a network system for vehicular traffic, roads are far more important than both railroads and inland waterways. Unlike the assumption made by Dao (2012), the variable *road* may have either positive or negative relationship. On one hand, good transportation network facilitates the rural-urban migration by cutting the migration cost. This suggests a positive relationship. On the other hand, good transportation network means greater connectivity to city centers thereby removing the need to physically move to urban areas (by commuting every day to work from rural to urban areas becomes feasible). This suggests a negative relationship with migration. The *colony* variable is expected to have positive impact on rural-urban migration as countries that were colonized are more likely to have a good infrastructure needed for the movement of people and goods. However, in our dataset, almost all the countries listed were once a colony. Therefore, I believe the inference gathered using this variable might not explain migration growth rate in the least developed countries.

3.2.2: Modified Rural-urban Migration Model

$$m = \beta_0 + \beta_1 conf + \beta_2 sctcng + \beta_3 avapc + \beta_4 dense + \varepsilon \quad (5)$$

m = rural-urban migration rate in a country[6], 1960 - 2010.

conf = Dummy variable taking value of 1 if a country was involved in an armed conflict, and 0 for the year where there was no armed conflict[7], 1960 – 2010.

sctcng = Difference between agricultural value added percentage growth and industrial and service sector value added percentage growth, 1960 – 2010.

ava_{pc} = Per capita Agricultural Value added (constant 2000 US$) divided by the total population of the country, 1960 – 2010.

pop = Population level in the country, in millions, 1960 - 2010.

dense = population density in a country, number of people per square km, 1960 – 2010.

Conflict, a push factor of migration is an important variable in explaining rural-urban migration in developing countries. As most of the armed conflict usually originates and takes place in the rural area, the year a country was affected by an armed conflict will cause people to move to an urban area. I assume, move to an urban area due to conflict will be permanent i.e. the people will not move back even after conflict is over. This can be due to fear of reoccurrence of the conflict and or societal ties to the new place. I

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[6] We assume that the rural-urban migration rate in a country over time period can be approximated by the difference between growth rate in urban population and total population. Since fertility rate are low in the urban areas, we understand that this estimation underestimates the extent of migration. Here, let m be the rural-urban migration rate, u the growth of the urban population, and p the growth rate of total population, then

m = u – p

Data on urban population growth rate, and total population growth rates are readily available from World Bank's World Development Index for various years.

[7] http://www.pcr.uu.se/research/ucdp/datasets/ucdp_prio_armed_*conflict*_dataset/

expect the sign of the coefficient of the variable conflict to be positive. The variable *agricultural value added per capita* instead of *agricultural value added per worker* will be used in this model. In developing countries, data on agricultural workers cannot be properly estimated as agriculture tends to be a family business with every family member lending a helping hand. In addition, majority of the population in developing nations are involved in agriculture. Therefore, using *agricultural value added per capita* will serve as a better proxy for the rural wage[8]. Following the Harris-Todaro framework, we argue that the urban wage is constant as it is instituitionally determined. Therefore, the variation on the agricultural value added per capita will influence the rural-urban migration decision. Henderson (2003) states that urbanization occurs as countries switch their sectoral composition away from agriculture into industry. This switch as technology advances in domestic agriculture releases labor from agriculture to migrate to the cities. I will use difference in agriculture value added as percent of GDP growth and summation of industrial value added as percent of GDP growth and service value added as percentage of GDP growth as a proxy for the switch in sectoral composition. I hypothesize the coefficient to be significant and have a negative effect on *migration*. i.e., as people move from the agricultural sector to the industrial sector, migration will increase. The data on rural population density is not available readily. Also, most of the developing countries have larger rural areas than urban areas and similarly higher rural population compared to urban population. Therefore, I will use *population density* as the proxy variable in explaining the magnitude of population pressure on the developing countries.

[8] It is assumed that expected rural income equals actual income. i.e. probability of finding rural employment is 1.

