An Explaining the Determinants of Migration in Korea by the VAR Approaches (1971~2004)

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Abstracts

The purpose of this paper is to explain the determinants of migration in Korea with the ratio of farm to unskilled urban wages using the time series data according to the Todaro hypothesis with the VAR approaches for capturing the short-run behavior of each variable and that analyzes the overall fluctuation of internal migration based on white noise disturbances. The test results show that the determinants of intermigration in Korea captures the Todaro hypothesis that urban sector's high real wage affects the rural migrants, even it is weak significance level. That is, there may exist many other non-economical factors which cause the rural migrants to move to the urban areas.

JEL Classification: J3, J6, R0
Keywords: Migration, Wage Difference, labor market, VAR Approach, Granger Causality, Impulse Response Function, Variance Decomposition.

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I. Introduction

Recent migration literature[1] touches on numerous thought-provoking issues concerning the determinants of migration and economic development in the less developed countries. In Harris and Todaro's (1970) framework, manufacturing job locations are exogenously set in the urban area, even rural residents maximize their well-being by moving to urban areas, even though the resulting unemployment rate is very high. Empirical studies based on the understanding for the theoretical structure of migration model, elaborate the estimation of the determinants of migration with respect to wages and employment. There has been considerable debate in the migration literature over the wage gaps[2] between rural and urban area. Nominal wage gaps between farm and city employment are one of the most pervasive aspects of modern economic growth - so that they have become a key stylized fact of development economics.

The purpose of this paper is to explain the determinants of migration in Korea with the ratio of farm to unskilled urban[3] wages using the time series data. By introducing the VAR (Vector Auto-Regression) that captures the short-run behavior of each variable, I analyze the overall fluctuation of internal migration based on white noise disturbances in Korea between rural and urban area during 1971-2004 by showing the Granger Causality test and Impulse response function and Variation decomposition analysis.

This paper is organized as follows: Section 2 shows the related empirical literature, and Section 3 deals with an economic environment of this model. Section 4 presents the empirical methodology in which the VAR approaches for short-run behavior are presented to measure the overall behavior of migration in Korea using the time-series data during 1971-2004. Section 5

[1] In theoretical issues concerning labor migration, the probabilistic view of migration between rural-urban sectors with labor market experiences, development, and population growth are the major features of the economic performance of migrants.
[2] In theoretical issues, Wildasin (1994) studies redistribution policies that transfer income between owners of immobile factors of production and workers in a given region.
[3] Urban refers to Seoul, Busan, Incheon, Daejon, Daegu, Kwangju, Ulsan city in Korea

analyzes the estimation result of this model and describes conclusions.

II. The Literature Review on Migration

Hatton and Williamson (1992) document a significant degree of fluctuation over time in rural-urban wage differentials in U.S. economic history. Among many historical wage gap documents, the unskilled full-time nominal city wages are about 41% higher than farm wages in the contemporary Third World, they were about 51% higher among late nineteenth-century industrialized countries. They were even higher in England in the 1830s, about 73%.

There has also been debate over the variations in mobility in terms of information flows[4], magnitude of flows in migration, skill decomposition, and education differences within rural-to-urban migration. Banerjee's (1984) empirical survey of migrant heads of households in Delhi between October, 1975 and April, 1976 shows that urban contacts can inform potential migrants about the prevailing state of the urban labor market, the type of jobs they can get, the difficulties involved in job search and in adjusting to the urban environment, etc. The survey indicates that 55.1 % of the sample used urban-based contacts as information channels, 7.0 % with formal channels, and 27 % of the sample said that they had no information on employment opportunities in Delhi prior to their arrival. Skill preferences in migration are useful in assessing the pattern of recent rural-to-urban migration. Using National Longitudinal Survey of Youth data for 1985 through 1991, Gabriel and Schmitz (1995) support the favorable 'self-selection hypothesis', and show that, in general, prospective migrants enjoy a wage advantage over nonimmigrants with similar earnings-related characteristics. Goss (1896) examined the impact of age on the migration decision of employees, and the results lend strong empirical support to

[4] In terms of theoretical issues of migration and information, Katz and Stark (1987) analyze the effects of informational asymmetry on the level and skill composition of international migration and on the level of output using a simple diagrammatic framework. El-Gamal (1994) studies a dynamic version of the Harris-Todaro migration model. Carrington et al. (1996) study a dynamic model of labor migration in which moving costs decrease with the number of migrants already settled in the destination.

the hypothesis that while age increases many of the costs of a geographic move, as a result reducing the probability of migration, and the possession of higher level of general skills, as measured by years of experience, increases mobility. Education issues are also important to evaluate the pattern of the migration. It is believed by many that education is a critical determinant of migration, and causes high mobility between regions. Faini et al. (1997) investigated the cause of the falling and low mobility level in Southern Italy, and found that males and more educated individuals were more likely to be willing to take a job anywhere compared to the alternative choice of moving to a neighboring town or staying at home. In the Arkansas study of migration patterns in terms of age and education, Voth et al. (1989) shows that out-migrants were more highly educated than in-migrants, which resulted in a decline in the average level of education in the Arkansas population. The pattern of higher educational levels among out-migrants is most dramatic in the age groups 18-24 and 25-34.

