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This paper is from the
GTAP Annual Conference on Global Economic Analysis
https://www.gtap.agecon.purdue.edu/events/conferences/default.asp

Contribution of rural migration to China's economic growth

– A dynamic general equilibrium analysis

Xiujian Peng

1. Introduction

China has experienced massive rural labour movement since 1978. The rural economic reforms have released large amounts of labour to move from agricultural sectors to other more productive sectors such as construction, manufacturing and services. According to the First Agricultural Census China had 74 million rural labour who worked for more than one month outside of their township of residence in 1997. The corresponding data has increased to 130 million in 2006 and 166 million in 2013. Meanwhile the employment in rural non-agricultural sectors has also increased dramatically. The large rural labour movement has proven to be a source of gain in allocative efficiency and labour productivity. Many studies have shown that the contribution to economic growth of rural labour movements (from agricultural to rural non-agricultural and urban industrial and services sectors) was 14 to 20 percent between 1978 and the mid 1990s (World Bank, 1997, 2005; Woo, 1998; Cai and Wang, 1999; Kuijs and Wang, 2005 and Dekle and Vandenbroucke, 2006). However there has less research in the literature about the contribution of rural labour movement to economic growth from the late 1990s to the present, though China has sustained its rapid economic growth during last two decades and there is rising and accelerating number of individuals from the rural labour force that are moving from farm to off farm employment (Wang, *et. al.* 2011*)*.

To fill this gap in empirical knowledge this paper conducts historical estimation of the contribution of rural labour movements to China's economic growth and rural household income growth over the period of 1997 to 2013.

2. Methodology
2.1 CHINAGEM model

The investigation employs a dynamic CGE model of Chinese economy - CHINAGEM model. It includes 137 sectors. There are two versions of CHINAGEM model: one is based on 1997 input-output table and the other is based on 2002 input-output table of China. In this paper, the former was applied to conduct the historical estimation of the contribution of rural labour

movements to economic growth over the period of 1997 to 2013. The core CGE structure of CHINAGEM is based on ORANI, a static CGE model of the Australian economy (Dixon et al 1982). The dynamic mechanism of CHINAGEM is based on the MONASH model of the Australian economy (Dixon and Rimmer, 2002). The CHINAGEM model captures three types of dynamic links: physical capital accumulation; financial asset/liability accumulation; and lagged adjustment processes in the labour market.

In CHINAGEM, production is modelled using nested constant elasticity of substitution (CES) and Leontief production functions which allow substitution between domestic and imported sources of produced inputs and between labour, capital and land. The production functions are subject to constant returns to scale. Household demand is modelled by the linear expenditure system (ELES). Trade is modelled using the Armington assumption for import demand and a constant elasticity of transformation (CET) for export supply. China is considered as a small open economy in import markets with foreign import prices determined in world markets. Exports are demanded according to constant-elasticity demand curves for most commodities. In the model, capital stock is accumulated through investment activities (net of depreciation). Investors respond to changes in the expected rate of return.

2.2 Labour market module

To capture the impact of movement of rural workers to China's economic growth, we introduce a labour market module into CHINAGEM which captures the specific features of China's labour market. Two crucial concepts in the CHINAGEM labour market module are categories and activities of labour supply. At the start of year t, the person-years of labour that will be available during the year are allocated to categories of labour supply. The categories are determined mainly on the basis of employment during the preceding year (t-1). Activities in year t are what people do in that year. The relationship between activities and categories is illustrated in Figure 1.

Figure 1: Labour market dynamics
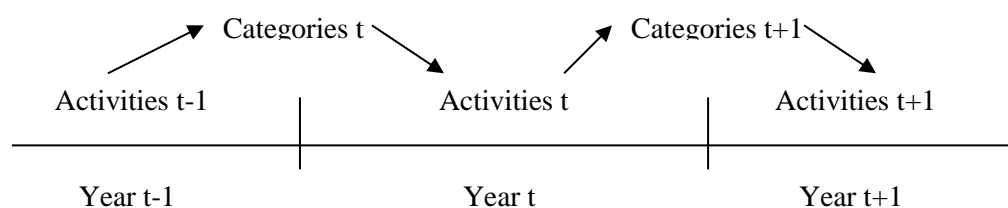
The labour market module contains ten labour supply categories: five employment categories, three unemployment categories, and two new entrant categories (Table 1). The first eight of these categories are associated with corresponding activities. For example, the category AG for year t refers to the number of person-years of employment in rural agriculture in year t-1 that is still available for employment in year t. The activity AG for year t refers to the number of person-years actually absorbed in rural agricultural employment in year t. Most of the AG-category labour in year t is employed in activity AG in year t. However, some AG category labour may flow to other activities, and some labour from other categories may flow to the AG activity.

