Seasonality Revisited

Seasonal Dimensions of Household Wellbeing and Labour Migration in Rural Hubei, China

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Abstract

Seasonal variation in agricultural and rural economy is a fundamental phenomenon characterising rural development in China. Socioeconomic consequences of seasonal patterns of household income, consumption and labour mobility need to be understood for designing appropriate interventions to smooth seasonality and to improve livelihoods. For example, policies encouraging seasonal migration for casual works during agricultural slack season will certainly help households improve economic wellbeing; timely arrangement for production loan during planting season will help households in input use in crops production.

The seasonality of households' earnings in rural China is characterised by the patterns of income generation from a variety of sources: sales of agricultural products, wages, family-based non-farm business profits, remittances and transfer payments. While households' income from field crops will be markedly seasonal, production and sale of cash crops may balance the seasonality of its agricultural-related activities. In the same way, casual non-farm work may balance the seasonality of its productive activities. Small farm households have developed integrated systems of livestock-grain productions and farm-non-farm activities in reducing seasonality in household income and wellbeing. However, seasonal dimensions in agricultural and rural development in China are less empirically investigated, and strategies of small farm households in coping with seasonal variations are currently poorly understood.

Using a data source on household monthly income, consumption and migration, covering 3300 farm households over 4 years (2004-2007), from Hubei, a province in south-central China, this paper aims to document patterns of seasonal migration from rural areas to urban cities in hunting for casual labour work; and to investigate the effects of seasonal migration on the changing patterns of households' income and consumption. More specifically, we will firstly describe the seasonal variations of household income and consumption, this will be done by investigating household monthly income and consumption variations over the year; secondly we will document the patterns of seasonal/monthly migration, to look at the correlation of migration and monthly agricultural activities, this will be done by mapping seasonal migration with agricultural production seasons, namely the busy season and the slack season; thirdly we will investigate the effects of seasonal/monthly migration on the changing patterns of household income and consumption, this will be done in different ways including comparing monthly income and consumption changes between households with and without migrant labour, mapping out timing of migration and its sensitivities to household income and consumption, and econometrically modelling how household income and monthly consumption are determined/affected by seasonal migration, in other words, whether seasonal migration helps smooth household consumption. Moreover, a unique farm household case, which we collected during previous study, will be used to reinforce the conclusions and get in-depth understanding of the seasonal variation of household wellbeing in rural China. Findings and conclusions will be drawn and implications for designing interventions in protecting small farm households' livelihoods will be suggested.

1 Introduction

Seasonal patterns of farm households' economic activities and wellbeing have been studied since the late 1970s, with most research focusing on tropical agriculture in countries from Africa and South Asia (Chambers, 1981; Devereux, 2009). It had been generally recognised over the last three decades that seasonal variations in household agricultural activities and other types of economic activities had explained, to a large extent, rural poverty in low income countries in general (Harris and Todaro, 1970; Paxson, 1993; Stark, 1993, 2007; De Haan, 1999) and in tropical countries in particular, and that there were numbers of negative factors that make the lives of poor household worse during the pre-harvest months every year. Furthermore, the backgrounds/contexts of agricultural development in most developing countries have been changing rapidly over the past decades, and the changes need to be taken into account when designing policy interventions in reducing negative effects of seasonality in the developing countries' agricultural and rural development.

Seasonal variation in agricultural and rural economy is a fundamental phenomenon characterising rural development in China (Zhao, 1999). The country is located in a wide range of geographic locations, with its southern part in tropical and subtropical regions and the northern part in the temperate region. While patterns of seasonal variation of its agricultural and rural economic activities in southern regions may follow what had been studied in African and south Asian countries, patterns of seasonal variation may have their own features in northern region.

The seasonality of households' production and wellbeing in rural China can be investigated in terms of patterns of income generation from a variety of sources: sales of agricultural products, wages, family-based non-farm business, remittances and transfer payments. While households' income from field crops will be markedly seasonal, production and sale of cash crops may balance the seasonality of its agricultural-related activities. In the same way, casual non-farm work may balance the seasonality of its productive activities. Small farm households in China have developed different combinations of livestock-grain productions and farm-non-farm activities in reducing negative effects of seasonality. However, seasonal dimensions in agricultural and rural development in China have been less empirically investigated, and strategies of small farm households in coping with seasonal variations are currently poorly understood.