In the Korea, there are few not many literature on the determinant of migration from rural to urban area. Yoo (1991) examines the long-term patterns of migration within Korea between 1966 and 1985. This analysis uses Census Population Survey data from Korea's 1965, 1970, 1980, and 1985. The result suggests that the critical determinants of migration for rural-to-urban sector and urban-to-urban sector migration are not by economic factors, such as differential expected income hypothesis and unemployment rates, etc., but by non-economic factors such as amenity and education opportunity. By the multiple regression analysis, he analyzes the determinants of migration in Korea during the specific period, and finds that (i) during the whole sample periods, the wage gap and job opportunity in cities do not affect the internal migration in Korea. In other words, there exist other essential factors that can capture the determinants of migration in Korea. According to him, as time increases, the economical differences between rural and urban sector is becoming decreased so that we need to look at

other factors to analyze the migration behavior, and that (ii) the educational opportunity in cities is very important factor determining the determinants of migration in Korea , meaning that people in the rural sector want their children to be educated in the cities where high level of educational institution can be assessed. Youn (1974) also tries to determine the general determinants of inter-migration in Korea. As he indicates, the general determinants of migration between two sector before the 1980s were about 38.3% for the family matters, 37.3% for the economic reasons, and 18.6% for the education opportunity. He also shows that different sexes have different reasons for migration, in which men (52.1%) is for the economic, and women (58.8%) for the family matters as the important determinants of migration. Goo(1986) analyzes the determinants of migration in Korea based on ages. He considers the degree to which each variable for under30 years old in terms of the sensitivity in migration by the economic reason, distance, and population crowd sensitivity. He finds that the higher the level of education the higher the rate of migration for the ages. But, it is not always true that those age group are determined to income, distance, and population crowd sensitivity. This implies that young migrants consider the economic opportunity in cities as the main determinant of migration in Korea. For those who have less educated people above 30 years old, the economic opportunity in cities do not appeal to them very much. Choi et. al. (1984, 1986) assert that the trend for migration from rural to urban cities is becoming decreased in the Korea after 1980s, whereas the trend for intracities tends to be increased after the 1980s. They also investigate the main determinants of migrants in terms of education, and asymmetric labor market information. According to them, relatively less educated, skilled, and informed persons tend to increase migrating between the sector. However, there exists a room for the migrant to stay in the urban sector after migrating.

III. The Theoretical Aspects of Migration

1. The human capital approach to migration

Economists have long been interested in migration because it is a mechanism that in principle should have an equilibrating effect in the labor market. While early analyses of migration emphasized these aggregate effects, more recent work has focused on migration behavior at the individual level. The human capital approach to migration (going back to the early 1960s and Sjaastad) treats migration as an investment increasing the productivity of human resources. Investment constitutes a sacrifice of current consumption in exchange for (presumably higher) future consumption. Investment activity thus entails both costs and returns, and in principle the desirability of the activity can be measured by the rate of return to resources allocated to the investment, or the present value of the stream of net returns.

DaVanzo's equation (1) nicely represents the basic microeconomic model of migration decision making:

$$PV_{ij} = \text{"SUM"} \text{ (from } t=1 \text{ to } T) \left[(U_{jt} - U_{it} - C_{ijt}) / (1+r)\text{exp } t \right] \text{----------(1)}$$

PV_{ij} equals the present value of the net gain of moving from place i to place j; U_{jt} equals the expected utility or real income at place j in period t; U_{it} equals the expected utility or real income at place i in period t; C_{ijt} equals the cost incurred in period t of moving from i to j; r equals the discount rate ($0 <= r <= 1$; according to DaVanzo r is normally between .05 and .15); and T equals the expected length of remaining lifetime.

This approach assumes that both objective and subjective variables can be translated into utility terms. Further, note that U_{it} effectively represents the opportunity cost of migrating. Given an individual's current place of residence (i), migration will occur if there is some destination (j) for which $PV_{ij} > 0$. If there is more than one such destination, migration will be to

the location (j) that has the highest value of PV_{ij}. U_{jt} - U_{it} represents the gain in utility in period t from moving. This gain can be broken down into two components: a portion attributable to the change in the migrant's real earnings or real income stream, $(Y_{jt}/P_{jt}) - (Y_{it}/P_{it})$, where Y/P represents money income relative to prices or real income; and a portion representing the change in utility due to the difference in locational preferences between the origin and the destination.

Likewise, the cost in period t of migration from i to j, C_{ijt}, may be viewed as representing three elements: the direct money cost of moving, the opportunity cost of moving (forgone earnings), and the psychic cost of moving (loss of utility from leaving behind friends and family). As DaVanzo notes, empirical work typically treats costs as occurring at the time of the move; later costs, such as subsequent forgone earnings, are treated as negative benefits.

Empirical implementation of this conceptual approach raises a host of issues, some of which will be examined in detail below. At this point, however, it is useful to highlight some immediate implications of the model that help account for observed regularities in migration behavior in a wide variety of social and economic settings. First, the model's emphasis on migration as an investment yielding returns throughout the migrant's lifetime helps account for the markedly higher propensity of the young to migrate. Young migrants have a longer period during which they can recoup the costs of investing in migration, and this result in a greater present value of returns, which in turn should increase the probability of migration.

Psychic costs of migration are also likely to be smaller for young people, who have not had the same opportunities (time) as their older counterparts to develop strong ties to their present location. With fewer belongings and smaller families, the young also have lower direct costs of moving (a relatively minor factor). More generally, the lifetime perspective inherent in the model emphasizes the importance of long-term considerations. Consideration of negative

transitory effects of migration and of complementary occupational training investments reinforces the desirability of taking a long view in studying migration behavior. We'll see later in this section that taking a long view is particularly helpful in understanding rural-urban migration in the Third World (Todaro model).

