DETERMINANTS OF INTER-DISTRICT VARIATIONS IN RURAL NON-FARM EMPLOYMENT IN ANDHRA PRADESH: A DISTRICT LEVEL DATA ANALYSIS

PRASADA RAO MECHARLA

PRUS WORKING PAPER NO. 13

September 2002

Poverty Research Unit at Sussex
University of Sussex
Falmer, Brighton
BN1 9SJ
Tel: 01273 678739
Email:pru@sussex.ac.uk
Website: http://www.sussex.ac.uk/Users/PRU

Abstract

This paper is attempted to examine the nature of rural non-farm employment (RNFE) in Andhra Pradesh (AP) using the district level data gathered from the secondary sources. It seeks to identify the determinants of inter-district variations in the shares and growth of RNFE across a cross-section of 7 categories of rural non-farm employment for 22 districts in AP. The basic objective is to test the hypothesis of 'distress diversification' against 'agricultural growth linkages' in order to explain the propensity of rural people to be involved in the RNFE. Econometric models have been used to explain the district level variation in the RNFE by pooling the data for 1981 and 1991 for various sub-sectors in AP. The analysis reveals that variations in irrigation, farm size, literacy, urbanisation, commercialisation, infrastructure and poverty are significant determinants of RNFE.

Acknowledgements

This discussion paper is developed from my doctoral thesis work under the supervision of outstanding scholars Professor Michael Lipton, Dr. Diana Hunt and the late Dr. Pramit Chaudhuri. I am grateful to them for encouragement and valuable guidance. Many people also assisted me while I was writing my thesis and I have already placed this on record in my thesis. I am grateful to the Poverty Research Unit Director Dr. J. Litchfield at the University of Sussex for bringing out this discussion paper. Finally, I am grateful to my colleagues in the Department of Economics at Andhra University, India for their usual support.

Abbreviations

ADD	: Agricultural Distress Diversification
ADL	: Agricultural Distress Linkages
AGL	: Agricultural Growth Linkages
AP	: Andhra Pradesh
ARTEP	: Asian Regional Team for Employment Promotion
CESS	: Centre for Economic and Social Studies
CV	: Coefficient of Variation
GCA	: Gross Cropped Area
GR	: Growth Rate
HHI	: Household Industry
ILO	: International Labour Organisation
IRDP	: Integrated Rural Development Programme
JB	: Jarque-Bera
JRY	: Jawahar Rozgar Yojana (employment scheme)
K	: Number of parameters used in χ_K^2
Kg	: Kilogram
Km	: Kilometre
Km2	: Square Kilometre
NSS	: National Sample Survey
ODD	: Overall Distress Diversification
ODL	: Overall Development Linkage
OLS	: Ordinary Least Squares
PWD	: Public Works Department
RMW	: Rural Main Worker
RNFE	: Rural Non-Farm Employment
RNFS	: Rural Non-Farm Sector
Rs.	: Indian Rupees
SD	: Standard Deviation
SE	: Standard Error (of a regression)
u	: Disturbance term with the classical properties

Glossary of terms

acre	: 2.45 acres = 1 hectare
godown	: similar to a warehouse
jowar	: a coarse cereal
kharif (sarwa)	: the first paddy autumn crop which is grown during June to September in the delta
lakh	: one hundred thousand
mandals	: revenue-cum development units
panchayat	: the form of local elected council (self-government) at the village level.
parishads	: district peoples' council
rabi (dalwa)	: the second paddy winter crop which is grown during November to March

Introduction

This paper seeks to identify the determinants of inter-district variations in the shares and growth of rural non-farm employment (RNFE)[1] in Andhra Pradesh (AP). The focus is on non-farm main workers i.e. workers who had worked for the major part of the year (183 days or more), and whose principal work was in RNFE.[2] We will consider the changes between 1981 and 1991 and seek to identify some of the factors associated, across districts and over time, with relatively larger RNFE in AP. A study of the determinants of non-farm employment can help to interpret the structure and functioning of the labour markets[3]. This paper attempts to identify these determinants and examines their inter-relationship with the help of district-wise data in the AP context. From the point of view of employment policy it is important to analyse the reasons for the large variations in non-farm employment which are observed across districts.