The variable *education* was not included in this model because although education encourages skilled labor to move to an urban area for the job possibility, it also affects economic growth. Therefore, to avoid the problem of endogeneity, I will include this variable in my growth model. Since the variable *density* is included in the model, *population* and *area* variables are not included to avoid the problem of multicollinearity[9].

3.2.3: Linear growth model

Within the general framework of aggregate production function with constant return to scale, we can express that Output is the function of *Capital*, *Labor*, and *Technology*.

$$Y = f\ (K,\ L,\ T) \tag{6}$$

By totally differentiating this function and manipulating the expression one gets:

$$Y = f_K dK + f_L dL + f_T dT \tag{7}$$

Where f_K, f_L, and f_T are marginal productivity of capital, labor and technology respectively.

$$\frac{dY}{Y} = f_K \frac{dK}{Y} + f_L \frac{dL}{Y} + f_T \frac{dT}{Y} \tag{8}$$

Since $I = dK$,

$$\mathrm{y} = f_K \frac{I}{Y} + f_L \frac{dL}{Y} + f_T \frac{dT}{Y} \tag{9}$$

$$\mathrm{y} = f_K \frac{I}{Y} + f_L \frac{L}{Y}\frac{dL}{L} + f_T \frac{T}{Y}\frac{dT}{T} \tag{10}$$

[9] While running the model with population and area one after another, the coefficient sign of density, population and area keeps changing along with fluctuating significance level suggesting high level of multicolliniearity. The variable road is also highly insignificant in the Dao's original model. Further, road as a part of infrastructure will be captured by the gross fixed capital formation that is used in the linear growth model.

$$y = f_K \frac{I}{Y} + b_L l + b_T t \quad (11)$$

where a lower case implies the growth rate of the variable and b_L, and b_T are elasticities of aggregate output with respect to labor, and technology. The growth model proposed by Romer (1986) suggests that the openness of an economy can be used as a proxy for its level of technology as technology change is assumed endogenous in the model. Technology is considered endogenous because technological change is the outcome of deliberate actions taken by economic agents.

So, $T = f\ (OPEN)$. Where, $OPEN$ is the openness to the trade. i.e. $OPEN = \frac{IM+EX}{Y}$.

K: investment as a percentage of GDP proxy

Using aggregate output function, our growth model becomes:

$$y = f_K(GFCF) + b_L pop + b_T(open) \quad (12)$$

Here, *pop* and *open* are the growth rate of population and trade openness respectively.

To capture the effect of migration, political structure, and education level, I shall introduce variables *mig*, *polity*, and *edu*

$$\text{So, } y = f_K(gfcf) + b_L(pop) + bT(open) + mig + polity + edu \quad (13)$$

Now, our model for GDP growth can be written as;

$$gdpg = \alpha_0 + \alpha_1 gfcf + \alpha_2 pop + \alpha_3 edu + \alpha_4 open + \alpha_5 mig + \alpha_6 polity + \mu \quad (14)$$

To address the problem of endogeneity, we will use instrumental variable approach.

1st Stage :

$$mig = \beta_0 + \beta_1 conf + \beta_2 sctcng + \beta_3 ava_{pc} + \beta_4 dense + \varepsilon \quad (15)$$

2nd Stage:

$$gdpg = \alpha_0 + \alpha_1 gfcf + \alpha_2 pop + \alpha_3 edu + \alpha_4 open + \alpha_5 \widehat{mig} + \alpha_6 polity + \mu \quad (16)$$

Where,

gdpg = Gross Domestic Product growth annual percentage, 1960 -2010,

gfcf = Gross Fixed Capital Formation, as percentage of GDP, 1960 – 2010,

pop = population growth rate, 1960-2010,

edu = Education Index. Expected and mean years of schooling, 1960 – 2010,

open = Trade Openness growth, 1960 -2010,

$\widehat{mig}$ = Predicted values from the migration equation (15),

polity = Political regime characteristics and transaction, Democracy – Autocracy, 1960 – 2010, and

μ = Error terms with 0 expected value.