At the same time, it should also be clear that short-run considerations may be relevant as well. At the individual level, the greater propensity of the unemployed to migrate presumably reflects lower opportunity cost of migration, as well as lowers opportunity cost of investing in information relevant to the migration decision. At the aggregate level, there are fluctuations in migration flows to various places (e.g., Australia, U.S. historically) that reflect short-run fluctuations in economic activity (recession vs. prosperity).

2. The Economic Environment

In terms of proper measurement of nominal wage gaps between farm and city, even though adjusting urban cost-of -living differentials and disamenities, a residual gap still remains to be explained even for these decades. Whether we observe equilibrium annul real earnings differentials or true manifestations of disequilibrium distortions in nominal wage gaps between farm and city is one of the most popular arguments for nominal wage gaps. Regarding this matter, Todaro(1969), even though his model has never been adequately tested with time series data, makes the plausible assertion that minimum wage, urban unemployment, and flexible wage jointly account for the wage gap. The Korea experience with the ratio of farm to unskilled urban monthly wages is plotted in the Figure 1.

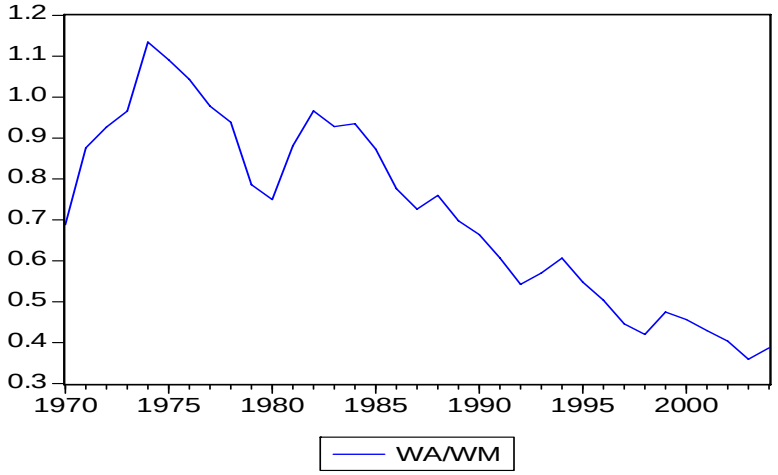

Figure1: The Nominal wage ratio

The Figure 1 shows that the nominal farm/non-farm wage ratio rise dramatically from the 1970 to the end of 1975 and from the 1980 to the end of 1984s, collapse so dramatically in the 1975s to the end of the 1980 and from the 1985 to the end of 2004.

IV. The Empirical Methodology

1. The Data

For our empirical tests, We examine data for Korea over the period from 1971 to 2004, using the yearly time-series data, and specify the nominal farm wage (W_a), the nominal nonfarm wage (W_m), terms of trade (P_a, P_m) variables in logarithmic according to the Todaro reduced model. Nominal farm wage (W_a) is measured as full time equivalent workers in agriculture, and nominal nonfarm wage (W_m) is defined as the manufacturer's monthly earnings of unskilled male workers, measured by Korea currency, won. Both wage terms (W_a , W_m) are obtained from the national statistics service of Korea.

In terms of trade (P_a, P_m), the farm price index, P_a is used for the price for the farm products

excluded non-food, indexed by 100 in 2000. This data is obtained from the bank of the Korea statistics. Similarly, the nonfarm price index, P_m, is used for the price for the manufacture goods, indexed by 100 in 2000, and obtained from the bank of the Korea statistics.

Farm migration rate data (M_a) is defined as annual migration rate from current December 31 to next year's December 31 between rural and urban cities; Seoul, Busan, Incheon, Daejon, Daegu, Ulsan, Kwangju, for the 1971-2004. It contains only economically labor population rather than total population. This data series is obtained from the yearbook of the internal migration in Korea (National Statistics).

The urban unemployment rate (U) is measured as unskilled male workers in manufacture sector for the 1971-2004, and is assumed that all unemployed are nonfarm, although farm seasonal employment is, of course, quite significant. This data is obtained from the bank of Korea via the Internet.

The civilian labor force (L) is defined as the population over 15 years old, and the underlying data series come from the national statistics in Korea.

2 The VAR approaches

Due mainly to a lack of good time-series data on migration, especially in Korea, studies of migration's determinants and consequences are rare in Korea. As a result of lack of time series data, investigators have little knowledge of the dynamic properties of migration models. A central, surprising, and controversial result of the Todaro hypothesis on migration literature is the claim that rural and urban sector 's wage are equalized through the migration based on the minimum urban industrial wage, that is, urban industrial wage is exogenously fixed by the government.

The VAR approaches in Korea's migration pattern allow us to measure its importance, and

extract estimates of its realized value in internal migration in Korea by applying these procedures to migration rate, urban wage, rural wage, urban price, rural price, and city employment rate for the time series data during 1971~2004. Econometric methodology in here can determine the importance of asymmetrical labor market conditions within a wide class of migration model.

