The Role of Households in Sustaining China's Economy 1997-2007, A Structural Path Analysis

(draft, please do not cite)

Ling Yang, Xi'an Jiaotong University, China
lynnone@gmail.com

James Thurlow,
United Nations University- World Institute for Development Economics Research,

Michael L. Lahr,
Edward J. Bloustein School of Planning and Public Policy
Rutgers, the State University of New Jersey

Abstract: It is well-known that one nation (region)'s economy depends on not only the industry structure but also its industry linkages. However, as an important connecting pole of economic activities or more exactly, the linkages between the production and consumption spheres of the economy, household has been ignored in most research. In this paper, we construct 1997 and 2007 social accounting matrices for China with the data from various yearbooks, input-output tables, etc. We use structural path analysis, a good way to see how a certain sector (household) transmits its economic influence in great detail. It is also a better method because it can even consider some cases ignored by multiplier analysis, for example, multipliers with small magnitude may involve many linkages in the economic system. We found that household plays a relatively important role in sustaining China's economy and the contribution varies from 12% to 43% across sectors. However, due to increasing import share and the deepening of economy in production activities, the importance decreases in 2007, i.e., from 7% to 38% for different sectors. The paper also shows that urban households and rural households play different role across sectors and time. In 1997, their importance is basically evenly distributed for most sectors, but in 2007, urban household exhibits significant importance in all sectors due to its great increment in both earning and consumption patterns.

Keywords: Households, Social Accounting Matrix, Structural Path Analysis

1. Introduction

China's economy is becoming increasingly consumer-oriented (Yang and Lahr, 2010; *People's Daily Online*, July 14, 2011). In fact, very recent official news from China (*Financial Post*, April 17, 2012) is starting to assuage concerns that the nation's economy may not be transitioning in this direction fast enough (Sharraden, 2011). But beyond eating more fish and meat (Maddisson, 2007) and an increasing predilection

of household to use energy resources (Zhang and Lahr, 2011), exactly how households spending is lifting and is expected to further lift China's economy remains unclear. Presumably, it has to do with transitioning the nation's economy so that it relies less upon its role in the global vertical specialization in manufacturing and assuring that its burgeoning domestic demands are endogenously met.

Through labor income and their expenditures, households account for sizeable shares of wealth accumulation, at least in developed nations (household spending accounts for just over 70% of US GDP, for example). So it is easy to see understand they might be able to propel economic growth. (But what aspect of the China's economy is its household spending expected to spur? For Western Isles region of Scotland and using structural path analysis, Deborah (2005) found that households with children were most effective at engaging in its local economy. But exactly why they were more effective remains unclear. Zhang and Lahr (2011) suggest that the introduction in China of lighting and heating to rural homes and of labor-savings devices to urban homes is inducing rises in electricity use and of energy use more generally. Unfortunately few other recent studies have investigated the details of the mechanisms by which households, especially those in China, might induce domestic growth.

The research presented here will employ a method similar to that used by Deborah (2005), but for China, one of the fastest-growing country in the world. In this vein, it may inform households' role as a growth pump primer for other developing countries, like India. Particularly, we examine households' changing effect on China's economy during the past decade. That is, we employ a comparative static analysis to complement existing research on both household economic linkages and structural path analysis.

In this paper, we construct 1997 and 2007 social accounting matrices (SAM) for China using data from various yearbooks, input-output tables, etc. We use structural path analysis to investigate how the household sector transmits its economic influence. It is also a better method because it can even consider some cases ignored by

multiplier analysis, for example, multipliers with small magnitude may involve many linkages in the economic system. The paper will answer the following questions: How household sustained China's economy? Particularly, for which sectors household are more important? How about things changed during the past decade and what's the different trend for urban households and rural households?

The paper organizes as the following: the second part describes the method in this paper, i.e., structural path analysis, section 3 shows how we construct China's social accounting matrix both for 1997 and 2007, section 4 discusses the result and the final part concludes the paper.

2. Method

2.1 SAM

SAMs illustrate economic relationships among different agents within an economic system during a certain year, see figure 1 for the direction of income flows within a SAM. Production activities usually indicate various sectors and factors include labor, capital and land etc. Institutions represent households, government and Rest of the World (ROW). It is clear that households transmit economic influence through income generation and induced spending. Table 1 is a simplified schematic SAM: income flows are depicted by rows and expenditures by columns in the square matrix. The total of each account in the row is equal to the same account in the column, which means an account's total income is equal to its total expenditures.