Following classical Lewis model of structural change, Migration can have a positive effect to the economic growth as it moves labor from the sector with low marginal productivity to the sector with the high productivity. However, following the Harris-Todaro framework, as more people move to urban areas due to the difference in expected income, urban unemployment may rise. This may have a negative effect on the economic growth of an economy. I, however, hypothesize that the migration will have a positive relationship with economic growth especially in the developing countries where actual output tends to be significantly lower than the potential output.

Gross fixed capital formation also known as gross domestic fixed investment in the investment on roads and other infrastructure such as schools, and hospitals, and also investment in private, commercial, and industrial buildings. Since infrastructure is important to growth, I will use gross fixed capital formation as the proxy for infrastructure investment. I expect the coefficient to have a positive relationship with

economic growth. Openness to trade can lead to greater efficiency through increased competition, and sharing of ideas and technology thereby leading to greater growth (Bregman and Marom, 1993). I expect the variable *open* to have a positive relationship with the economic growth. Government structure and political environment in a country are very important in economic growth of that country. Meta-analysis of the total pool of 81 studies with 470 published estimates of the democracy-growth association, Doucouliagos and Ulubasoglu (2006) find no accumulated evidence of democracy being detrimental to economic growth. Although the authors do find direct effect to be zero, they argue that democracy has significant indirect effect on growth through various channels. Therefore, I expect the *polity* variable to have a positive relationship with economic growth. *Edu* variable is the proxy for the level of educated labor force in the economy. With skilled, educated labor, I expect the variable *edu* to have a positive relationship with economic growth.

3.3: Data Collection

3.3.1: LIC vs. LDC

One of the major differences between Dao's research and this study is the difference in the sample data. Dao (2002) uses Low Income Country (LIC) for the analysis. Whereas, countries in this study are considered Least Developed Countries (LDC) according to the U.N classification.

World Bank categorizes countries based its lending categories civil works preferences, and IDA eligibility[10]. Low Income classification is the classification based on the GNP (Gross National Product) per capita income of less than $ 1,005 or less in 2010. World Bank Atlas Method is used to calculate the income level.

[10] http://data.worldbank.org/about/country-classifications

This study, however, uses the U.N classification of the least developed countries. This classification takes into consideration social, economic and environmental aspects of a country. To be qualified for the inclusion in the list of the least developed countries according to the United Nations Economic and Social Council a country must fulfill the following criteria:

- A low gross national income per capita,
- low human asset index or low level of human resources development, and
- High degree of economic vulnerability index.

I believe using countries that are least developed gives one an opportunity to pool countries with a similar level of development. This should facilitate a more reliable cross country analysis.

3.3.2: Data Collection

The basic data needed for various regressions consists of annual data from 1960 to 2010. They are collected from the World Bank Data, Development Indicators[11]. *Migration growth rate* is approximated by using difference between urban population growth rate and total population growth rate. The method for calculating migration growth rate is presented in an earlier chapter. Data on urban population growth rate and total population growth rates is readily available from World Bank's World Development Index for various years.

Agricultural value added per worker is readily available at the World Bank database online. For a*gricultural value added per capita* however was derived by dividing agricultural value added as of 2000 us constant dollar and divide it by the total

[11] http://data.worldbank.org/data-catalog/world-development-indicators

population for that year for every year. Variables such as *population, area, population density,* and *road density* are easily and readily available on World Bank online database.

Education index is one of the three indices on which the Human Development Index is built. It is based on the mean year of school for adult and expected years of school for children. The data can be obtained from the report prepared by the Human Development Report Office (HDRO)[12]. *Sectoral change* variable is calculated by subtracting the summation of Industrial and Service value added annual percentage growth from the agricultural value added annual percentage growth. The data on *agricultural value added, industrial value added*, and *service value added* can be easily obtained from World Bank online database.

Colony variable was collected from the website, "Economy Point" where descriptive classification of western colony is listed[13]. The *colony* variable takes the value of 1 if the country is a former colony, 0 otherwise. *Conflict* dataset is collected from UCDP/PRIO Armed Conflict Dataset Version 4 maintained by Uppsala University. The variable *conflict* is a dataset with information on armed conflict where at least one party is the government of a state in the time period 1946-2010.