An overview of the econometric techniques used to answer the questions posed in introduction. A VAR is a system in which every equation has the same right hand variables, and those variables include lagged values of all of the endogenous variables. Let Π_t and ε_t respectively, be the vector of the five dependent variables, (M_A, W_m/P_m, W_a/P_a, P_a/P_m, and E_m)' and the vector of the orthogonal innovations, ($\varepsilon_t^{M_A}$, $\varepsilon_t^{W_m/P_m}$, $\varepsilon_t^{W_a/P_a}$, $\varepsilon_t^{P_a/P_m}$, and $\varepsilon_t^{E_m}$)'. The system of equation can be collected and written in vector form as:

$$C_0\Pi_t = \mu + C(L)\,\Pi_{t-1} + \varepsilon_t \qquad (2)$$

Where Π_t = (M_A, W_m/P_m, W_a/P_a, P_a/P_m, and E_m)'

ε_t = ($\varepsilon_t^{M_A}$, $\varepsilon_t^{W_m/P_m}$, $\varepsilon_t^{W_a/P_a}$, $\varepsilon_t^{P_a/P_m}$, and $\varepsilon_t^{E_m}$)'

$\mu = (\mu_1, \mu_2, \mu_3, \mu_4, \mu_5)'$

$$C_0 = \begin{vmatrix} 1 & -\beta^{(0)}_{12} & -\beta^{(0)}_{13} & -\beta^{(0)}_{14} & -\beta^{(0)}_{15} \\ -\beta^{(0)}_{21} & 1 & -\beta^{(0)}_{23} & -\beta^{(0)}_{24} & -\beta^{(0)}_{25} \\ -\beta^{(0)}_{31} & -\beta^{(0)}_{32} & 1 & -\beta^{(0)}_{34} & -\beta^{(0)}_{35} \\ -\beta^{(0)}_{41} & -\beta^{(0)}_{42} & -\beta^{(0)}_{43} & 1 & -\beta^{(0)}_{45} \\ -\beta^{(0)}_{51} & -\beta^{(0)}_{52} & -\beta^{(0)}_{53} & -\beta^{(0)}_{54} & 1 \end{vmatrix}$$

and C_s is a (5 ×5) matrix whose row *i*, column *j* element is given by $-\beta^{(s)}_{ij}$ for s=1,2,3,..*p*. It is assumed that a sufficient number of lags of *p* are included and the matrices C_s are defined so that ε_t is vector white noise. If instead, say, ε_t followed an r-th order VAR, with $\varepsilon_t = B(L)\,\varepsilon_{t-1} + \eta_t$

then we could multiply equation (14) by $B(L)^{-1}$ to arrive at the system of the same basic form as equation 1 with p replaced by ($p+r$) and ε_t replaced by the white noise disturbances η_t.

If each side of equation (2) is premultiplies by $C^{-1}{}_{0,}$ the result is

$$\Pi_t = \delta + \Phi(L)\,\Pi_{t-1} + \zeta_t \qquad (3)$$

where $\delta = C^{-1}{}_0\mu$

$\Phi_s = C^{-1}{}_0\, C_s$ for s = 1, 2, 3,…p

$\zeta_t = C^{-1}{}_0\varepsilon_t$

Assuming that equation (2) is parametrized sufficiently that ε_t is vector white noise, then ζ_t will also be vector white noise and equation (3) will be recognized as the vector autoregressive representation for the dynamic structural system of equation (2). Thus, a VAR can be viewed as the reduced form of a general dynamic structural model.

1) Preliminary Data Analysis

The data are monthly Korea observations on migration rate (M_A) between rural and urban sector, real urban wage income (W_m/P_m), real rural wage income (W_a/P_a), the relative price of the agricultural good (P_a/P_m), and urban employment rate (E_m) for the 1971-2004. The levels of all variables are in logs. We first plot each of the variables both in levels and in first differences in the Figure 3, and 4, respectively. The plots of the data in levels and differences indicate that the variables are likely to be nonstationary in levels and stationary in differences.

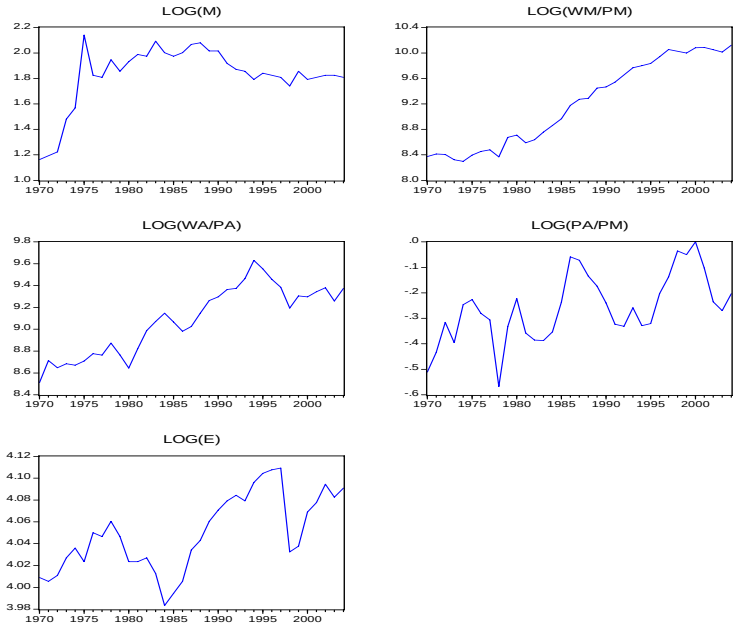

Figure 3: The plots of level data, 1971-2004.