We can identify broadly two categories of RNFE: traditional and modern. In rural communities traditional non-farm activities (such as blacksmithy, carpentry, pottery, weaving, washing, toddy tapping, barbering, cobbling, shepherd rearing and cotton cording) continue even though today some are declining. These activities may be grouped under seven headings: crafts, processing of crops, non-factory textiles, traditional forms of transportation and trade/commerce, personal services, repair and construction in homes and fields. For classification of non-farm activities see Appendix Table 1. The second category consists of modern manufacturing and processing, including sugar and textile factories, oil and grain mills, small factories producing engineering goods, shoes, paper, furniture, soap, matches and small scale quarries. A newly emerging third category consists of rural white-collar workers: public services, health and extension services, credit and marketing agencies, and public works construction.

This paper seeks to test 'distress diversification' against 'growth linkages' as explanations of employment of the propensity of rural people to be involved in the RNFE. The strict agricultural growth linkages (AGL) are that higher (or a faster growing) agricultural income/output/employment tends to cause more (or faster–growing) nearby rural non-farm share. The agricultural distress diversification hypothesis (ADD) is that lower (or slower-growing) agricultural production (or 'performance' in agriculture) causes higher (or faster growing] RNFE shares. The research will also test a wider 'development linkage/diversification hypothesis'. This overall development linkage hypothesis (ODL) is that higher (or faster growing) development indicators such as literacy, bank branches, urbanisation, tend to cause more (or faster growing) nearby RNFE. The converse overall distress diversification hypothesis (ODD) is that lower (or slower-growing] development indicators cause higher (or faster-growing) RNFE share.

A central hypothesis tested in this paper is that a high traditional RNFE share is associated with low literacy and distress diversification, while a high modern RNFE share is associated with high literacy and rural growth linkages from agriculture. This issue is explored using a cross-sectional study of industrial categories IV to IX for 22 rural districts of AP (a) pooled 1981 and 1991 cross-section data (Census) regressions and (b) growth of shares between 1981 and 1991 data regressions.

---

[1] Rural areas are defined as rural in the decennial Census of India as meeting three criteria: that the population is below 5,000; that these areas have a population density of less than 400 persons per square kilometer; and that less than 75 per cent of the male working population should be engaged in non-agricultural pursuits. The definition for rural non-farm employment in the 1991 Census is those workers who have been "engaged in some economic activity during the year preceding enumeration and who are neither cultivators or agricultural labourers but are 'other workers' (non-farm workers)".

[2] Marginal workers: are those who had worked for less than six months (183 days) in the year (Census of India, 1991 p.5).

[3] For instance Murty and Durga (1992), Parthasarathy (1987), Vibhooti Shukla (1991), and Unni (1991) have identified and suggested certain factors associated with high RNFS, output and employment and have examined the inter-relationship using either state-wise or district-wise data.

For our study we define as a RNFE any household with at least one member in a primary occupation in categories 1V-1X of workers in the 1991 Census. The focus of our analysis bears on the importance of non-farm relative to agricultural employment. We have used the percentage of RNFE to the total employment variable and we have experimented with other structural differences (such as gender) between 1981-91. Also by contrast, we have analysed RNFE in a disaggregated manner using all IV to IX categories (divisions) of RNFE for 1981 and for 1991.

Methodology: Estimations of the shares of RNFE - and of both modern and traditional sub-sectors in total employment (main workers) and its determinants - were made for total workers (males and females) to explain district-level RNFE shares. For 1981 and 1991, regressions were run by pooling the data for various sub-sectors in AP. Similar regressions were carried out with average annual growth rates over the decade used as the dependent and explanatory variables for all the categories. Thus, we aim to explain (1) the level of RNFE across districts and (2) the growth of RNFE share between 1981-91. The econometric model used is the linear multiple regression (OLS) for growth rates between 1981 and 1991. A log linear model is used for pooled data 1981 and 1991. This is based on some strong key assumptions. We have checked for the violation of these assumptions.