[12] http://hdrstats.undp.org/en/indicators/103706.html
[13] http://www.economypoint.org/l/list-of-colonies.html

Table 3.1: Summary statistics for the variables

Variable	Mean	Std. Dev.	Min	Max	Observations (N)
Mig	2.531995	2.435833	-42.3484	18.98688	2091
Sctcng	-5.46667	25.81985	-253.994	579.7101	1260
Popg	2.529712	1.144215	-7.53325	9.770495	2091
Pop	10.83252	17.96362	0.0407	148.6921	2091
pop79	5.927978	11.67186	0	78.34274	2091
Area	468.8726	586.4209	0.81	2376	2091
Dense	70.44072	132.448	0.85242	1142.292	2050
Avapc	140.763	185.868	2.394372	1236.271	1166
Avapw	349.8822	454.5248	65.39698	5699.661	859
Rds	11.12585	17.45883	0.5	166	1205
Conflict	0.202296	0.401808	0	1	2091
Edu	0.270963	0.114863	0.033	0.647	957
Col	0.95122	0.21546	0	1	2091
Gfcf	18.69972	10.66259	-23.7626	93.12931	1492
Polity	-9.84603	21.85207	-88	9	1812
Opengrowth	2.718325	20.88365	-81.0302	317.8811	1543

Chapter 4

Regression Results and Analysis

Regression analysis shows the mathematical relationship between dependent and independent variables for the purpose of establishing quantitative economic relationships. Our data involve panel data set therefore we will run both fixed-effects and random-effects models. Fixed-effects model allows us to infer about available data at hand, whereas random-effects model allows us to infer about the larger population from which the sample dataset is drawn. Also, a problem with data for relatively large number of cross-sectional unit is that, it may suffer from the problem of heteroskedasticity. To correct for the problem of heteroskedasticity and autocorrelation, I will employ Generalized Least Squares (GLS) method. I will then instrumental variable approach to examine the relationship between migration and economic growth[14].

This analysis is designed to examine the determinants of internal migration in the least developed countries in the first stage of model estimation. The predicted values of migration are then used to find the relationship between migration growth rate and economic growth rate of that country. The empirical results of this analysis will be presented in three subsections:

1. Examination of the results from Dao's (2002) model using LDC countries in panel dataset.
2. Examination of result from the modified model of rural-urban migration.

[14] Checking for endogeniety of migration, we used both Wu-Hausman F test and Durbin-Wu-Hausman chi-sq test and rejected the null hypothesis that regressor is exogenous. Therefore, we will use instrumental variable approach.

3. Analysis of the model of economic growth, where instrumental variable approach is used to find relationship between migration and GDP growth.

4.1: Model of Rural-Urban Migration

4.1.1: Dao's Model

Table 4.1: Result for the Dao's model:

	Fixed Effect			Random Effect			Generalized Least Squares		
Mig	Coef.	t	P > t	Coef.	z	P > z	Coef.	z	P > z
AVApw	-0.002	-1.990	0.047	-0.002	-2.330	0.020	-0.002	-4.770	0.000
EDU	0.798	0.690	0.490	-1.268	-1.440	0.149	-1.838	-3.010	0.003
POP79	omitted	.	.	0.024	0.900	0.368	-0.019	-1.460	0.143
AREA	0.172	0.110	0.915	-0.001	-1.850	0.064	-0.001	-3.310	0.001
DENSE	-0.013	-3.620	0.000	-0.004	-1.890	0.059	0.002	1.020	0.309
RDS	0.016	0.950	0.342	0.014	1.090	0.277	0.004	0.340	0.734
COL	omitted	.	.	-0.614	-0.640	0.525	-1.100	-2.840	0.005
Const	-93.009	-0.100	0.918	3.667	3.780	0.000	4.472	11.010	0.000

Looking at the results from GLS model, we find that *agriculture Value added per worker*, which is a proxy for rural wage has expected negative sign and is highly significant. This result is consistent with Harris-Todaro model, which suggests increasing agriculture wage to slow down the rural-urban migration. This result is also consistent with Dao's results. *Edu* variable does not have the expected positive sign. This variable, which was not significant in original finding of Dao is now significant in the same model

with updated data (but still has a negative sign). Since urban subsistence sector that employs large rural labor who are uneducated or have little education, mean years of schooling may not have the desired effect on migration. Contradictory to Dao's results, *land area* does have the expected negative sign and is statistically significant. *Population* variable that is the population level on 1975 (considered the beginning of the migration period) has a negative sign and is not significant in explaining *migration growth rate* in developing countries.