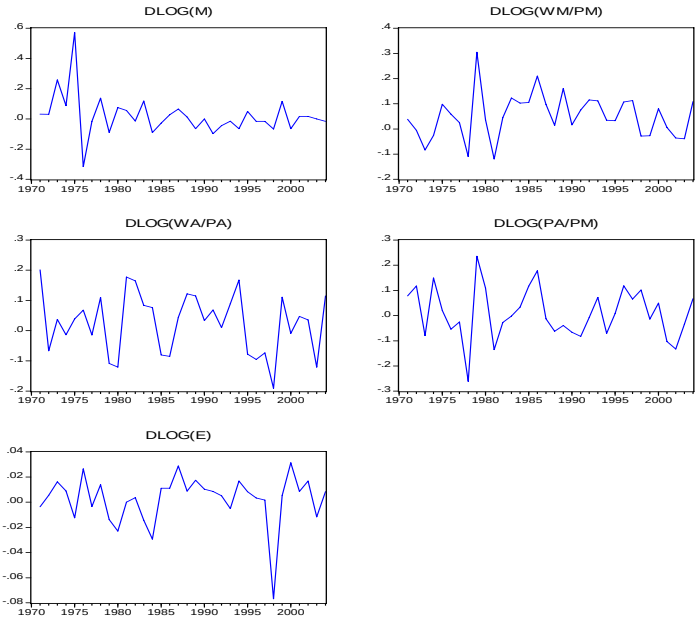

Figure 4: The plots of difference data, 1971-2004

For time series analysis, the stability of time series data must be guaranteed, and unit root test

[5]can confirm this. There are some sorts of unit root tests to time series analysis; in general, DF test presented by Dickey-Fuller (1979), informs that ADF test extends to DF test, and PP test revealed by Phillips-Perron (1988). PP test, which is introduced by Phillips-Perron (1988), modifies and supplements DF test by introducing a case of hetero-phenomenon, even autocorrelation of error terms as well - that is a comprehensive situation which is not adequate to the assumption error terms should come to i.i.d$(0,\sum)$. Accordingly, PP test have an advantage that is able to test a wide rage of variables compared to DF test or ADF test.

The following two models are used for ADF test. First of all, general AR model (2) is

$$\Delta Y_t = \mu+\rho Y_{t-1}+\varepsilon_t \quad (4)$$

In equation (4), AR (1) has a stable time series in terms of $1<\rho<1$, but result in a unstable time series if any p=1. So, the model to ADF test is revised as below.

$$\Delta Y_t = \mu+\gamma Y_{t-1}+\varepsilon_t \quad (5)$$

where, $\gamma = \rho-1$, H_o: $\gamma=0$

If null hypothesis (H_o: $\gamma=0$) is not rejected above model (5), ΔY_t, a time series, is exceptional and have a unit. The result of test is as shown in the Table 4.

Table 4: The summaries of ADF tests for the variables

	M_A	W_M/P_M	W_A/P_A	P_A/P_M	E_M
level	-3.168	-0.17	-1.67	-2.84	-1.65
	(0.03)	(0.93)	(0.43)	(0.06)	(0.44)
1st	-7.13	-5.49	-5.56	-5.55	-5.32

[5] In case that regression analysis is preformed among the unstable time series, which involves a unit root, it is possible that "spurious regression" (being not clear for statistical significance) is likely to be generated

Difference	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Note: 1.The numbers represents the t-values on the coefficient of each variable based on level and difference

2. P-values are in the parentheses

3. Critical values(1% level:-3.64, 5%level:-2.95, 10%level:-2.61)

This table 4 shows that we can reject the presence of unit-root components in the great ratio; all the variables are significant at the 1-percent level for the 1st difference. However, the unit-root test for the level data doesn't reject. Thus, univariate analysis of these five variables indicates that all variables are characterized as I(1) process without drift.

2) Analysis of Granger Causality Test

The Granger approach to the question whether X causes Y is to see how much of the current Y can be explained by past values of Y and then to see whether adding lagged values of X can improve the explanation. Y is said to be Granger-caused by X if X helps in the prediction of Y, or equivalently if the coefficients on the lagged Xs are statistically significant. Note that two-way causation is frequently the case; X Granger causes Y and Y Granger causes X. It is important to note that the statement "X Granger causes Y" does not imply that Y is the effect or the result of X. Granger causality test measures precedence and information content but does not by itself indicate causality in the more common use of term. We, namely, can think of two-equation system that express it clearly such as the following or vector auto-regression by column vector of (X.Y), where X, Y are the set of each two test variables among M_A, W_m/P_m, W_a/P_a, P_a/P_m, and E_m .

$$X_t = \sum_{i=1} a_i X_{t-1} + \sum_{j=1} b_j Y_{t-j} + \varepsilon_{1t} \qquad (6)$$

$$Y_t = \Sigma_{i=1} c_i Y_{j=1} + \Sigma_{j=1} d_i X_{t-j} + \varepsilon_{2t}$$

After presuming above formulas and thinking two null hypotheses, which is H_o^1:a_i=0 and H_o^2:d_j =0, we judge existence of causality by practicing F test[6] about each null hypothesis. If rejecting H_o^1:a_i=0 and H_o^2:d_j =0, causality exists, and if selecting those. In terms of rejecting H_o^1:a_i=0 and not rejecting H_o^2:d_j =0, Granger cause from X to Y exist. On the opposite side, it is estimated that Granger cause from Y to X exist. The results are as shown in the Table 5.