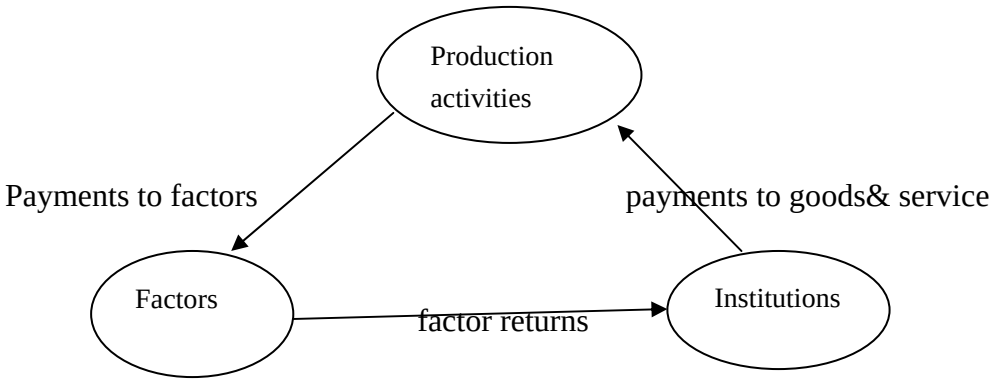

Figure 1. The Direction of Income Flows within a SAM

Table 1. Simplified Schematic Social Accounting Matrix

		Expenditures			
		Activities	factors	Households	Exogenous accounts
Receipts	Activities	T_{aa}	0	T_{ah}	T_{ax}
	factors	T_{fa}	0	0	T_{fx}
	Households	0	T_{hf}	T_{hh}	T_{hx}
	Exogenous accounts	T_{xa}	T_{xf}	T_{xh}	T_{xx}

The character T in table 1 denotes the transactions and the subscript a, f, h and x are the abbreviations of activities, factors, households and exogenous accounts respectively. $T_{i,j}$ reflects the income of i (row) from j (column). For example, T_{aa} means the transactions within the production activities, which is just the intermediate input matrix of an input-output table, such as the payment from the manufacturing sector to the agriculture sector. $T_{,h,f}$ shows the factor income of households for from the time they spend working, and T_{ah} represents households' consumption of goods and services. Several sub-matrices with zero value indicate that no transactions take place between the identified economic agents.

2.2 SAM multipliers

Usually we separate accounts into two categories: endogenous accounts and exogenous accounts. All the production activities, factors and households are incorporated endogenously, and the other accounts are exogenous to the model. Letting y be the total income, x be the injection of the system and A is the average expenditure propensity, which is only limited to endogenous accounts.

Keeping this in mind, we can easily get the following Leontief equation:

$$y = Ay + x$$
$$= (I - A)^{-1}x = Mx \qquad (1)$$

where M is the matrix of Leontief multipliers for the SAM, where a multiplier denotes the total endogenous income generated from a unit of exogenous injection. The Leontief multipliers account not only for the direct and indirect effects in the production activities but also for the induced income and consumption effects afterward. Household-related multipliers have limite usefulness: 1) income multipliers, identify the change in household income due to an exogenous change in a production sector; 2) household linkages, such as the change in low-income household income due to a change in high-income household spending; 3) others, such as identifying the impacts arising from exogenous injection from household. From these it would appear that identifying the ability of households to sustain regional economic change is not within reach. This is where structural path analysis is helpful.

2.3 Structural Path Analysis (SPA)

SPA decomposes multipliers into their component paths, i.e., it lists all the connecting poles between the certain exogenous account and the ultimate endogenous account for each path. The method identifies clearly both the qualitative nature of the influence transmitted within an economic structure and how large the influence is. Defourny and Thorbecke (1984) suggest that SPA is the most general sort of decomposition approach for multipliers. The method also has the advantage that it is comprehensive so that ven small sectors with a high degree of connection with the economic system get deserved recongition (Basu and Johnson, 1996). In summary it is a great way to examine sectors (households) that may be important transmitters of economic influence.

The technique yields information about three kinds of influences: global influence, total influence and direct influence. The multiplier in the M matrix in equation (1), called as “global influence” can be decomposed into sets of “total influence” and the latter is the product of “direct influence” and path multiplier. This relationship can be expressed by the following equations:

$$I_{j,i}^{G} = m_{j,i} = \sum_{p=1}^{n} I_{p(j,i)}^{T}$$

$$= \sum I^{D}_{p(j,i)} M_{p(j,i)} \qquad (2)$$

where $I^{G}_{j,i}$ = global influence from the ith column to the jth row.

$I^{T}_{p(j,i)}$= total influence from i to j

$I^{D}_{p(j,i)}$=direct influence from i to j

$M_{p(j,i)}$=path multiplier

p is the number of paths from i to j and n is the total number of elementary paths.

Figure 2 illustrates. There are altogether three elementary paths from poles i to j. The first is from i to node x, then y and reaches the destination, j; the second is from i to s and then j and the final one is linked by account v. Each two nodes are connected by an arc and the direct influence is the product of the intensities of the arcs (average expenditure propensities, which are the elements of coefficients in matrix A). For the first and third path, each path has one or more loops and hence their direct influence is transmitted along an elementary path that is amplified by adjacent circuits. Such amplification is measured by the path multiplier. An elementary path with more arcs typically has a higher path multiplier, and it is also reasonable that it takes longer time to transmit the influence. On the other hand, when fewer arcs are contained in an elementary path, its influence more easily identified. Due to the declining ability to be sure of attaining multiplier effects over many arcs, scholars applying SDA typically restrict their analyses to paths of that have 3 arcs or fewer (Deborah, 2005, Kahn and Thorbecke, 1989). In nay case, Defourny and Thorbecke (1984) suggested that paths with 3 or less arcs can account for quite a big part of the global influence (in a simple example, Miller and Blair, 2009, Table 2.6, show more than 98% of the all effects are, on average, accounted by using just three arcs). Meanwhile, it is difficult to cover all paths with different length as the number of paths could be very high. In our paper, we try to sketch a more comprehensive picture by incorporate paths with 3, 4, and 5 arcs