Socioeconomic consequences of seasonal patterns of household income, consumption and labour mobility need to be understood for designing appropriate interventions to smooth seasonality and to improve livelihoods. For example, policies encouraging seasonal migration for casual work during slack season will certainly help households improve economic wellbeing; timely arrangement for production loan during planting season will help households in input use for crops production. This paper aims to describe patterns of seasonal variations in household income and expenditure, to document patterns of seasonal migration from rural areas to urban cities in hunting for casual labour work; and to investigate effects of seasonal migration on the changing patterns of households' income and consumption.

Data for this paper is from the Rural Household Survey (RHS) of the State Bureau of Statistics (SBS). RHS is administered directly by SBS through its provincial and county

survey network, and this ensures that the data collected are free from local interference. Rather than employing a single-interview approach, each selected household maintains a daily diary over the entire year. An assistant interviewer is supposed to visit each household every two weeks to check the diary and assist the household in filling them in and transfer the information to the county level. A dataset covering 3,300 households in 33 randomly selected counties (from its total of 75 counties) during 2004 to 2007 in Hubei (a southern Province along the middle reaches of the Yangtze River), containing thousands variables on household demographics, monthly migration, monthly income and expenditure and others, is used for this paper. Rainfall data is from the Meteorological Bureau in Hubei, containing monthly rainfall data from 1982 to 2001.

The paper is organised into the following sections. Firstly we describe the seasonal variations of household income and consumption in section 2; this will be done by investigating household monthly income and consumption variations over the year; Secondly we document the patterns of monthly migration, to look at the correlation of migration and monthly agricultural activities, in section 3; this is done by mapping seasonal migration between peak and slack seasons; Thirdly we investigate the effects of monthly migration on the changing patterns of household income and consumption, this is done by comparing monthly income and consumption variations between households with and without migrant labour, and modelling how household income and monthly consumption are affected by seasonal migration, in other words, whether seasonal migration helps smooth household consumption. Moreover, a unique farm household case, which we interviewed during a previous study, is analysed in section 4 to reinforce the conclusions and get in-depth understanding of the seasonal variation of household wellbeing in rural China. Finally findings are presented and implications for designing interventions in protecting farm households' livelihoods are drawn.

**2 Seasonal variations of household income and consumption in rural Hubei**

2.1 Rainfall and its seasonal patterns

In a subtropical region, where Hubei is located, seasonality seems more intuitive since summer and winter distinctly differ from each other, with crops harvested in summer and autumn and a slack season in winter and early spring. To investigate seasonal patterns in agriculture, an attempt is made to define dry and wet season in the study province in an absolute sense based on monthly rainfall[1]. The average rainfall in each month from randomly selected 10 counties (of its 75 counties) in Hubei for a period of 1982 to 2001 is given in Figure 1. Rainfall shows a trend increase from January and reaches its peak in July, and then a trend decrease until December. An arbitrary approach is used to classify the whole year into dry and wet seasons, in which 100 mm of rainfall per month is taken as a threshold. The wet season can be seen from April to September while the remaining months are seen as the dry season.

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[1]   More sophisticated studies may use 'temperature' as well. To make our study as a starting point, only rainfall is used. Further investigation of seasonality in a subtropical region may need to take temperature into account.