As a preliminary step, means and standard deviations were computed for all the variables. T-tests were used to compare the difference in the means between 1981 and 1991 for all categories of RNFE, as well as for some of the independent variables. The results are given in Tables 10 and 11.

We are aware of the problems in comparing proportions between the districts. For example, suppose district 1 has 80 per cent of adults in the workforce on an average day, of whom 98 per cent are successful in obtaining work (including self-employment) but only 20 per cent of these are in the RNFS. District 2 has only 50 per cent of adults in the workforce, and on an average day only 80 per cent obtain work, but 25 per cent of these are in the RNFS. It does not really make sense to compare RNFE 1 (which has over 15 per cent adults normally working) and RNFE 2 (10 per cent) unless we also look at absolute figures.

The rest of this paper is divided into three sections. 1. describes inter-district variations in shares, structure (by gender, by industry), and trends between 1981 and 1991 for RNFE. Section 2. summarises the hypotheses on inter-district variations in the RNFE share, the variables used in the subsequent empirical analysis, their specifications and the expected relationships. The model which will be used to explain RNFE is specified. This section also includes a summary of the changes to the explanatory variables used in the model between 1981 and 1991. Section 3. presents empirical results and relates to these the alternative hypotheses (distress diversification and growth linkages). The chapter concludes with a brief summary of findings.

Map 1: The districts of Andhra Pradesh

Note: The *Coastal Andhra* region is composed of the districts of Srikakulam, Vizianagaram, Visakhapatnam, East Godavari, West Godavari, Krishna, Guntur, Prakasam, and Nellore. The *Rayalaseema* region is composed of the districts of Kurnool, Anantapur, Cuddapah, and Chittoor. The *Telangana* region is formed of the remaining districts Ranga Reddy, Hyderabad, Nizambad, Medak, Mahabubnagar, Nalgonda, Warangal, Khammam, Karimnagar, and Adilabad.

1. Trends in the composition and shares of rural non-farm employment in AP districts: A comparison between 1981 and 1991

Why do districts vary in RNFS characteristics and growth? In order to provide some insight into this question, we first consider rural AP as a whole, and then the differences between districts.

Rural employment data is considered in this section. The data presented relate to the degree of labour absorption in the RNFS which is measured as the ratio of main workers in the RNFS to main workers in the rural areas. This is computed using Census data, as NSS data is lacking district-wise information.

Only about 18 per cent of total main workers are generally involved with non-farm activities. There are moreover few differences between the share of those involved with the non-farm sector in India and those involved with this sector in AP. Total main workers in the RNFS reached 23 million in 1991. At that time the RNFS share was 17.1 per cent and slightly higher than the 16.8 per cent calculated for 1981 (Table 1). There were 3.9 million workers in the RNFS, 75 per cent were males, compared with 76.3 per cent in 1981. Among all main workers, 61.4 per cent were males compared with 65.4 per cent in 1981. The female employment share in the labour force is higher in the farm sector than in the non-farm sector. Whilst changes occurred with the increasing rate of female labour, the RNFS still appears

male-dominated. 39 per cent of all total main workers were females and 25 per cent of those involved with the RNFS were females.

In terms of the composition of RNFE for 1991, other services accounted for the highest share followed by trade, household industry and non-household industry. Rising trends could be seen in all sub sectors except for HHI for totals for males but not for females. The analysis of RNFE when deconstructed at the sub-sector level shows that the share of the construction sector is particularly low in total, for both males as well as females.

From Table 1. one can see that the proportion of males involved with the RNFS has slightly increased. The reverse holds for females. Comparisons of growth rates of the workforce by industry groups show that the total agricultural workforce in AP grew at around 2 per cent per annum while the rate of growth for non-farm employment was around 2.2 per cent per annum. For farming, the growth rate of females (3.2 per cent) was higher than that of males (1.2 per cent). In the non-farm sector an opposite trend can be marginally noted. The highest (per annum) rural employment growth-rate (between 1981 and 1991) was among agricultural labourers (3.3 per cent). The growth rate of cultivators was the lowest (0.6 per cent). All the sectors apart from agriculture and household manufacturing showed positive growth. Employment in the agricultural allied category declined.