a_{yx}

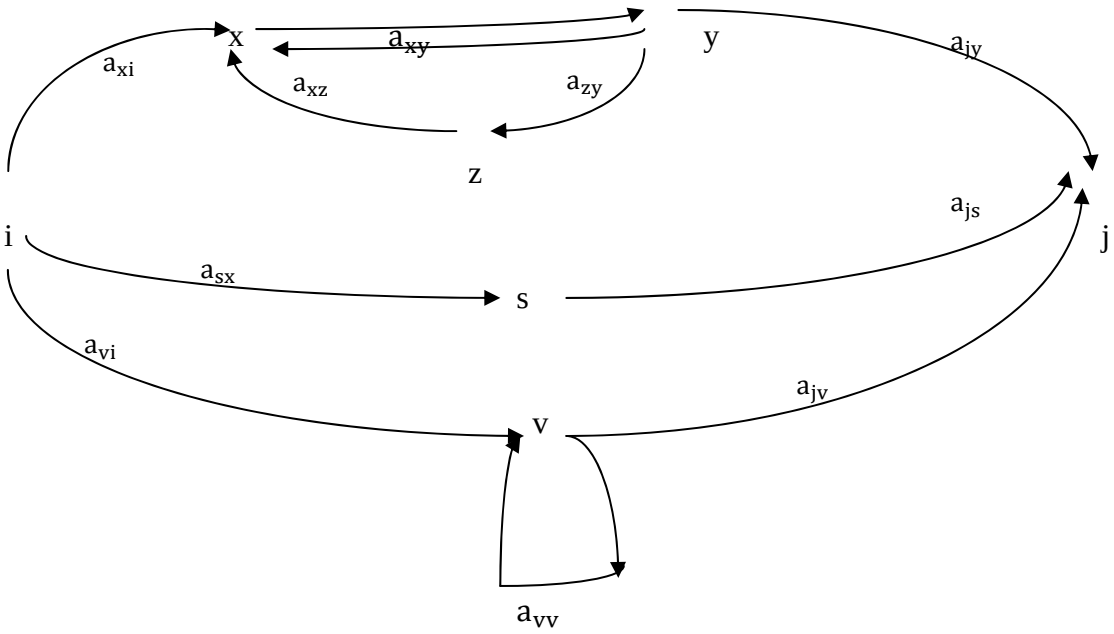

Figure 2. Network of elementary paths and adjacent circuits from poles i to j (Defourny and Thorbecke, 1984)

Following Deborah (2005), we bifurcate global influence into paths that pass through at least a household account and the others that do not pass through household account directly. That is,

$$I^{G}_{j,i} = \sum_{p=1}^{n} I^{T}_{p(j,i)} = \sum_{p=1}^{h} I^{T}_{p_h(j,i)} + \sum_{p=1}^{n-h} I^{T}_{p_{nh}(j,i)} \qquad (3)$$

Where h is the number of paths including at least one household account between i and j. Then we can add the global influence from sector j to all the production sectors (m), that is:

$$\sum_{i=1}^{m} I^{G}_{j,i} = \sum_{i=1}^{m} \sum_{p=1}^{h} I^{T}_{p_h(j,i)} + \sum_{i=1}^{m} \sum_{p=1}^{h} I^{T}_{p_{nh}(j,i)} \qquad (4)$$

The point here is to derive the global influence of those paths that pass through household accounts directly. This is identified by the first term on the right-hand side of equation (4). Household accounts may just appear in the adjacent circuit of the second term.

$$\text{RATIO\_H} = \sum_{i=1}^{m} \sum_{p=1}^{h} I^{T}_{p_h(j,i)} / \left(\sum_{i=1}^{m} I^{G}_{j,i} - 1 \right) \times 100\%$$

RATIO_H is the total influence effects arising from paths with household account included to the net global influence and the value has excluded those paths

that only have transactions within production activities. To be clearer, net sectoral multiplier means global influence minus one, i.e., $\sum_{i=1}^{m} I_{j,i}^{G} - 1$. RATIO_H is the indicatior to identify households' importance in transmitting influence for each sector.

3. Data

The data are mainly from 1997 and 2007 China's Flow of Funds and input-output tables. The SAM has 21 production activities, 3 factors, and 3 institutions, see table 2 below. Several things are worth mentioning about the complex processof building the SAM. First, we split the household sector into urban and rural households, using data from Chinese input-output tables directly: other information for income and expenditures is from *China Statistical Yearbook* and *China Yearbook of Rural Household Survey*. Specifically, we assumed the difference between total households and rural households was the value for urban households. We could have taken rural households as the difference between total household sector and rural households, butwe believe data from the income survey for rural households is morereliable. Second, labor is bifurcated into two groups: professional labor in urban units and other labor. Third we used the cross-entropy method suggested by Robinson (2001) to balance the final SAM, and inflated the 1997 SAM into 2007 prices, so that we compare our two tables. 4) To make 1997 and 2007 SAM are comparable, we use completely the same methods and steps to construct both SAMs.