Table 5: The Granger Causality test results

Null Hypothesis	F-stat.	Prob.
LOG(WM/PM) ≠ LOG(M)	1.38232	0.27247
LOG(M) ≠ LOG(WM/PM)	**5.09323**	**0.00465**
LOG(WA/PA) ≠ LOG(M)	**2.62020**	**0.06262**
LOG(M) ≠ LOG(WA/PA)	0.92759	0.46594
LOG(PA/PM) ≠ LOG(M)	1.85041	0.15517
LOG(M) ≠ LOG(PA/PM)	**3.78898**	**0.01721**
LOG(E) ≠ LOG(M)	**2.85723**	**0.04775**
LOG(M) ≠ LOG(E)	0.33527	0.85122
LOG(WA/PA) ≠ LOG(WM/PM)	**2.31062**	**0.08980**
LOG(WM/PM) ≠ LOG(WA/PA)	1.84870	0.15549
LOG(PA/PM) ≠ LOG(WM/PM)	0.78101	0.54955
LOG(WM/PM) ≠ LOG(PA/PM)	1.85044	0.15516

[6] F Test is little different from the existing method like this. That is F=[(SSRR-SSRU)/q]/ [(SSRU)/(n-k)]. n,k,q is relatively total data number, the number of estimated parameter, and the number of constraints

LOG(E) ≠ LOG(WM/PM)	0.49804	0.73737
LOG(WM/PM) ≠ LOG(E)	1.35530	0.28145
LOG(PA/PM) ≠ LOG(WA/PA)	1.02284	0.41738
LOG(WA/PA) ≠ LOG(PA/PM)	2.05853	0.12100
LOG(E) ≠ LOG(WA/PA)	1.91312	0.14394
LOG(WA/PA) ≠ LOG(E)	1.21503	0.33280
LOG(E) ≠ LOG(PA/PM)	1.29247	0.30344
LOG(PA/PM) ≠ LOG(E)	1.21662	0.33217

Note: 1.* indicates that the null hypothesis can be rejected at 10 % significance level.

2. lags for 4

3. ≠ stands for "does not Granger cause"

According to this test results, Table 5, the employment rate does Granger cause the migration rate, which in turn does Granger cause the urban real wage and the relative price of the agricultural goods. Also, the rural real wage does Granger cause the urban real wage. However, there is no Granger causality relationship among the relative price of agricultural goods and the urban real wage, the employment rate and urban real wage, the relative price of agricultural goods and the rural real wages, the employment rate and the rural real wage, and the employment rate and the relative price of agricultural goods. So, unlike the Todaro's hypothesis, migration between rural and urban sector in Korea isn't driven by the urban real wage, but by the employment in the urban sector. However, the test results of the Granger Causality are weak significance level of F-stat, implying that there may exist other factors that capture the determinants of Korea's intermigration between rural and urban sector. That is the major

determinants of intermigration in Korea can be characterized by non-economic factors[7] such as amenity, education opportunity, and family matters, etc.

3) Impulse Response Function

The impulse function traces the response of an endogenous variable to a change in one of the innovations[8]. An impulse response function describes the response of an endogenous variable to one of the innovations. Specifically, it traces the effects on current and future values of the endogenous variables of a one standard deviation shocks to one of the innovations. The ambiguity in interpreting impulse response functions arise from the fact that the errors are never totally uncorrelated. When the errors are correlated they have a common component which cannot be identifies with any specific variable. More technically, the errors are orthogonalized by a Cholesky decomposition so that the covariance matrix of the resulting innovation is diagonal. While the Cholesky decomposition is widely used, it is a rather arbitrary method of attributing common effects[9]. There is one impulse response function for each innovation, and the ordering[10] of the innovation is the employment, farm migration rate, the urban real wage, the relatively price of agricultural goods, and the rural real wage($\varepsilon_t^{E}{}_{m,}\varepsilon_t^{M}{}_{A,}\ \varepsilon_t^{W}{}_{m}^{/P}{}_{m,}\varepsilon_t^{P}{}_{a}^{/P}{}_{m}$ and $\varepsilon_t^{W}{}_{a}^{/P}{}_{a}$)based on the results of Granger causality test[11].

According to the impulse response function results as shown in the Figure 5, the employment

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[7] See the study of Yoo (1991), Youn (1974), Goo(1986), and Choi et. al. (1984, 1986)

[8] The ordering of innovation for the impulse response function and variance decomposition is $\varepsilon_t^{E}{}_{M} \rightarrow \varepsilon_t^{M}{}_{A} \rightarrow \varepsilon_t^{W}{}_{m}^{/P}{}_{m} \rightarrow \varepsilon_t^{P}{}_{a}^{/P}{}_{m} \rightarrow \varepsilon_t^{W}{}_{a}^{/P}{}_{a}$, based on the results of Granger causality test.

[9] Changing orders of equation can dramatically change the impulse response and care should be given to interpreting the impulse response function

[10] A somewhat arbitrary method of dealing with this problem is to attribute all of the effect of any common component to the variable that comes first in the VAR system.

[11] Also the number of periods to trace the response function is 10.

rate in the urban sector responds to the rural real wage, relative price of the agricultural goods, and employment rate itself for the beginning periods which is about 1~2 years, but doesn't respond to farm migration rate and the urban real wage. The farm migration rate responds to the farm migration rate itself for the 1~2 years, the urban real wage and the rural real wage for 1~4 years, the relative price of agricultural goods and employment rate for 1~7 years. The urban real wage responds to the farm migration rate for the 1~5 years, the urban real wage itself for 1~7 years, the rural real wage 1~4 years, the employment rate for 1~6 years, but responds to relative price of agricultural goods weakly. The relative price of agricultural goods respond to all the variables, and the rural real wage responds to all the variables except the farm migration rate. See the Figure 5 for the detail.

4) Variance –Decomposition

The relative importance of the random innovation in our model by conducting a variance decomposition is examined. The results present the fraction of the forecast errors variance of the variables that is attributed to each of the shocks. The most important disturbance for the employment rate in the urban sector is the employment rate itself, other four variables doesn't account for the disturbance of the employment rate. For the farm migration rate between rural and urban sector, the most important disturbance is the migration rate itself, the relative price of agricultural goods and the rural real wage. But, the urban real wage and employment rate account for the disturbance of the farm migration rate weakly. For the urban real wage, the most important disturbance is the urban real wage itself, other four variables doesn't account for the disturbance of the urban real wage mostly. For the relative price of agricultural goods, the most important disturbance are the urban real wage and the relative price of agricultural goods itself, but responds to the rural real wage and the employment rate weakly. For the rural real wage, the

most important disturbance is the rural real wage itself, but responds to other variables very weakly.