The data shows that agriculture is the predominant activity in rural AP and that there appears to be a modest structural shift away from agriculture and allied categories to the RNFS. The significant growth of agricultural labourers is also a pointer to agricultural distress in the State.

Table 1 indicates that between 1981-1991 in AP there was an increase in mining and quarrying (category IV). This could be due to the liberalisation policies applied to cement production and the removal of subsidies to the granite industry. Storage and warehousing also increased from 1981 to 1991. This could be due to the increase in public construction of *godowns* for food grains and essential commodities in all marketing centres, and the encouragement by the authorities to private entrepreneurs to construct warehouses. The number of persons employed in the electricity, gas and water sectors decreased over the 10 year period. This could be due to the change in the billing system by the Electricity Department: the introduction of the slab system led to a considerable decrease in the number of bill collectors. Another reason for this decrease could lie with the introduction of machines in power projects.

Turning to employment trends by gender, the proportion of rural male main workers in agriculture declined. For females there was a marginal increase in the share. Regarding males in the RNFS, there is a continuous increase in mining and quarrying, manufacturing, trade and services, construction and transport. The largest increase for males is in transport, followed by services, trade and construction. For females it is to be seen in manufacturing, transport and services. A striking feature of this table is that overall female employment outgrew that of male employment. This feature was relatively pronounced in most RNFE sectors; indeed in 'allied' and household industry, female employment rose and male employment fell.

From the above discussion it would seem that the level and growth between 1981 and 1991 of rural employment in AP varies across different categories. The differences between males and females also requires explanation. Quantitative assessment of the possible influence and significance, of different factors that have shaped the 1991 scene can be provided by using an appropriate econometric model. At this stage, the overall conclusion regarding the employment changes in rural AP is that the share of non-farm employment increased very marginally and less than all-India, both for the total and for males. This was mainly due to the increase in the tertiary sector (trade, transport, and construction). The share of non-farm employment for females has marginally declined due to the decline in household industry.

The industrial distribution of the workforce for males for the state as a whole shows that services was the major sector in terms of its share for total and for males in RNFS. For females, household industry had the highest share in RNFS.

Table 1: Growth rate of rural employment in AP (1981 and 1991 census data):

Category	Rural (1981)	Rural (1991)	% Annual Growth Rate	Rural (1981) Males	Rural (1991) Males	% Annual Growth Rate	Rural (1981) Females	Rural (1991) Females	% Annual Growth Rate
I to IX Total Main Workers	18832869 (100.0)	23026505 (100.0)	2.0	12326971 (100.0)	14145823 (100.0)	1.4	6505898 (100.0)	8880682 (100.0)	3.2
Agriculture									
(I) Cultivators	7229577 (38.4)	7703384 (33.5)	0.6	5556880 (45.1)	5528638 (39.1)	-0.05	1672697 (25.7)	2174746 (24.5)	2.6
(II)Agri-labourers	7912322 (42.0)	10940275 (47.5)	3.3	3877712 (31.5)	5280400 (37.3)	3.1	4034610 (62.0)	5659875 (63.73)	3.4
(III) Agrl. Allied	515588 (2.7)	435471 (1.9)	-1.7	468345 (3.8)	376359 (2.66)	-2.2	47243 (0.7)	59112 (0.7)	2.3
(I to III) Total Farm workers	15657487 (83.1)	19079130 (82.9)	2.0	9902937 (80.4)	11185397 (79.1)	1.2	5754550 (88.4)	7893733 (88.9)	3.2
Rural non-farm									
(IV) Mining	55028 (0.3)	153253 (0.7)	10.8	43904 (0.4)	119162 (0.8)	10.5	11125 (0.2)	34091 (0.4)	11.8
(Va) Household Mfg.	845866 (4.5)	742685 (3.2)	-1.3	556885 (4.5)	395536 (2.8)	-3.4	288981 (4.4)	347149 (3.9)	1.9
(Vb) Non-Household Mfg	526637 (2.8)	690240 (3.0)	2.7	421560 (3.4)	538409 (3.8)	2.5	105077 (1.6)	151831 (1.7)	3.7
(IV) Construction	155805 (0.8)	178854 (0.8)	1.4	136650 (1.1)	158331 (1.1)	1.5	19155 (0.3)	20523 (0.2)	0.7
(VII) Trade	589284 (3.1)	765788 (3.3)	2.7	472822 (3.8)	620850 (4.4)	2.8	116462 (1.8)	144938 (1.6)	2.2
(VIII) Transport	167276 (0.9)	236079 (1.0)	3.5	164870 (1.3)	232460 (1.6)	3.5	2406 (0.04)	3619 (0.04)	4.2
(IX)Other Services	835483 (4.4)	1180476 (5.1)	3.5	627344 (5.1)	895678 (6.3)	3.6	208139 (3.2)	284798 (3.2)	3.2
(IV to IX) Total RNFS workers	3175379 (16.8)	3947375 (17.1)	2.2	2424035 (19.6)	2960426 (20.8)	2.0	798588 (11.6)	986945 (11.1)	2.1