Table 2. Accounts in the China Social Accounting Matrix

Endogenous accounts		**Production activities (continued)**	
Production activities (a)		FSRV	Finance and insurance
AGRI	Agriculture	REES	Real estate
MINE	Mining	GSRV	Government services
FOOD	Processed foods	OSRV	Other services
TEXT	Textile, apparel and leather	**Factors (f)**	
WOOD	Wood, paper and printing	FLAB-P	Professional labor in urban units*

FUEL	Petroleum refining and coking	FLAB-O	Other labor
CHEM	Chemical	FCAP	Capital
NMET	Non-metal minerals	**Institutions (h)**	
METL	Metals	HRUR	Rural households
MACH	General and special equipment	HURB	Urban households
EMCH	Electronic & electric equipment	ENT	Enterprises
VEHI	Transportation machinery	**Exogenous accounts**	
OMAN	Other manufacturing products	GOV	Government
UTIL	Utilities	TAX	Tax
CONS	Construction	S-I	Capital account
TRAD	Trade , hotels and catering	DSTK	Stock change
TRAN	Transportation, warehousing, post and telecommunication	ROW	Rest of world

* Professional Personnel refers to the persons who are engaged in special professional work or in professional management who got the titles of a professional post before 1983 or who were appointed to professional positions since 1984. (see China Statistical Yearbook, 2008)

4. Result

This section illustrates the results from structural path analysis. Three examples with respective features are presented first, and then we report the total influences transmitted by household account.

As mentioned earlier, we examine all the paths with 3, 4 and 5 arcs. For each pair of accounts, the number of paths can be quite large--in some cases more than one hundred. As a result we present just the top ten paths for both years.

4.1 Example: sector-to-sector analysis

The first case details the effect of a change in output of agriculture sector (origin) on the output of real estate sector (destination). It is clear that the influence is transmitted not only via production activities but also via value-added and consumption. For example, both paths rank among ten most significant paths for 1997 SAM: One starts from agriculture and reaches the real estate account directly and the

other one is connected via the trade sector. It is somewhat surprising that the other eight paths all pass through either the urban household or rural household accounts. But, this is reasonable since real estate is typically a major household expense item, thus its consumption by household should account for a large share of the global influence.

in addition to the path labels, there are five columns in table 3, each referring to a path type. We refer here to the first path in this table. The table indicates that the global influence of agriculture to real estate sector is 0.04896, in other words, an increment of 1 million RMB into the agriculture activity yields an increase of 48960 RMB in the real estate sector. The table also indicates that the total influence transmitted by those paths with 5 arcs or less accounts for almost 85 percent of the global influence; This shows that our analysis covers most possible paths. Of the ten most important paths, the first path consists of three arcs, from agriculture to other labor, then to rural household, and finally to real estate account. The direct influence is the product of the expenditure propensity of the three arcs, and it is amplified through the effects of feedback circuits, which is measured by the path multiplier, which is 2.04791 in this case. Easily the total influence can be obtained by multiplying direct influence with path multiplier. And the total influence of this path account for 45.95% of the global influence, which is the reason why it is the most important path of all. Besides this, there are four paths containing a household account and have a higher total influence than that direct path, i.e., from agriculture to real estate sector directly. This clearly shows how important the role household plays in sustaining an economy.

Several things can be observed from this example. First, whileDeborah (2005) and Kahn and Thorbecke (1989) suggest that concentrating analysis on path with three arcs and less is enough for a research purposes, we find six paths with four arcs within the top ten most influential paths. Moreover, several paths with 5 arcs rank high, but are not quite influential enough to be reported in the table. This suggests that the three arc rule may be insufficient for a thorough structural path

analysis; otherwise key paths are ignored. Also, both urban household and rural household appear four times in the top ten paths, with those paths passing through rural household accounting for about 49 percent of global influence while urban households share is just 25 percent[1]. The phenomena can be easily explained as agriculture is main source for rural households' income.

Looking at the other two cases for 1997, we find very different results. Urban households play much more important role in the ten most important paths between financial service and government service than rural household. The former accounts for more than half of the global influence and the latter just occupy 8.0 percent. TThis is because urban household are far more likely work in financial sectors, partly due to the higher level of educationof urban dweller, which is needed for financial jobs but also because the demand for financial services is higher in urban areas where much of industry is located[2]. While the last case is completely different from the first two examples: no influence is transmitted through a household account among the top ten paths from fuel to mine sector, in other words, those important paths only exist within production activities as these two sectors especially the latter one are usually limited to the production sphere.

Table 3 Sector-to-sector Structural Path Analyses

AGRI TO REES (1997)					
Global influence		0.04896			
Proportion of influence for all paths with less than 5 arcs (%)		84.91			
Top 10 paths of influence	Direct influence	Path multiplier	Total influence	Proportion	Accumulated Proportion

[1] in 2007, urban household are more important transmitter for paths starting from agriculture to real estate sector. There are two reasons for this: first, China started its housing reform in1998. Piror to that point many enterprises in urban areas either partly compensated workers by distributing houseing or by subsiding their housing payments so that workers needed to a small portion of their housing costsThat is housing was largely a transfer from businesses to the household sector for those who work in cities. Secondly, the income of urban household rose much faster than that of rural households from 1997 to 2007, which we will also mention in section 4.3.