IV. Conclusions

Based on the Macro time series data, the Korea experience with the ratio of rural to unskilled urban monthly wages indicates that the nominal farm/non-farm wage ratio rise dramatically from the 1970 to the end of 1975 and from the 1980 to the end of 1984s, collapse so dramatically in the 1975s to the end of the 1980 and from the 1985 to the end of 2004. This statistical evidence shows that like the most of the migration literature assists urban wage are greater than that of rural sector, which in one crucial factor that leads to move the rural migrants to the urban sector.

For the short-run transitional dynamic behavior, this paper analyze the determinants of Korea’s migration between the two sector by taking the VAR approaches in which Granger Causality test, impulse response function and the variance decomposition according to the general process of the VAR approaches. Korea's migration pattern by applying the VAR approaches to emigration rate, urban real wage, rural real wage, relative agricultural price, and city employment rate for the 1971-2004 time series data.

According to the Granger Causality test results, Table 2, the employment rate does Granger cause the migration rate, which in turn does Granger cause the urban real wage and the relative price of the agricultural goods. Also, the rural real wage does Granger cause the urban real wage. However, the test results of the Granger Causality are weak significance level of F-stat, implying that there may exist other factors that capture the determinants of Korea’s intermigration between rural and urban sector.

The impulse response function analysis as shown in the Figure 5 is consistent with the result

of Granger Causality tests that the farm migration rate responds to the farm migration rate itself for the 1~2 years, the urban real wage and the rural real wage for 1~4 years, the relative price of agricultural goods and employment rate for 1~7 years.

For the farm migration rate between rural and urban sector, the most important disturbance is the migration rate itself, the relative price of agricultural goods and the urban real wage and the rural real wage. But, the employment rate account for the disturbance of the farm migration rate weakly.

In conclusion, the determinants of migration between rural and urban sector in Korea are mostly consistent with the hypothesis of Todaro's model, except the role of labor force in the reduced-form version of the Todaro model, implying farm migration rate is dependent upon the farm terms of trade(P_a/P_m) and the urban real wage, $\log(W_m/P_m)$, conform expectation. However, the positive coefficient on the labor force does not support the Todaro view in Korea. Even if given industrial wages were sticky, the labor force served not to raise urban unemployment, to lower farm emigration rate, and to reduce the farm wage relative to industry.

However, the analysis can not capture the non economical factors which affect the Korea's migration pattern so that we should be combine the microeconomic data and more complicated methods to verify the other non economical determinants of migration pattern in Korea.