Notes: RMW: Rural Main Workers; Brackets indicate the percentage share of total main workers.

Sources: Census of India 1981, series-1 India, General Economic Tables, (Tables B.1 to B.5) pp. 242-245.

- Census of India 1991, Andhra Pradesh, Population Totals, Series-2.

RNFE shares and growth by district are shown in Tables 2, 3 and 4. Activities absorb varying proportions of workers across districts, and the annual change in the proportions involved in each sector points to a diversification of the rural economy during the decade. The expansion of sub-sectors of activities has resulted in wider opportunities in RNFE for both males and females. Yet, some districts seems to have performed better than others. In terms of growth rates, 12 of the 22 districts displayed increases for total share as well as for male RNFE share.

In the analysis of rural employment for total (males and females combined) employed population at the sectoral level, one can observe important changes in the growth rates between 1981 and 1991 for AP and India. Perhaps most striking is the difference for HH industry. The proportion of those employed in this sector has grown by 8.74 per cent per year in AP compared with 0.44 per cent for India. Other sectors which have absorbed employment more rapidly in AP than in India are agricultural labour (roughly twice the rate of India) and by decreasing order mining and quarrying and transport. The other sectors have grown either more slowly in AP than in India or declined more rapidly. Services and in particular trade (both are tertiary activities) have grown more slowly. The proportion involved in construction has declined over the period in AP whilst it has increased in India (-0.62 per cent compared to 0.19 per cent). In terms of decline, the proportion involved with agricultural allied activities has declined relatively substantially (a 3.65 per cent annual fall in AP compared with a 1.88 per cent fall for India). The shift away from cultivators has been more pronounced in AP. For non-HH industry the decrease occurred in AP and India by an almost similar magnitude. One can thus say that relatively, the involvement with the tertiary sector is different in AP than when compared with India. Moreover in terms of shares, one can say that cultivators and agricultural allied activities have experienced relatively more important declines in AP, compared with India, within these categories. Another sector whose performance would have been outstanding and distinct is the HHI.

The district-wide share and growth rates of rural employment (farm and non-farm) between 1981 and 1991 are also presented in the following tables. The difference in shares of males only among the districts grew between 1981and 1991. The biggest group of workers in 1991 was agricultural labourers but the sector which expanded most was mining and quarrying. As we have already seen, most sectors have expanded in AP during the decade with the exception of agricultural and allied activities and the HH industry. The districts in which agricultural and allied activities have declined the most are Warangal, Nalgonda, Karimnagar and East Godavari. These districts have not faced a decline of similar magnitude in HH industry. The biggest decline in this sector, albeit from a small base, was in Ranga Reddy.