[2] According to China's statistical system on identification of urban household and rural household, when college students officially designated as being from rural areas find a formal job in the city, their employer may help them apply for a hukou so that they officially become urban households. Also, after a year and a half of living gainfully employed in an urban area, people who migrate from rural areas to find work in urban areas are officially regarded as urban households.

AGRI. FLAB_O. HRUR. REES.	0.01099	2.04791	0.0225	45.95	45.95
AGRI. FLAB_O. HURB. REES.	0.00516	2.11427	0.01091	22.29	68.23
AGRI. FCAP. ENT. HRUR. REES.	0.00025	2.55467	0.00063	1.28	69.51
AGRI. FCAP. ENT. HURB. REES.	0.00022	2.61539	0.00058	1.19	70.7
AGRI. FLAB_O. HURB. FSRV. REES.	0.0002	2.33548	0.00046	0.95	71.65
AGRI. TRAD. REES.	0.0002	2.11258	0.00042	0.85	72.5
AGRI. REES.	0.00023	1.77605	0.00041	0.83	73.34
AGRI. FLAB_O. HURB. TRAD. REES.	0.00017	2.39952	0.0004	0.81	74.15
AGRI. FLAB_O. HRUR. TRAD. REES.	0.00016	2.33849	0.00038	0.77	74.92
AGRI. CHEM. FLAB_O. HRUR. REES.	0.00012	3.08688	0.00037	0.76	75.68

AGRI TO REES (2007)

Global influence 0.06428

Proportion of influence for all paths with less than 5 arcs(%) 83.99

Top 10 paths of influence	Direct influence	Path multiplier	Total influence	Proportion (%)	Accumulated Proportion(%)
AGRI. FLAB_O. HURB. REES.	0.0149	1.82774	0.02724	42.38	42.38
AGRI. FLAB_O. HRUR. REES.	0.00942	1.70024	0.01602	24.92	67.3
AGRI. FLAB_O. HURB. TRAD. REES.	0.0006	1.93476	0.00116	1.8	69.11
AGRI. FCAP. ENT. HURB. REES.	0.00037	2.08467	0.00077	1.19	70.3
AGRI. TRAD. REES.	0.00035	1.67839	0.00058	0.91	71.21
AGRI. FLAB_O. HURB. OSRV. REES.	0.00027	2.00354	0.00054	0.84	72.04
AGRI. FLAB_O. HRUR. TRAD. REES.	0.00029	1.83095	0.00053	0.82	72.86
AGRI. FLAB_O. HURB. FSRV. REES.	0.00026	1.97823	0.00052	0.81	73.68
AGRI. FOOD. FLAB_O. HURB. REES.	0.0002	2.26802	0.00045	0.7	74.38
AGRI. OSRV. REES.	0.00023	1.70848	0.00039	0.6	74.98

FSRV TO GSRV (1997)

Global influence 0.04917

Proportion of influence for all paths with less than 5 arcs (%) 73.49

Top 10 paths of influence	Direct influence	Path multiplier	Total influence	Proportion	Accumulated Proportion
FSRV. GSRV.	0.0107	1.22453	0.01311	26.65	26.65
FSRV. FLAB_O. HURB. GSRV.	0.00257	1.90542	0.00489	9.95	36.61
FSRV. FCAP. ENT. HURB. GSRV.	0.00162	2.05324	0.00333	6.76	43.37
FSRV. FLAB_P. HURB. GSRV.	0.00212	1.55025	0.00329	6.7	50.07
FSRV. FLAB_O. HRUR. GSRV.	0.00133	1.86159	0.00247	5.03	55.09
FSRV. OSRV. GSRV.	0.00104	1.37282	0.00143	2.9	58
FSRV. FCAP. ENT. HRUR. GSRV.	0.00043	2.18068	0.00095	1.92	59.92
FSRV. FLAB_O. HRUR. AGRI. GSRV.	0.00025	2.33469	0.00057	1.17	61.09
FSRV. TRAD. FLAB_O. HURB. GSRV.	0.00017	2.16563	0.00038	0.76	61.85
FSRV. TRAN. GSRV.	0.00027	1.36139	0.00036	0.74	62.59

FSRV TO GSRV (2007)

Global influence 0.0544

Proportion of influence for all paths with less than 5 arcs (%) 81.09

Top 10 paths of influence	Direct influence	Path multiplier	Total influence	Proportion (%)	Accumulated Proportion (%)
FSRV. FCAP. ENT. HURB. GSRV.	0.0074	1.76058	0.01302	23.94	23.94
FSRV. GSRV.	0.00834	1.20839	0.01008	18.53	42.47
FSRV. FLAB_O. HURB. GSRV.	0.00532	1.60997	0.00856	15.74	58.21
FSRV. FLAB_P. HURB. GSRV.	0.00257	1.4985	0.00385	7.08	65.29
FSRV. FLAB_O. HRUR. GSRV.	0.00204	1.51106	0.00308	5.67	70.96
FSRV. FCAP. ENT. HRUR. GSRV.	0.00075	1.66732	0.00125	2.29	73.25
FSRV. OSRV. FLAB_O. HURB. GSRV.	0.0003	1.76121	0.00053	0.97	74.22
FSRV. OSRV. GSRV.	0.00036	1.36679	0.0005	0.92	75.13
FSRV. TRAD. FLAB_O. HURB. GSRV.	0.00021	1.70641	0.00035	0.65	75.78
FSRV. TRAN. FLAB_O. HURB. GSRV.	0.00017	1.77032	0.00029	0.54	76.32