**Figure 1. Rainfall and cropping calendar in Hubei**
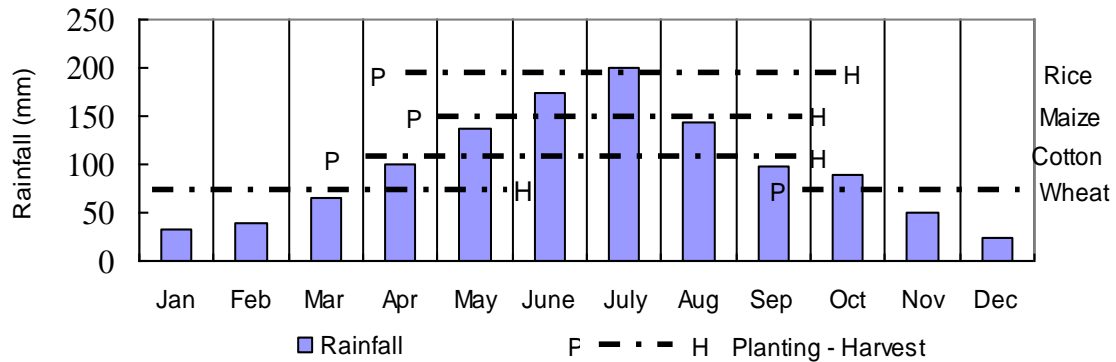
There are a wide range of crops grown in the area, with rice, maize and cotton in summer and wheat in winter being the main crops. The rainfall is an important element to determine crop production (in addition to temperature, see footnote 1). Figure 1 depicts a generalised version of cropping calendars in the area. Rice, maize and cotton are generally planted in April and harvested in September. Wheat is sown in October and harvested in next May. It can be concluded that main agricultural activities happen in wet season, and the slack season coincide with dry season.

2.2 Seasonal variations of household income and expenditure

Income and consumption are used to denote household's well-being in this paper. Household income consists of wage income, family-based business income and others (mainly remittances), while household expenditure consists of family-based business expenditure and consumption expenditure.

Figure 2 depicts seasonal variations of monthly household income, expenditure and balance in 2006 to 2007[2]. The seasonal variation over years actually shows similar trend. Monthly income is averagely lower than monthly expenditure for most of the year and the only opposite occurs in December. More generally, household income and expenditure in peak season is lower than that in slack season.

Figure 2. Seasonal variation of income, expenditure and balance, 2006–2007


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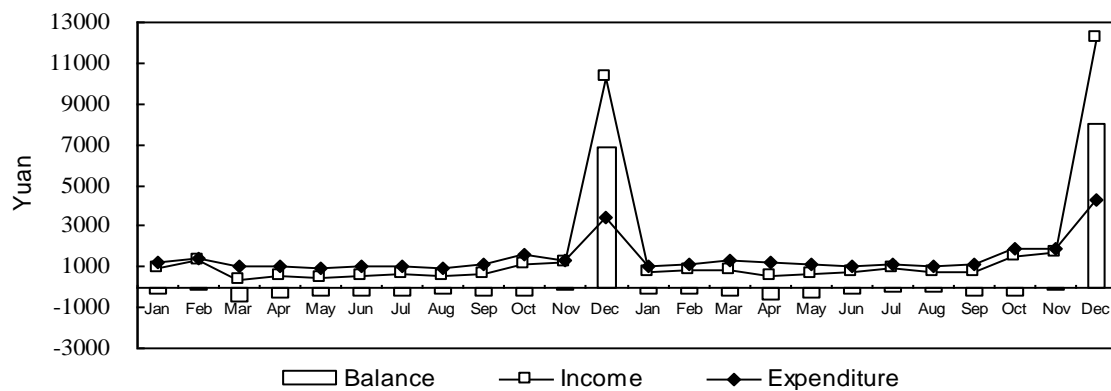
[2] The Chinese lunar calendar is used in the paper, which is based on the cycles of the moon. In the Chinese lunar calendar the beginning of the year falls somewhere between late January and early February. Chinese farmers mainly base their agricultural activities on the lunar calendar, and it is also used for festive occasions such as the Chinese New Year.

To investigate the variations of monthly income and expenditure, income sources in Figure 3 and expenditure items in Figure 4 are separated. The varied shares of different income sources and expenditure items show seasonal variation patterns over the year: 1) Wages are the main income source from January to September, while family-based business becomes the main income source from September as household would sell their agricultural products at this time; 2) The share of family-based business income in peak season is generally lower than that in slack season; 3) Consumption is one of the main expenditure items over the year, and it is higher in lunar December when the traditional Chinese New Year is around, this is especially true for food consumption; 5) The share of family-based business expenditure is much higher (about 40%) in peak season, indicating the higher agricultural inputs use.