For total RNFE, the largest variation in share across districts is for the HH industry (CV = 0.81) in 1991. Differences across districts can also be observed in growth rates for the agricultural and allied sector (a difference of 11 per cent points change between Warangal and Srikakulam). The most pronounced uniformity (i.e. lowest sub-sector CV among districts) in terms of growth rate between 1981-91 is for agricultural labour. The proportion of workers involved as agricultural labourers has increased by a similar proportion across the districts. Besides the district-wide increase of the numbers of workers as agricultural labourers and in mining and quarrying, trade has grown throughout AP, with the exception of Visakhapatnam for transport and Ranga Reddy for the service sector.

District wide male share and growth rates in rural employment (farm and non-farm) activities between 1981 and 1991, presented in Table 3, show that mining and quarrying has most widely differing figures for both shares across districts in 1991 (CV = 1.29).

For males rural (farm and non-farm) breakdown, some changes are worth noting. The proportion of males involved with the HH industry has in fact declined for AP and India, although more for AP (-4.68 per cent per year compared with -3.74 per cent for India). On the other hand a shift might have occurred towards the non-HH industry sector where the signs are the opposite of those of the HHI (non-HHI for males increased by 1.09 per cent for AP and 0.54 per cent for India). Another sector which has expanded towards male employment between 1981 and 1991 has been mining and quarrying. The proportion of the shift in AP has been very pronounced for males compared with India (9.15 per cent compared to 0.79 per cent). On the other hand, the performance of agricultural allied activities for males is similar to that observed for totals, suggesting that what has happened to this sector has had relatively little effect for females (in fact confirmed by looking at Table 4). For the tertiary sector, the

proportion of males has increased in AP but by less than India, with the exception of transport which has absorbed males increasing more rapidly in AP than in India. There thus appears to be some relatively important sectoral gender differences over the period which are specific to AP for HH industry (a female sector) and transport and mining and quarrying (a male sector).

Unlike for males, the number of female main workers has grown between 1981-91 for both AP and India, although by slightly less in AP. Similarly to males, the share of female cultivators and in agricultural allied activities has resulted in a decrease in AP. Also similarly to males, the growth rate in agricultural labour is positive for females in AP. Yet the extent of all of these changes is much less pronounced for females than for males. This is contrasted with the pattern of positive growth in India for females for cultivators and agricultural allied activities. Contrasts with that is of the males in India, where it has been negative. The share of agricultural labour increased for males in India but decreased for females. The increase for males and females in the agricultural labour sector does not outweigh the decline in the other agricultural sectors. It is thus likely that employment has been found elsewhere.

Mining and quarrying is the sector with the highest growth for females in AP and in fact it is the only sector that would have absorbed females significantly. In AP, the tertiary sector such as trade, transport and services has declined or remain almost stagnant for females. The only noticeable sector of marginal experience has been non-HHI (which experienced 0.54 per cent annual income). Household industry and construction have declined by over 1 per cent per year in AP. The observation for AP contrasts somewhat with the overall India pattern as mining and quarrying decline and services increase.

In terms of the sectors in decline for females, AP has performed better than India for HHI, construction and transport. In terms of the expanding sectors AP has done worse than India for non-HHI and services. Finally it remains that in 1991 there were relatively few differences in the share between AP and India for construction, trade, transport and services. For mining and quarrying AP had 1.35 times the proportion of India but for the non-HHI it had only 3/4 of the proportion that India had. The key sector for female employment would appear to have been HHI in which 4.44 per cent of females RNFE were concentrated. This was 1.5 times higher than in India in 1991. Within agricultural activities females are predominately engaged as agricultural labour (1.3 times India's proportions).

There is a positive growth rate for agricultural labour in all districts. The majority of districts experienced negative growth rates in agricultural and allied activities.