FUEL TO MINE (1997)

Global influence 0.49628

Proportion of influence for all paths with less than 5 arcs (%) 96.43

Top 10 paths of influence	Direct influence	Path multiplier	Total influence	Proportion	Accumulated Proportion
FUEL. MINE.	0.34754	1.31475	0.45692	92.07	92.07
FUEL. UTIL. MINE.	0.00582	1.43822	0.00837	1.69	93.76
FUEL. CHEM. MINE.	0.00132	2.05365	0.00272	0.55	94.3
FUEL. NMET. MINE.	0.00168	1.54846	0.00261	0.53	94.83
FUEL. METL. MINE.	0.00104	2.02546	0.00211	0.43	95.25
FUEL. MACH. METL. MINE.	0.00055	2.42427	0.00133	0.27	95.52
FUEL. EMCH. METL. MINE.	0.00021	2.72199	0.00056	0.11	95.64
FUEL. CHEM. UTIL. MINE.	0.0002	2.23322	0.00046	0.09	95.73
FUEL. MACH. MINE.	0.00024	1.59622	0.00039	0.08	95.81
FUEL. OMAN. METL. MINE.	0.00014	2.23677	0.00032	0.07	95.87

FUEL TO MINE (2007)

Global influence 0.74037

Proportion of influence for all paths with less than 5 arcs (%) 98.84

Top 10 paths of influence	Direct influence	Path multiplier	Total influence	Proportion (%)	Accumulated Proportion(%)
FUEL. MINE.	0.58075	1.2419	0.72123	97.41	97.41
FUEL. UTIL. MINE.	0.00286	1.89292	0.00542	0.73	98.15
FUEL. CHEM. MINE.	0.00083	2.04824	0.00169	0.23	98.37
FUEL. METL. MINE.	0.00057	2.00168	0.00113	0.15	98.53
FUEL. MACH. METL. MINE.	0.00041	2.479	0.00102	0.14	98.67
FUEL. NMET. MINE.	0.00047	1.49781	0.0007	0.09	98.76
FUEL. CHEM. UTIL. MINE.	0.00009	3.10395	0.00029	0.04	98.8

FUEL. MACH. MINE.	0.00009	1.56902	0.00015	0.02	98.82
FUEL. TRAN. MINE.	0.00009	1.40077	0.00013	0.02	98.84
FUEL. MINE.	0.58075	1.2419	0.72123	97.41	97.41

4.2 Importance of households in transmitting influence – sectoral result

By using equation (3) and (4), we can derive results at sectoral level as displayed in table 4. This table shows the importance of household-related paths for each production sector. In 1997 about 11.86% (fuel sector) to 42.92% (agriculture sector) of the total net multiplier effect is transmitted through a household account. We find that households generally play a much more important role in primary and tertiary sectors compared to its role in secondary sectors. This is undoubtedly due to the consumptive nature of the goods and service produced by these sectors. The trend is very similar in 2007 but to a lesser extent. The influence can be further decomposed into contributions made by rural and urban household. So we decompose the RATIO_H into RATIO_R and RATIO_U to see the differential importance of rural household and urban household in sustaining China's economy. Indeed the situations for two kinds of households are different and it changed a lot during last decade, which we will discuss a little bit in the following section.

4.3 Comparison between 1997 and 2007

In this section, we provide a temporal comparison for China in 1997 and 2007. We focus on two pronounced changes take place during the period: 1) shares systematically decline from 1997 to 2007 and 2) the roles of rural and urban households change radically.

Firstly, China's economy opened up during the period, which means that it learned to depend more on the economy of other nations. This is evidenced by the rapid rise of imports, total import share of gross output in 1997 was only 5.67% but reached 8.4% in 2007[3]. Another reason for the decreasing influence of household

[3] Author's calculation with 1997 and 2007 SAM.

importance is because China's economy deepened. That is, inter-industry transactions in production sphere rose faster in absolute terms than did household incomes.

Let us now turn to the influence transmitted by urban and rural households. Basically, we find that while their performance was quite distinguished from one another across sectors in 2007, their difference was less pronounced in 1997. That is early in the study period, rural household and urban household played nearly equally important roles in transmitting economic influence, for most sectors. Rural households naturally are more important for total influences originating from agriculture sector. They also appear in more of the important paths. On the other hand, urban households play a bigger role in financial service, real estate and government service sector and still do so in 2007. But the relative importance of urban versus rural households changes greatly from 1997 to 2007. As we mentioned earlier, this is due to changes both in how households gain factor income and in their consumption patterns.