Figure 3. Seasonal variation of income shares from different sources
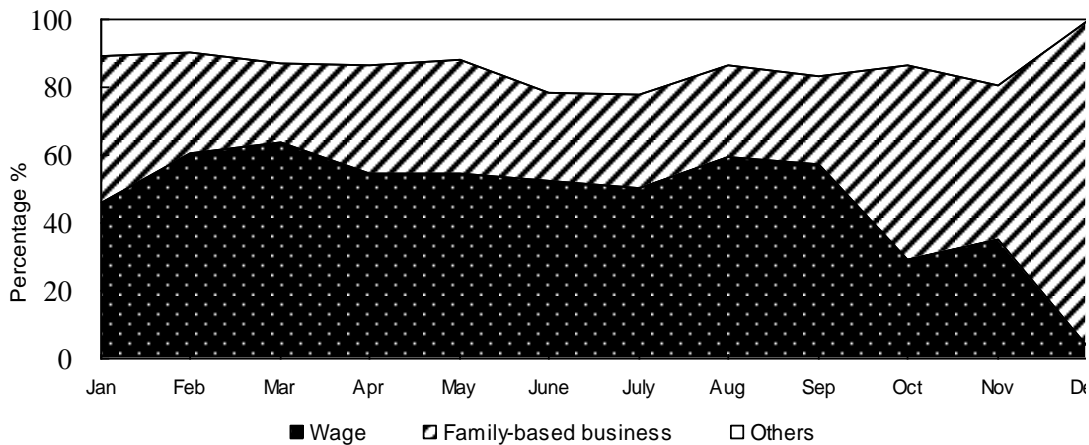
Figure 4. Seasonal variation of expenditure shares for items
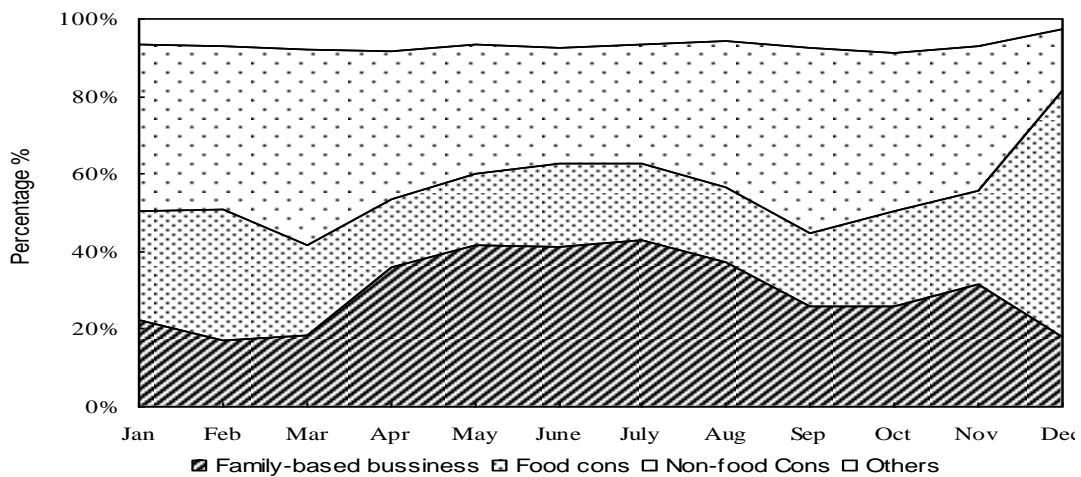
2.3 Quantifying seasonal variations of household income and expenditure

To quantify seasonal variations of household income and consumption, a seasonality index (Walsh, 1980) is used in this paper, and it can be expressed as follow:

$$SI = \frac{\sum_{n=1}^{n=12} |x_n - \frac{\overline{R}}{12}|}{\overline{R}}$$

Where *SI* denotes seasonality index, x_n means income / consumption of month n, and $\overline{R}$ is the mean annual income / consumption. The seasonality index takes into consideration all months of the year.

Seasonality indices of household income and consumption from 2004 to 2007 are listed in Table 1. Seasonality indices of monthly income and expenditure show the trend of decrease in general from 2004 to 2007 meaning monthly income and expenditure are becoming more stable. Over the time period, variations for wage income is lesser and for family-based business income is higher, and this may be due to that agriculture as a kind of family-based business requires more inputs in peak season but its income mainly comes later in slack season. Looking at expenditure, it shows an overall declining trend, with family-based business expenditure in the increasing trend and consumption expenditure in the declining trend.