Road density seems to be statistically insignificant in explaining *migration growth rate*. With construction of a better road network, there is a chance that a reverse migration may have taken place i.e. people may have moved back to the rural area as expansion of road opened economic opportunities in the rural areas. This may explain the statistical insignificance of *road density* in explaining *migration growth rate*. Surprisingly, *population density* does not seem to contribute to migration growth rate. This result is similar to Dao's findings. The *colony* variable, however, is significant in explaining *migration growth rate* but has unexpected negative sign. This may be due to the fact that almost all of the countries in our data set were colonized.

To examine the extent of the multicollinearity among the explanatory variables, we calculated the sample correlation coefficient for each possible pair of variables. The result is reported in table 4.2.

Table 4.2: Sample Correlation Coefficient Matrix for Dao (2000) model

	AVApw	EDU	POP	AREA	DENSE	RDS	COL
AVApw	1						
EDU	0.028	1					
	0.484						
POP	-0.113	0.013	1				
	0.001	*0.684*					
AREA	-0.168	-0.296	0.177	1			
	0.000	***0.000***	***0.000***				
DENSE	0.001	0.102	0.578	-0.284	1		
	0.968	***0.002***	***0.000***	***0.000***			
RDS	0.323	0.228	0.327	-0.351	0.837	1	
	0.000	***0.000***	***0.000***	***0.000***	***0.000***		
COL	0.067	0.063	-0.186	-0.052	-0.028	0.118	1
	0.050	*0.053*	***0.000***	***0.018***	*0.201*	***0.000***	

Note: Italicized values signify corresponding p-values for the coefficient.
Bold values imply significance at 1 percent level.
Bold and underlined imply significance at 5 percent level.

There is a strong linear correlation between the following pairs of explanatory variables: *agricultural value added per worker* and *population, agricultural value added* and *area, agricultural value added* and *road density, education* and *area, education* and *density, education* and *road density, population* and *density, population* and *road density, population* and *colonization, area* and *density, area* and *road density, road density* and *colonization.* There is a moderate correlation between the following pairs of explanatory variables: *agricultural value added* and *colonization*, and *area and colonization.*

Table 4.3: Regression Results for Dao's Model: Interaction variables Included

	Fixed Effect			Random Effect			Generalized Least Squares		
Mig	Coef.	t	P>t	Coef.	z	P>z	Coef.	z	P>z
Edu	0.711	0.340	0.731	-1.866	-1.340	0.180	-1.725	-1.810	0.071
AVApw	-0.002	-1.070	0.287	-0.002	-1.620	0.105	-0.001	-1.850	0.064
(EDU)(AVApw)	0.000	-0.100	0.920	0.002	0.550	0.585	-0.001	-0.260	0.796
COLONY	(omitted)			-1.230	-0.600	0.552	-1.399	-0.710	0.475
(DENSE)(COLONY)	-0.012	-0.810	0.417	-0.003	-0.320	0.749	0.003	0.230	0.816
(RDS)(DENSE)	0.000	-0.210	0.836	0.000	-0.320	0.748	0.000	-4.570	0.000
AREA	-1.401	-0.600	0.551	-0.004	-1.780	0.075	-0.004	-2.930	0.003
DENSE	0.001	0.090	0.930	0.001	0.060	0.949	0.002	0.160	0.871
POP	(omitted)			0.053	1.290	0.196	0.039	2.480	0.013
(COLONY)(AREA)	(omitted)			0.003	1.390	0.164	0.003	2.260	0.024
Cons	787.434	0.600	0.549	4.409	2.140	0.033	4.316	2.220	0.026

Borrowing the interaction variables that were used in Dao's (2002) paper, I ran the regression with interaction variable included. Looking at the generalized least squares method's result, we find only area, road and density interaction variable to be significant at 1% level. Variables were better at explaining the variation in growth rate of migration when Dao's original model (without the interaction variables) is used.