We can clearly see from the 1997 SAM that factor income is distributed rather evenly between urban and rural households, especially the factor income from other labor[4]. Meanwhile, consumption appears evenly balanced between the groups for most sectors. While in the 2007 SAM, both earning and consumption patterns are biased toward urban households. Table 5 illustrates the income source of urban and rural households for both years. The income of urban households from professional labor and capital (enterprises) is much more than that of rural households especially in 2007[5].

Table 6 presents the ratio of factor multipliers to other labor multipliers. It clearly indicates these kinds of factor multipliers are increasing more quickly than that of other labor multipliers from 1997 to 2007 particularly the factor-capital since it's facor multipliers is more than 2 times of that for other labors. This is demonstrated further in the first two micro examples in section 4.1, where paths passing through

[4] Of all the expenditure of other labor, rural household accounts for 48.8% and urban household's share is 50.2%. This is based on authors' calculation with 1997 SAM.

[5] Table 5 presents the share of total income for different households. In fact, the absolute income from a certain factor, say, other labor, is much higher for urban households than it is for rural households, although its share is smaller for urban household since professional labor and capital are also important income sources.

enterprises and urban households account for a bigger shares in 2007 compared with those in 1997. In other words, for the same path passing through enterprises and urban households, the one in 2007 has a higher rank. For example, in 1997, the path running from financial services to enterprises then to urban household and winding up in the government service sector is the third most important path:it accounts for only about 7 percent of global influence, and in 2007 it ranks first with a share of global influence of about 24 percent.

Table 4. The Ratio of Total Influence for Paths Passing through a Household Account

1997	SECTOR	RUR_T_INF	URB_T_INF	G_INF	RATIO_R	RATIO_U	RATIO_H
1	AGRI	0.6327	0.5792	3.8236	22.41%	20.51%	42.92%
2	MINE	0.2432	0.2691	3.5945	9.37%	10.37%	19.75%
3	FOOD	0.2571	0.2632	3.9240	8.79%	9.00%	17.79%
4	TEXT	0.3102	0.2885	3.8864	10.75%	9.99%	20.74%
5	WOOD	0.3206	0.3005	3.6912	11.91%	11.17%	23.08%
6	FUEL	0.1487	0.1568	3.5769	5.77%	6.08%	11.86%
7	CHEM	0.2178	0.2159	3.6289	8.29%	8.21%	16.50%
8	NMET	0.2749	0.2561	3.9880	9.20%	8.57%	17.77%
9	METL	0.2170	0.2112	4.0570	7.10%	6.91%	14.01%
10	MACH	0.2188	0.2141	3.4284	9.01%	8.82%	17.83%
11	EMCH	0.1847	0.1761	3.6619	6.94%	6.62%	13.56%
12	VEHI	0.2140	0.2141	3.8704	7.45%	7.46%	14.91%
13	OMAN	0.2630	0.2494	3.6250	10.02%	9.50%	19.52%
14	UTIL	0.2234	0.2519	3.6127	8.55%	9.64%	18.19%
15	CONS	0.3158	0.2907	4.2399	9.75%	8.97%	18.72%
16	TRAD	0.3523	0.3394	3.5466	13.83%	13.33%	27.16%
17	TRAN	0.3127	0.3330	3.4226	12.91%	13.75%	26.65%
18	FSRV	0.2305	0.3075	2.9492	11.82%	15.78%	27.60%
19	REES	0.2595	0.3123	2.7865	14.52%	17.48%	32.00%

20	GSRV	0.3708	0.4817	3.9301	12.66%	16.44%	29.10%
21	OSRV	0.2717	0.2803	3.8070	9.68%	9.99%	19.66%

2007	SECTOR	RUR_T_INF	URB_T_INF	G_INF	RATIO_R	RATIO_U	RATIO_H
1	AGRI	0.2897	0.6947	3.5728	11.26%	27.00%	38.26%
2	MINE	0.0833	0.2469	2.6679	4.99%	14.80%	19.79%
3	FOOD	0.1175	0.3249	3.8448	4.13%	11.42%	15.55%
4	TEXT	0.1066	0.2870	4.1978	3.33%	8.97%	12.31%
5	WOOD	0.0936	0.2627	3.8392	3.30%	9.25%	12.55%
6	FUEL	0.0586	0.1588	3.3377	2.51%	6.79%	9.30%
7	CHEM	0.0630	0.1902	3.5576	2.46%	7.43%	9.90%
8	NMET	0.0803	0.2266	3.6890	2.98%	8.43%	11.41%
9	METL	0.0645	0.1919	3.7542	2.34%	6.97%	9.31%
10	MACH	0.0610	0.1751	3.5141	2.43%	6.96%	9.39%
11	EMCH	0.0441	0.1306	3.3590	1.87%	5.54%	7.41%
12	VEHI	0.0651	0.1806	3.9243	2.23%	6.18%	8.40%
13	OMAN	0.0596	0.1901	3.1351	2.79%	8.90%	11.69%
14	UTIL	0.0762	0.2743	3.5981	2.93%	10.56%	13.49%
15	CONS	0.0853	0.2284	3.9868	2.86%	7.65%	10.50%
16	TRAD	0.0934	0.2971	3.1015	4.44%	14.14%	18.58%
17	TRAN	0.0821	0.3001	3.1149	3.88%	14.19%	18.07%
18	FSRV	0.0995	0.4107	2.6753	5.94%	24.52%	30.46%
19	REES	0.0721	0.3344	2.2285	5.87%	27.22%	33.08%
20	GSRV	0.1464	0.5347	3.5820	5.67%	20.71%	26.38%
21	OSRV	0.0829	0.2826	3.2212	3.73%	12.72%	16.45%

Note: RUR_T_INF and URB_T_INF denote the sum of total influences for those paths that passing through the rural and urban household accounts. G_INF denotes the sum of global influence for paths originating from certain sector, i.e., sectoral multiplier. RATIO_R and RATIO_U represent the ratio of total influence of paths passing through rural and urban household to net sectoral multiplier respectively. RATIO_H is the sum of RATIO_R and RATIO_U.