**Table 1. Seasonality index for income and expenditure, 2004–2007**

Year	Income			Expenditure		
	Total	Wage	Family-based business	Total	Family-based business	Consumption
2007	1.227	1.281	1.682	0.702	0.975	0.816
2006	1.248	1.285	1.667	0.725	0.945	0.827
2005	1.294	1.305	1.658	0.722	0.926	0.842
2004	1.298	1.346	1.650	0.774	0.907	0.928

3 Effects of migration on changing patterns of household income and consumption

3.1 Seasonal patterns of migration

Migration from rural areas to urban cities earning a living has become an important phenomenon in China over last few decades, with considerable amount of migration being seasonal. The monthly distributions of proportion of households with members migrating during 2004 to 2007 are showed in Figure 5. There are increasingly numbers of households with members migrating over the time period. Pattern of migration shows seasonal variation, with less going out in peak season and more in slack season. Most migration occurs in February when the traditional Spring Festival is just over.

Figure 5. Percentage distribution of households with migration over months
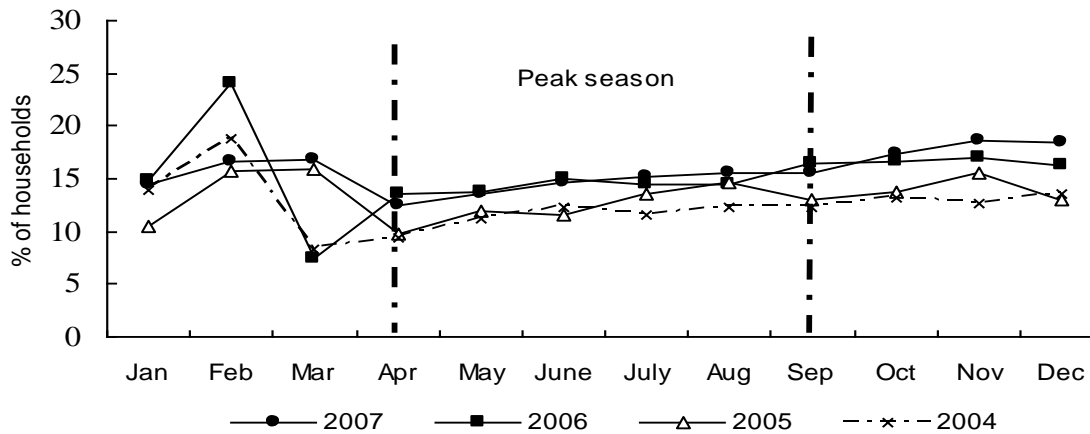
To further investigate the effects of seasonal migration on household income and expenditure, monthly income of different types of households are compared in Figure 6: household without migration, with 1-3 months migration, with 3-6 months migration and with 6+ month migration. The log value of income is adopted for intuitional expression. Households with longer migration time are generally with higher income. When looking into separate months, it follows what we found earlier, that household income is lower in peak season and higher in the slack season, with December having the highest monthly income.

Figure 6. Monthly income of households with different migration periods
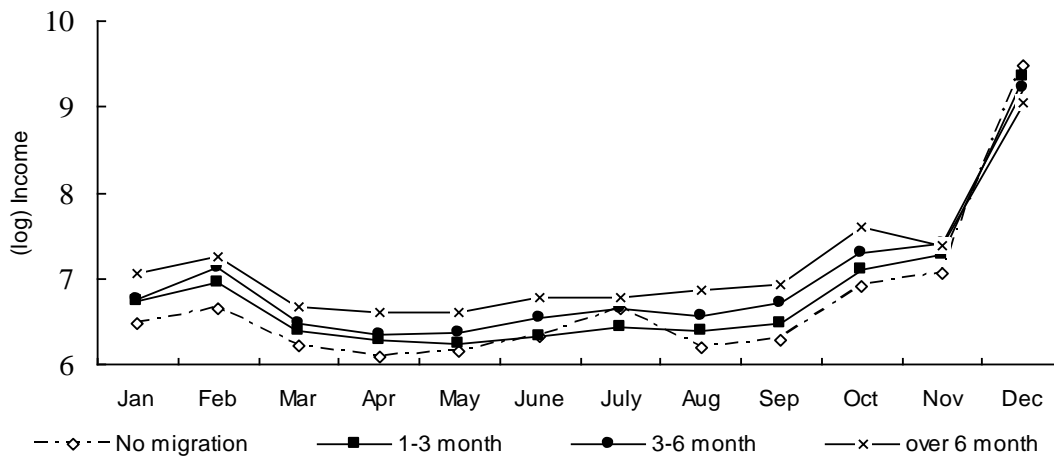
3.2 Effects of seasonal migration on household income and expenditure