Different categories have different labour supply behaviour and there are different degrees of mobility between categories. We treat the entire rural labour force as unskilled workers and we assume that all rural employment and unemployment categories can only make offers to work in rural activities (AG, RNAG, and RUE) because of China's residential registration (hukou) system. But rural new entrants (NRUR) can make offers to rural as well as urban activities. This is based on the assumption that some urban enterprises recruit new entrants from rural areas and grant them urban residential status. Rural new entrants with university degrees may acquire a job in a skilled urban occupation and obtain urban residential status. For the urban labour force we disaggregate into two employment categories, urban skilled employment (USE) and urban unskilled employment (UUSE); one unemployment category (UU); and one new entrant category (NURB). We assume that urban categories make offers only to urban activities (UUSE and USE). We assume no voluntary unemployment in China. Consequently, no category makes offers to unemployment. We summarize the labour supply categories and activities in Table 1.

The number of persons employed in an activity in the current year is determined by the

demand for and supply of that activity. Those who make an offer to an employment activity but do not get a job in that activity will be forced back to their previous employment activity or to the relevant unemployment activity.

The labour market module of the CHINAGEM model has the following equation blocks:

- demand for and employment of labour by activity;
- supply of labour by category;
- wage adjustment reflecting the gap between demand and supply;
- the determination of everyone's activity in year t; and
- linking the number of people in activity o in year t to the number of people in category c in year t+1.

Please refer to the appendix for a formal presentation of the labour market module.

Table 1: Categories and Activities

	Employment categories and activities
AG	**AG**riculture - Person-years of employment in rural agriculture sectors with rural residential status
RNAG	**R**ural **N**on-**AG**riculture – Person-years of employment of rural people in non-agriculture industries within their township of residence, such as in township and village enterprises and private enterprises in rural areas
RUE	**R**ural-**U**rban **E**mployment – Person-years of employment of rural people in non-agriculture industries outside of their township of residence
UUSE	**U**rban **U**n**S**killed **E**mployment – Person-years of employment of urban people in unskilled occupations
USE	**U**rban **S**killed **E**mployment – Person-years of employment of urban people in skilled occupations
	Unemployment categories and activities
RAGU	**R**ural **AG**ricultural **U**nemployment – Person-years spent by rural workers without a job in their township of residence
RUU	**R**ural-**U**rban **U**nemployment – Person-years spent by rural workers without a job outside their township of residence
UU	**U**rban **U**nemployment – Person-years of urban labour force that are not employed
	New entrants categories (no corresponding activities for these categories)
NRUR	**N**ew entrants **RUR**al – Person-years of new entrants into labour force with rural residential status
NURB	**N**ew entrants **URB**an – Person-years of new entrants into labour force with urban residential status

2.3 Data

For this paper the key part of the data is employment by activity and unemployment from 1997 to 2012. To derive a starting point for our dynamic simulations we needed to estimate the number of person years in 2002 spent in each of the 8 activities identified in Table 1.

2.3.1 Person-Year for the Five Employment Activities

The China Labour Statistical Yearbook provided totals on person-years of urban employment and rural employment. From the urban total we calculated the numbers of person-years in urban skilled employment (USE) using data (also from the China Labour Statistical Yearbook) on the shares of workers in urban sectors with post-high-school education. Urban unskilled employment (UUSE) was calculated by subtracting the USE employment from the total number of employed urban persons. The resulting employment data in person years for USE and UUSE is presented in Rows (4) and (5) of Table 2.

Table 2: Number of person-years (millions) of employment by activity

Categories	2002	2003	2004	2005	2006	2007	2002-2007 (%)
(1) AG	312	305	294	284	272	260	-3.6
(2) RNAG	96	97	101	105	108	111	3.0
(3) RUE	82	86	93	97	101	107	5.6
(4) UUSE	209	219	225	231	238	246	3.0
(5) USE	38	38	40	42	45	47	5.8
(6) Total number of employed rural person (6)=(1)+(2)+(3)	490	488	487	485	481	479	-0.4
(7) Total number of employed urban person (7)=(4)+(5)	248	256	265	273	283	293	3.4

Sources: Estimated by Yinhua Mai from data in China Statistical Yearbook, various issues; China Labour Statistical Yearbook, various issues; RCRE National Fixed-Site Survey of Rural Households; and National Bureau of Statistics, Second Agricultural Survey.

Available data on the number of persons employed in the RUE activity (rural migrant workers) are very confusing. The First and Second Agricultural Survey concluded that the total number of employed rural people were 560.9 and 478.5 million persons respectively in 1997 and 2006. The corresponding numbers of people who worked more than a month outside their township were 72.2 and 131.8 million persons.

These numbers need to be translated into person-years of employment in the industrial and services sectors of the model. For this purpose, we requested data from RCRE (Table 3) on numbers of working days as well as persons. RCRE data allowed us to calculate the share of RUE person-years in total employed rural persons. In calculating number of person-years in

the RUE activity, we assumed that a typical rural employed person works for 326 days per year (6.5 days a week with a two-week holiday during Chinese New Year). The resulting number of person-years in the RUE category is presented in Row (3) of Table 2. RCRE's National Fixed-Site Survey of Rural Households provides comparable data from 2003-2007. We derived numbers for 2002 by backwards extrapolation.