Table 5. Sources of Households income (Share of Total Income) (%)

	1997		2007	
	Rural	Urban	Rural	Urban
Professional labor	0	10.67	0	8.54
Other labor	82.64	65.04	80.76	53.90
Enterprises	14.73	22.36	13.89	35.20
Government transfer	1.60	11.74	1.75	0.77
Foreign transfers	1.03	0.8	3.6	1.59
Total income	100	100	100	100

Source: calculation with 1997 and 2007 China SAM

Table 6. Ratio of Factor Multipliers to Other Labor Multiplier

(Weighted Average across Sectors)

	1997	2007	Ratio
Professional labor	0.072	0.106	1.477
Capital	0.655	1.388	2.119

5. Conclusion

Multiplier and key sector analysis are widely used. Most research tend to focus upon the production sphere and largely ignores the role households play in sustaining a nation's (region's) economy by combining production and consumption transactions. Yet is is often critical for policymakers to have some ability to get a reasonable idea of how household spending is likely to transmit its economic influence. Federal stimulus packages, individual income tax credits, tax rebates, and other policy tools are typically instituted to spur economies forward, based in large part to the capacity of households. A reason why such research is lacking appears to be that researchers believe they lack the tools and information to study this topic.

In this paper, we investigate the case of China--one of the biggest countries with rapid developing speed. We apply structural path analysis to social accounting

matrices for 1997 and 2007 to get a better handle on the changing role that China's households have played over that period..

We find proof that household plays a relatively important role in sustaining China's economy. On a sectoral basis, its contribution varies from 12% to 43% in 1997. We find, due to China's rise in the use of imports and the deepening of its economy in production activities, that households' importance declined across the board by 2007. . We also find that urban and rural households play different roles across sectors and time. Most important is that while they are equally importance for most sectors in 1997, urban households became much more important in all sectors by 2007, due to the sky-rocketing urban-rural gap in labor income and consumption patterns.

References:

Basu, R. and Johnson, T. G. The Development of a Measure of Intersectoral Connectedness by Using Structural Path Analysis, *Environment and Planning A*, 1996, 28, 709-730.

Bernat, G. A. and Johnson, T. G. Distributional Effects of Household Linkages, *American Journal of Agricultural Economics*, 1991, 73(2), 326-333.

Deborah, R. The Role of Households in Sustaining Rural Economies: a Structural Path Analysis, *European Review of Agricultural Economics*, 2005, 32(3), 393-420.

Defourney, J. and Thorbecke, E. Structural Path Analysis and Multiplier Decomposition within a Social Accounting Matrix Framework, The Economic Journal, 1984, 94, 111-136.

Dietzenbacher, E. Interregional Multipliers: Looking Backward, Looking Forward, *Regional Studies*, 2002, 36(2), 125-136.

Financial Post. Private Consumption on the Rise in China, GDP Figures Show, April 17, 2012 http://business.financialpost.com/2012/04/17/private-consumption-on-the-rise-in-china-gdp-figures-show-goldmans-oneill

Kahn, H. A. and Thorbecke, E. Macroeconomic Effects of Technology Choice: Multiplier and Structural Path Analysis within a SAM Framework, *Journal of Policy Modeling*, 11(1), 131-156.

Maddison, Angus. *Chinese Economic Performance in the Long Run*, Development Centre of the

Organization for Economic Co-operation and Development, 2nd edition 2007, http://browse.oecdbookshop.org/oecd/pdfs/product/4107091e.pdf.

Miller, R. E. and Blair, P. D. *Input-Output Analysis, Foundations and Extensions*, Cambridge University Press, 2nd revised edition, 2009.

People's Online Daily. Consumption in China Set to Gradually Rise, July, 14, 2011. http://english.people.com.cn/90001/90778/90862/7439345.html.

Sharradan, Samuel, Putting China's Low Household Consumption in Perspective, New America Foundation,

http://roundtable.newamerica.net/blogposts/2011/putting_china_s_low_household_consumption_in_perspective-46600

Yang, Ling and Michael L. Lahr. Sources of Chinese Labor Productivity Growth: A Structural Decomposition Analysis, 1987-2005, *China Economic Review*, 2010, 21, 557–570.

Zhang, Haiyan and Michael L. Lahr. China's Energy Intensity Change from 1997 to 2007: A Structural Decomposition Analysis, unpublished paper presented at the 19th International Input-Output Conference, Alexandria, VA, June 23, 2011.