To look at the effects, we estimate seasonality indices for different types of households as showed in Figures 8, 9, 10 and 11. Households with more migrants, or with longer migration time, will have lower seasonality index of total income and wage income, and have higher seasonality index of family-based business income, meaning that migration helps smooth variations of total income and wage income, and that migration leads to high variations for family-based business income. However, households with

more migrants, or longer migration time, will have higher seasonality index of total expenditure and family-based business expenditure, as well as consumption expenditure, meaning that migration is generally increasing the variation in expenditure. One of the reasons may be that migrant labourers will generally have higher consumption expenses when they are away from home, and this may be quite unique in rural China.

Table 2. Seasonality index by types of migrations

		Income			Expenditure		
		Total	Wage	Family-based business	Total	Family-based business	Consumption
Migration labourers	No migration	1.344	1.361	1.628	0.725	0.946	0.844
	1 migration	1.220	1.289	1.675	0.747	0.960	0.858
	1+ migration	1.212	1.262	1.703	0.767	0.956	0.890
Migration time periods	1-3 month	1.238	1.304	1.662	0.749	0.938	0.870
	3-6 month	1.218	1.274	1.694	0.755	0.954	0.872
	6+ month	1.187	1.244	1.714	0.764	0.991	0.873

3.3 An OLS regression analysis

OLS regressions on determinants of, more specifically effect of migration on, seasonal variations of household income and consumption expenditure are applied in the paper. Taken into consideration of that other factors also affect variations of household income and expenditure, variables such as household assets, farm size, working time per labourer and proportion of household labourers received training are included in the analysis. The determinant equation can be expressed as follow:

$$Y = a_0 + a_1 asset + a_2 farmsize + a_3 worktime + a_4 training + a_5 migrationdummy + u$$

Where *Y* represents household income (consumption expenditure) or seasonality index; *asset*, *farmsize*, *worktime* and *training* represent value of productive assets, farm size, working time per labourer and proportion of household labourers received training, respectively, While *migration.dummy* represents numbers of migration labour dummy variables (0 if no migrant, 1 if 1 migrant, 2 if more than 1 migrant); *a0* is constant item, *a1* to *a5* are the coefficients of corresponding independent variables, and *u* is disturbance term. Using data of 2007, the OLS estimations of four equations are listed in Table 2 for income and table 3 for consumption expenditure.

The results show that migration has a positive effect on household income generation, with the effect being statistically significant at the 1% level when household has more than 1 migrant labourer. Other variables, including value of productive assets, farm size and proportion of household labourers accepting training, also have significant positive effects on income. Moreover, migration also has significant negative effect on seasonality index of income, meaning that migration helps reduce seasonal variation of household income.

Despite the evidence that migration has positive effects on household income and consumption expenditure, it cannot reduce the variation of household consumption expenditure. On the contrary, migration may actually increase seasonal variation of household expenditure consumption. This may be explained by the fact that seasonal migrant labourers are actually having higher consumption expenditure when they are out than when they stay at home – for example, more costs for travel, higher living expenses in cities. Other variables have significant positive effects on consumption expenditure. In regard to variation of seasonality index of consumption expenditure, working time per labourer and proportion of household labourers received training can reduce the variation of household consumption expenditure, but farm size will increase the variation of consumption expenditure.

Table 3. Determinants of income and its seasonality index

Variables	Income		Seasonality index of income	
	Coefficient	T value	Coefficient	T value
Asset	0.480***	16.24	0.000***	-2.76
Farmsize	797.814***	13.39	0.024***	19.89
Migration.dummy=1	563.591	0.80	-0.089***	-6.18
Migration.dummy=2	2650.531***	3.58	-0.132***	-8.70
Worktime	250.622	1.21	-0.014***	-3.28
Training	2502.053***	2.86	0.018	0.98
Constant	10690.610***	5.44	1.274***	31.61
Observation	3300		3300	
R-squared	0.1361		0.1745	

Note: ***Significant at 1% level.