4.1.2: The Modified Model:

After dropping the variable that were not significant in Dao's model, and retaining and including the variable that may affect the rural-urban migration, we get the result for the modified rural-urban migration model[15].

[15] The rationales for including the variables are presented in earlier sections.

Table 4.4: Regression result for the modified model

	Fixed Effect			Random Effect			Generalized Least Squares		
Mig	Coef.	t	P > t	Coef.	Z	P > z	Coef.	z	P > z
CONF	0.652	4.870	0.000	0.602	4.540	0.000	0.217	1.630	0.102
Stccng	-0.003	-1.370	0.172	-0.003	-1.430	0.153	-0.008	-2.780	0.005
Avapc	-0.002	-2.010	0.045	-0.002	-2.100	0.035	-0.001	-4.210	0.000
DENSE	-0.006	-8.790	0.000	-0.005	-7.060	0.000	0.001	3.100	0.002
COLONY	omitted			-0.146	-0.190	0.851	-0.226	-1.040	0.298
Const	3.110	21.490	0.000	2.833	3.740	0.000	2.640	12.090	0.000

Here, we find that conflict has a positive effect on the rural-urban migration. However, it is not significant. We see that the change in percentage of GDP that was contributed to agricultural sector to industrial and service sector significantly encourages rural-urban migration. We also find that *rural wage (avapc)* is very significant i.e. increased rural wage will slowdown rural-urban migration as predicted in Harris-Todaro model. *Density* which is also a proxy for pressure on rural population has high significance in explaining rural-urban migration. The coefficient also has expected positive sign. Since *colony* variable was significant in the Dao's model, we included in the modified model as well. However, here, colonization is not significant in explaining rural-urban migration and still has negative sign which was not expected.

Table 4.5: Modified model, after removing colony

	Fixed Effect			Random Effect			Generalized Least Squares		
Mig	Coef.	t	P > t	Coef.	Z	P > z	Coef.	z	P > z
CONF	0.652	4.870	0.000	0.603	4.550	0.000	0.243	1.860	0.063
Sctcng	-0.003	-1.370	0.172	-0.003	-1.430	0.153	-0.008	-2.800	0.005
Avapc	-0.002	-2.010	0.045	-0.002	-2.130	0.033	-0.001	-4.350	0.000
DENSE	-0.006	-8.790	0.000	-0.004	-7.030	0.000	0.001	3.080	0.002
Const	3.110	21.490	0.000	2.695	12.460	0.000	2.430	29.540	0.000

Our final model of rural-urban migration has *conflict*, *change in economic structure*, *rural wage*, and *density* significantly affecting *migration growth rate*.

Now, after migration is explained through above mentioned variables, we will include the estimated migration in our economic growth model.

4.2: Model of Economic Growth

Table 4.6: Regression result: GDP growth model

Gdpg	Coef.	Z	P>z
migration	1.6683	3.4800	0.0010
GFCF	0.0219	0.7200	0.4710
EDU	9.5531	3.8000	0.0000
Openness growth	-0.0188	-0.5500	0.5830
POLITY	0.0455	4.3300	0.0000
Population Growth	1.3375	2.3700	0.0180
Const	-5.7341	-2.5000	0.0120

Assuming a linear relationship between *GDP growth* and the independent variables, we find that migration growth rate is significant at 1% level in explaining GDP growth all else constant. *Education* is also significant in explaining the economic growth rate in a country suggesting more skilled laborers are attracted to high skill urban jobs thereby increasing productivity. *Gross fixed capital formation*, which is proxy for level of

investment in a country does not seem to be significant although it has expected positive sign. Countries with a higher level of political freedom, i.e., are more democratic, seem to have higher economic growth. *Population growth rate*, which is a proxy for labor growth in the least developed countries have a positive significant effect on growth rate of an economy[16]. *Growth rate of trade openness* does not have an expected positive sign and is not significant in explaining GDP growth. We will test the model by removing *openness growth* and *gross fixed capital formation* successively to see the effect of infrastructure and technology[17] on GDP growth.