Table 3: RCRE survey data, 2003-2007

	2003	2004	2005	2006	2007
(1) Number of rural migrant workers in the sample (persons)	15596	16063	17193	17576	18739
(1.1)Agriculture, forestry and fishing	2484	2729	3123	3142	2867
(1.2)Non-agriculture, forestry and fishing	13112	13334	14070	14434	15872
(2) Number of days worked outside township of residence (1,000 days)	4015	4183	4519	4626	4942
(2.1)Agriculture, forestry and fishing	471	520	614	622	554
(2.2) Non-agriculture, forestry and fishing	3545	3663	3904	4004	4388
(3) Total number of employed rural persons in the sample (person-years)	59041	55985	56966	55615	57192

Sources: RCRE National Fixed-Site Survey of Rural Households: data provided by RCRE in April 2008.

The estimates for number of person-years employed in the RNAG activity is mainly based on number of persons employed in township and village enterprises by sector published in China Labour Statistical Yearbook. Similar to rural migrant workers, employees of township and village enterprises also engage in agricultural, forestry and fishing production. Due to lack of direct statistics, we assumed that the percent of person-year labour spent by an average township-and-village-enterprise worker in non-agriculture production is similar to that of a

rural migrant worker. We assume that an average township-and-village-enterprise worker spent a larger percentage of labour-year in agricultural production than an average rural migrant worker due to the former's proximity to home. The resulting employment in person years for the RNAG activity is presented in Row (2) of Table 2.

The number of persons employed in the AG activity (Row (1) in Table 2) is calculated by subtracting the person years employed in the RUE and RNAG activities from the total number of employed rural persons (Table 2). The total number of employed rural persons is published in the China Labour Statistical Yearbook.

Table 2 shows that the employment in the RUE category grew by about 5.6 per cent per year on average during 2002-2007. In 2006, number of person years in the RUE category was estimated to be 101 million. There are two reasons for this number to be lower than the number of rural migrant workers published in the Second Agricultural Survey (130 million). First, in the Second Agricultural Survey, the 130-million migrant workers are those who worked more than one month outside their township of residence. In our model, two persons working half-year each are counted as one person-year of employment. Second, the Second Agricultural Survey data includes those who travelled outside their township and worked in agricultural, forestry and fishing sectors. In the model, the RUE category is defined as rural person-years employed in industrial and services sectors outside their township of residence.

2.3.2 Person-Years for the Three Unemployment Activities

Person-years for unemployment activities in 2002 are derived from assumptions about unemployment rates. We assumed that the urban unemployment rate is about 6 per cent, slightly higher than the urban unemployment rate published in the China Statistical Yearbook. We assumed that the unemployment rate for the RUE activity is about 4 per cent, similar to the level of unemployment rate published in China Statistical Yearbook. Unemployment in rural areas is very small because most rural people can work on the allocated family land. However, we allowed for a small rate of unemployment (about 1.4 per cent) to reflect time spend by rural employed persons in transition between the three different rural employment activities. The resulting person-years by activity for the 2002 model database are presented in Table 4.

Table 4: Number of person-years of employment by activity in 2002

Categories	Million person-years
(1) AG	312
(2) RNAG	96
(3) RUE	82
(4) UUSE	212
(5) USE	35
(6) RAGU	6
(7) RUU	3
(8) UU	15
(9) Total	761

Sources: Estimated by authors.

3. **Baseline scenario**

In the baseline scenario, we tell the model what actually happened to China's economy from 1998 to 2013. We will update the model's database year-on year from 1998 to 2013 based on the data we obtained from China's statistical yearbooks, World Bank and other major surveys. We particularly tell the model the actual employment numbers of all labour categories.

4. Alternative scenarios

Two alternative scenarios are simulated in order to estimate the contribution of the rural labour movements to economic growth and rural household income growth.

- The first alternative scenario estimates the contribution of rural-urban migration to economic growth. In this scenario we assume that from 1998 the government tightens the migration policy and rural workers are not allowed to work in urban sectors as rural-urban migrants. The supply of rural-urban migrant workers will be reduced so that the annual number of rural-urban migrant workers from 1998 to 2010 will maintain at the same level as in 1997. This counterfactual simulation will be conducted as a policy simulation. By comparing the counterfactual simulation results

with the baseline scenario results, the effect of rural-urban migration on China's economic growth over the period of 1997 to 2013 will be evaluated.

- The second alternative scenario estimates the contribution to economic growth of rural labour movements from agricultural sector to non-agricultural sectors including rural non-agricultural sectors and urban industrial and service sectors. In this scenario we assume that the government would tighten the migration policy even further. The rural workers are forbidden working not only in urban sector but also in rural non-agricultural sectors from 1998. In this counterfactual scenario we will further reduce the supply of rural non-agricultural workers so that not only the number of rural-urban migrant workers but also the number of rural non-agricultural workers from 1998 to 2013 will maintain at the same level as in 1997. This counterfactual simulation will be conducted as a policy simulation. By comparing this counterfactual simulation results with the baseline scenario results, the contribution of rural labour inter-sectoral movement to economic growth will be evaluated.

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