Table 4. Determinants of consumption expenditure and its seasonality index

Variables	Consumption expenditure		Seasonality index of consumption expenditure	
	Coefficient	T value	Coefficient	T value
Asset	0.093***	6.39	0.000	-1.11
Farmsize	176.274***	6.02	0.004***	4.35
Migration.dummy=1	473.890	1.37	0.011	1.03
Migration.dummy=2	525.929	1.45	0.040***	3.68
Worktime	404.758***	3.97	-0.006*	-1.90
Training	2089.322***	4.87	-0.047***	-3.67
Constant	5889.684***	6.10	0.873***	30.63
Observation	3300		3300	
R-squared	0.083		0.054	

Note: ***Significant at 1% level, *significant at 10% level

4 Seasonal variations of household cash income and expenditure: a case study

A farm household in Guangxi, a southwest province, was interviewed in the summer of 2002. The head of household voluntarily recorded the household's detailed cash income and expenditure diary from January 2001 to March 2002 by the time we visited. Different items of cash income and expenditure are classified into several categories based on official statistic standards and listed in table 4.1.

Table 4.1. A household's cash income and expenditure in 15 months, 2001–2002

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Total
Oilseeds			54.5											36.4		90.9
Rice				22.2												22.2
Milled rice		40		105	28.6	102.5			46		45.6	2.9	31.7	38.4		440.7
Vegetables	61.5	11.7	25.9	33.5		10.5			52.5	75.1	45.6	17.5	4	18.2		356.1
Maize				214.5	23.3	56						55.5	59.5			408.8
Rice husks						23.7			5.5			8	10.5			47.7
Rice noodle													37.7	27		64.7
Bok choy													4.2	7.5	9.1	20.8
Pigs	420.1								110							530.1
Dogs		140														140
Trees		50														50
Non-farm wage		10														10
Income	481.6	241.7	35.9	407.5	74.1	192.7	0	0	214	75.1	91.2	83.9	147.6	127.5	9.1	2181.9
Seeds	10.3	2	0.5	0.5	1			2			2.5		39	0.5		58.3
Pesticides				19	15.3	0.3	1	4	2					5		46.6
Fertilisers		25	2.4	89	3			6				6		21	23	175.4
Rice milling								90								90
Livestock		40		5	30			4		187		1	1	1		269
Prod. Tools		6				234				21	16	7			5	289
Foods	29.1	11.3	87.9	74.7	30.3	170.8	14.2	52.8	41.9	66.9	47.9	114.7	37.4	53	9.4	842.3
Clothes			5.6	2	4						17.9	8				37.5
Necessities	19.7	7	27.8	15.4	6.7		6	10.5	1.3	8.6	5	21.2	0.5	6.2		135.8
Medicines	3	4.6	0.6					0.2				0.8	0.2	0.5		9.9
Transport	0.2							5				5				10.2
Fuels	5.3		7.1	3.5	0.6	4.5	1.7	2.8	0.2	0.4	6.9	8.2	0.2	1.3	3.7	46.4
Transfers	40	20	20				20				102.5	130	80			412.5
Expenditure	107.4	115.9	151.9	209.1	90.9	409.6	42.9	177.3	45.4	301.8	188.8	286.9	165.3	88.5	41.1	2422.8

The household has its livelihood almost entirely depending on agriculture. The cash inflows include selling various types of agricultural products such as grains, vegetables, animals, and so on. He grows single season rice but does not sell it at once. Instead, the sales are rather scattered across the year, with the largest sales occurred during April to June when it is the pre-harvest season and household may be in short of cash income and also in intensive labour use. The constant cash inflow over the year is by selling vegetables.