To examine the extent of the multicollinearity among the explanatory variables, we calculated the sample correlation coefficient for each possible pair of variables. The result is reported in table 7.

Table 4.7: Sample Correlation Coefficient Matrix for GDP growth model.

	mig	GFCF	EDU	Open	POLITY	Popg
Mig	1.000					
GFCF	-0.026	1.000				
	0.310					
EDU	-0.152	0.346	1.000			
	0.000	***0.000***				
Open	0.037	0.032	-0.003	1.000		
	0.145	*0.219*	*0.941*			
POLITY	0.024	0.119	0.077	-0.083	1.000	
	0.317	***0.000***	***0.019***	***0.001***		
Popg	-0.064	-0.045	-0.123	-0.058	0.031	1.000
	0.004	*0.085*	***0.000***	***0.023***	*0.187*	

Note: Italicized values signify corresponding p-values for the coefficient.
Bold values imply significance at 1 percent level,
Bold and underlined imply significance at 5 percent level and underline implies significance at 10 percent level.

[16] Using lagged value for population growth would have made more sense. For short period (few years) the population growth rates in the developing countries tend to be similar to that of last year. Therefore, lagging population for more than several years was necessary. However, due to limitation on data, we use the population growth rate without lag.
[17] Openness is the proxy for technology

Here, we find a strong correlation between following pairs of explanatory variables: *migration growth rate* and *education*, *migration growth rate* and *population growth rate*, *gross fixed capital formation* and *education, gross fixed capital formation* and *political freedom, education* and *population growth, trade openness* and *political freedom*. We find moderate correlation between following pairs of explanatory variables: *education* and *political freedom, trade openness* and *population growth,* and *gross fixed capital formation* and *population growth.*

Tables below show the regression results after successively interchanging *gross fixed capital formation*, our investment variable and *openness*, our technology variable.

Table 4.8: Including Gross fixed capital formation in the Growth model (removing openness)

Gdpg	Coef.	Z	P>z
Mig	1.60	3.28	0.00
GFCF	0.02	0.76	0.45
EDU	9.63	3.80	0.00
POLITY	0.05	4.83	0.00
Popg	1.36	2.23	0.03
Const	-5.73	-2.48	0.01

Table 4. 9: Including Openness growth rate in the Growth model (removing GFCF)

Gdpg	Coef.	Z	P>z
Mig	2.41	4.00	0.00
Open	-0.02	-0.60	0.55
EDU	10.52	4.25	0.00
POLITY	0.05	4.35	0.00
Popg	1.48	2.23	0.03
Const	-7.53	-2.61	0.01

Here, we observe that the *migration growth rate* is highly significant in explaining *GDP growth rate* in both models. *Gross fixed capital formation* has an expected positive sign but is not significant in explaining the variation in *GDP growth rate*. This may be explained by the poor development of infrastructure and the nature of investment in least developed countries. For example, in the developing nations, the investments may only focus on specific areas, such as mines and petroleum extraction and refineries. Also, due to poor infrastructure development, infrastructures such as bridges and roads need to be build and maintained recurrently. This may result in a high level of investment, but without the benefit, investment may bring in the developing countries. The effect of *openness growth rate* is unexpected: its coefficient is highly insignificant and has a negative sign. The high level of correlation between the explanatory variables may have influenced these results. Multicollinearity causes standard error of the coefficients to be inflated. This can cause some variables to be insignificant when in fact the variables are significant. Also openness may not be an accurate measurement as proxy for technology for the developing countries. Most of the time, there is necessity for transformation of agricultural product as there is no agricultural base. For example, developing nations growing coffee beans do not have the necessary technology to produce finished coffee ready for consumption. Similarly, the developing nations tend to export product such as cotton and other raw agricultural product, only to import more finished product. Therefore, a country can have a huge agricultural export while at the same time population is suffering from famine[18].