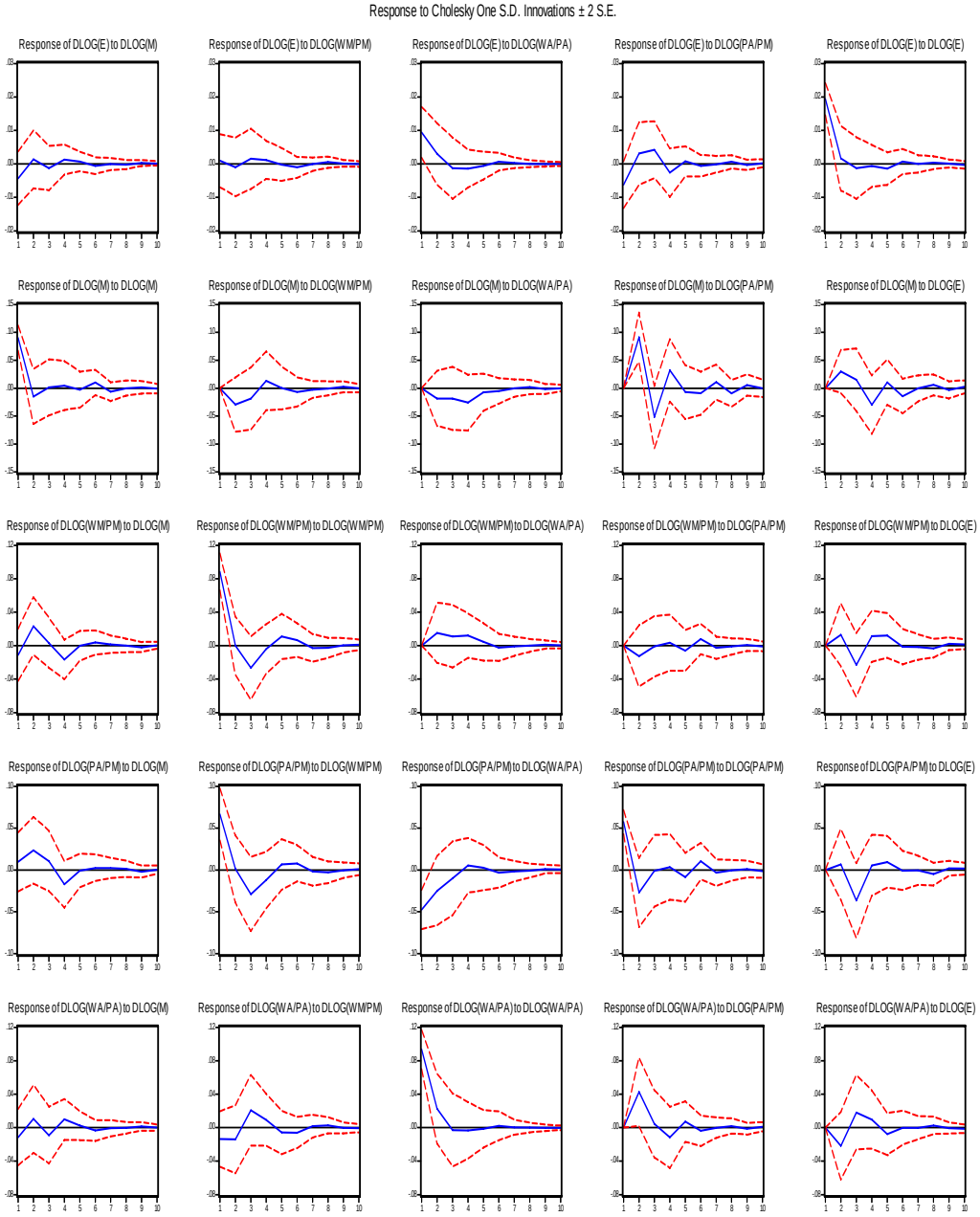

Figure 5: Impulse Response Function

Note: The emigration rate, M, the urban real wage, $W_m/P_{m,}$, the rural real wage, $W_a/P_{a,}$, the relative agricultural price, $P_a/P_{m,}$, and the employment rate, E.

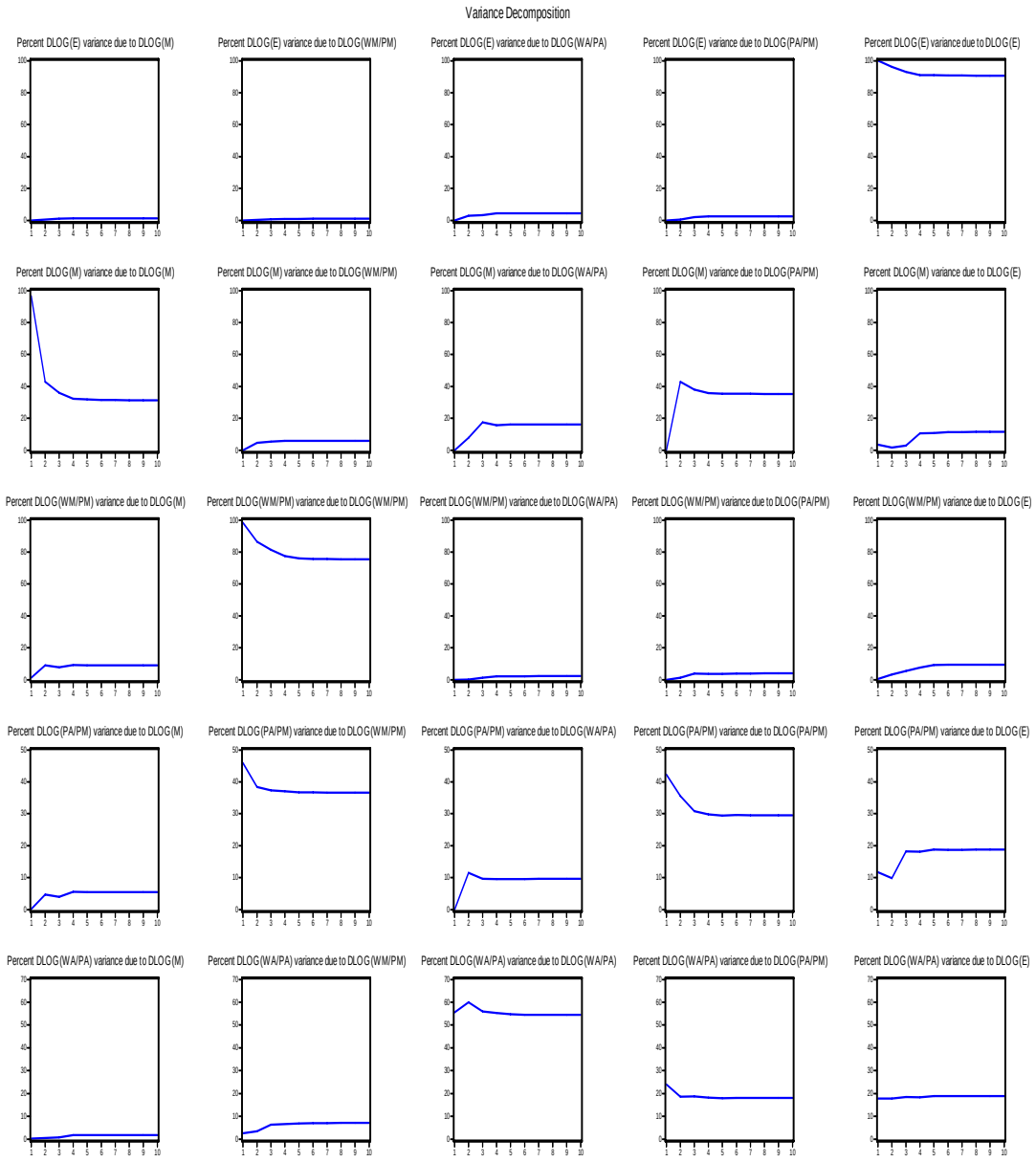

Figure 6: Variance decomposition

Note: The emigration rate, M, the urban real wage, $W_m/P_{m,}$, the rural real wage, $W_a/P_{a,}$, the relative agricultural price, $P_a/P_{m,}$, and the employment rate, E.

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