As for the cash expenditure, the constant cash outflow occurs in items such as food, daily necessities and fuels. The sudden increase in food expenditure in June is mainly due to the fact that he is installing a biogas system (costing 234 Yuan) for which his wife cooks for the technicians every day. The constant cash inflow from vegetable sales may compensate the expenses of agricultural inputs (seeds, pesticides and fertilisers). However, a transfer payment, in which he gives cash to one of his relatives as a gift for a ceremony, makes him indebted, and the situation is even worse in the subsequent month, in which he gives gifts for other ceremony (it is common in rural China, farm households usually have their celebration/ ceremony held later in the year in slack season). The monthly cash inflows and outflows is shown in Figure 4.1.

Figure 4.1. A household's cash flow over 15 months
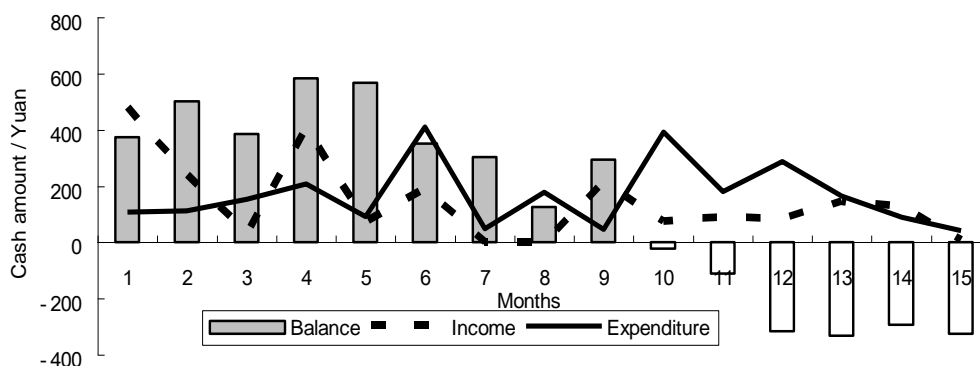
As can be seen, the fluctuation of his cash flow in income and expenditure over the year shows no rule, with the peaks and bottoms not matching at all. He faces a cash deficit since October (he actually borrows in this month), and gets to be indebted by some 300 Yuan by the end of the year. Furthermore, his indebted status continues at the same level for the next few couple of months. Suppose there were no government support, no social network around, no market for borrow, he would probably have to sell his productive assets in the hard press for debt repayment. In other case, he may not have sufficient assets to sale, or one of his family members may suddenly suffers an emergency/ accident, he would then not be able to sustain his living for next year, and his livelihood may collapse.

5 Concluding remarks

Risks and uncertainties have been seen as fundamental causes leading farm households in rural China into poverty and desperation. Looking at household level, it had led to great fluctuations for household income and expenditure. Seasonality in subtropical regions, such as in Hubei of China, can be an important source of risks and uncertainties. This may be seen by the fact that seasonal changes in agricultural production explained, to a large extent, the variations in households' cash income and expenditure. This may be especially true for households who mostly depend on agriculture for their livelihoods.

While household income variations may be smoothed by seasonal migrant labour income generation, seasonal migration is having negative effects in smoothing household expenditure. Furthermore, variations in household agricultural productive expenditure are getting higher over the time periods concerned while variations in consumption expenditure are getting less. Further investigation is needed in explaining such a pattern of variations. That no significant variations in seasonal food consumption patterns have been evidenced may indicate that household food supply in the study area has been secured to some extent and there may be other things in explaining seasonal variations of household wellbeing.

Casual labour migration from rural to urban is seen as the main income generation activities. Seasonal migration has been one of the important factors affecting the fluctuation of household cash income and productive expenditure. While it is generally seen that income from migrant labourers help smooth household expenditure elsewhere, it may not always the case in rural China, as household expenditure can be more varied when household has migrant labourers, this may be because the migrant labourers may have much higher cash expenditure when they are away from home.

Seasonal variations in agriculture and farm household livelihoods in China have been less investigated, and little evidence has been collected. Further efforts should be put on in identifying the nature and extent of seasonal variations of households in rural China. Two arguments can be made: 1) Agricultural policies and rural development agenda need to engage more with agricultural seasonality and look more at household level evidence which is currently rarely present in the policy interventions; 2) More institutional (or integrated) interventions (i.e., financial support for agricultural production, subsidies) and technological improvements, rather than *ad hoc* arrangements (i.e. social relief programs), in helping smoothing seasonal variations of household income and expenditure in rural areas are needed.

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