[18] During 2005-06 Niger continued to export food while the country was suffering from famine.

We also find *education* to be highly significant in explaining *GDP growth rate*. *Polity* variable which is measured as democracy minus autocracy is very significant in encouraging *GDP growth.*

Chapter 5

Conclusion and Agenda for Future Research

5.1: Conclusion

In order to capture the effect of changes in migration patterns on GDP growth in the least developed countries (LDCs), this thesis has used a statistical analysis in three stages:

1) Use Dao's 2000 model of rural-urban migration on panel dataset of least developed countries;
2) Modify Dao's model so that migration can be included in GDP growth model.
3) Estimate GDP growth equation using predicted values of migration growth rate.

Although some independent variables in various equations show instances of multicollinearity, the sign of the coefficient are as expected for our model (except for openness growth).

The empirical result in our modified model of rural-urban migration show that armed conflict plays an important role in displacing rural population and motivates them to seek more security in urban areas. Rural wage also is found to have a very important role in internal migration. An implication for policy, thus, is to increase agricultural wage so as to reduce urban unemployment. This is consistent with the assumption made by the Harris-Todaro model of rural-urban migration. A structural change, i.e. a change in the percentage of GDP that is accounted for by agriculture relative to the industrial and service sectors concentrated in urban areas has a very high impact on rural-urban migration. This is important as the country moves itself from an agrarian society to a

more industrial and service oriented society. Establishment of vocational training programs, and trade schools for rural and urban population can be useful in smoothing the transition to a new industrial economy. Population density also is highly significant in causing rural-urban migration. As the population increases, it is natural for people to move to urban areas where jobs are less land intensive compared to the land intensive rural sector jobs, where land is limited (especially with growing population density).

The empirical result from our second model; the growth model - seeks to examine the relationship between GDP growth and migration growth after controlling for explanatory variables. We find that as migration accelerates, GDP growth also increases. This is consistent with the Lewis's structural change model. As rural population moves from area of low productivity to the urban sector that has higher productivity, the output growth increases. It is however, necessary to acknowledge that rural-urban migration may cause urban unemployment as suggested by the Harris-Todaro model. Our finding suggests that on average, as migration growth increases, Gross Domestic Product also tend to increase in least developed countries. We also find that although investment does not significantly affect GDP growth in our model, education, trade openness, and the type of government or political freedom has an important role in encouraging GDP per capita growth rate in least developed countries.

5.2: Suggestions for Further Study

This study begins with an interest on the effect of migration on economic growth. The method applied in this study uses a pooled cross-sectional time series data in order to capture the effect of explanatory variables on migration and the effect of migration on economic growth over time as well as across countries.

The lack of sufficient data on many developing countries made my sample size smaller than expected. Significance of the above mentioned effects may have been reduced due to smaller sample size. Therefore to improve on this study, a bigger sample is recommended.

This study has examined migration and growth in least developed countries. The results in this thesis may not completely go through when the same model is estimated on more developed or highly developed countries. Therefore, to improve on this study, different samples based on a different levels of development may be used.

The level of financial sector development is overlooked in this study. Access to finance may have both positive and negative effects in rural-urban migration. A developed financial sector is likely to have a positive impact on economic growth. Hence, to improve on this study, the effect of financial sector development on rural-urban migration and economic growth may be examined.

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Appendix

List of least developed countries

Afghanistan	Lao PDR
Angola	Lesotho
Bangladesh	Liberia
Benin	Madagascar
Bhutan	Malawi
Burkina Faso	Mali
Burundi	Mauritania
Cambodia	Mozambique
Central African Republic	Nepal
Chad	Niger
Comoros	Rwanda
Congo, Dem. Rep.	Senegal
Congo, Rep.	Sierra Leone
Djibouti	Sudan
Ethiopia	Tanzania
Gambia, The	Timor-Leste
Guinea	Togo
Guinea-Bissau	Uganda
Haiti	Yemen, Rep.
Kiribati	Zambia