Table 2: District-wide total share and growth rates in rural employment (farm and non-farm) activities (1981 and 91)

		Cultivators		Agrl. Labour		Agrl. Allied Activities		HH Industry		Non-HH Industry		Mining & Quarrying		Construction		Trade		Transport		Services	
DISTRICT	Growth of MW	% 91	GR	% 91	GR	% 91	GR	% 91	GR	% 91	GR	91	GR	% 91	GR	% 91	GR	% 91	GR	% 91	GR
Srikakulam	1.69	35.19	-0.59	43.59	3.79	4.24	3.06	3.65	-1.04	1.50	-1.44	0.24	25.81	0.43	1.15	4.18	2.28	0.89	4.17	6.09	4.39
Vizianagar	1.96	42.74	0.71	37.08	3.14	2.25	2.04	3.39	0.52	2.39	-1.06	0.30	6.55	0.52	4.66	4.29	3.39	1.05	4.82	6.00	6.04
Visakhapt	1.72	50.15	1.33	30.79	3.60	2.30	-1.13	3.13	-0.62	1.94	-3.88	0.45	8.12	0.70	-1.78	3.61	0.78	1.40	-1.51	5.53	3.35
East Goda	1.52	17.81	-2.04	59.23	3.30	2.34	-4.54	3.30	-1.72	2.85	-1.05	0.13	15.48	0.49	0.30	5.05	1.39	1.26	1.54	7.54	5.29
West Goda	2.11	17.30	-1.51	61.38	3.15	1.87	0.90	2.08	-2.15	3.20	1.86	0.20	27.39	0.52	1.61	4.58	4.31	1.44	4.34	7.42	4.73
Krishna	2.11	20.49	-0.34	61.05	3.25	2.20	1.37	2.04	-1.75	2.98	2.41	0.38	27.84	0.66	-0.07	3.65	3.12	1.74	2.26	4.81	1.49
Guntur	2.18	25.01	0.02	59.08	3.46	1.50	0.49	0.92	-7.37	2.67	-0.26	0.59	12.29	0.75	3.89	3.49	3.66	1.20	4.39	4.79	3.13
Prakasam	2.01	29.23	0.40	54.57	3.59	2.26	0.33	1.56	-5.95	2.26	-0.47	0.30	9.73	0.94	0.33	2.98	1.40	0.91	1.33	4.98	3.18
Nellore	1.51	25.01	-0.73	54.62	2.55	3.24	1.51	2.47	-3.13	2.14	1.77	0.43	5.26	1.15	1.96	3.71	5.40	1.26	3.45	5.96	3.13
Chittor	1.75	43.16	0.49	38.86	2.84	2.20	1.75	2.26	-1.41	2.54	0.74	0.47	23.68	0.75	0.59	3.34	4.64	1.21	5.92	5.21	4.96
Cuddapah	1.03	35.24	0.53	46.30	1.78	1.88	0.26	2.67	-4.22	2.12	-1.64	0.59	0.08	0.96	-0.23	3.22	1.86	1.14	3.22	5.89	2.67
Anantapur	2.16	41.61	1.12	43.34	3.12	1.83	-0.36	2.19	-0.89	1.88	2.76	0.17	8.10	0.95	6.91	2.68	2.58	0.71	4.49	4.64	4.98
Kurnool	2.27	29.30	1.74	56.03	2.83	0.86	-1.38	1.65	-2.47	1.47	-1.24	2.01	5.99	0.73	2.97	2.61	1.02	0.73	2.29	4.60	2.93
Mahabub	2.68	41.80	1.41	43.59	4.66	1.86	-1.75	1.77	-6.47	3.00	7.76	0.34	13.71	0.81	4.98	2.68	2.44	0.72	5.78	3.44	2.90
RangaRed	1.38	38.32	1.07	40.52	3.23	2.43	-3.83	1.29	-10.83	4.45	1.13	1.68	19.19	1.28	-0.16	3.80	0.59	1.44	1.79	4.79	-0.85
Medak	2.53	43.41	1.41	38.82	4.10	1.42	-4.27	2.85	-3.13	5.08	8.67	0.54	43.53	0.60	4.04	2.76	3.26	0.66	3.73	3.88	2.62
Nizamaba	1.88	37.96	0.50	34.09	3.05	1.42	-3.30	13.39	3.32	3.82	1.05	0.21	12.50	0.74	2.22	3.22	2.53	0.66	4.90	4.49	4.19
Adilabad	1.87	39.17	1.16	39.14	1.77	1.20	-3.73	5.11	1.76	3.70	5.24	3.42	8.63	0.55	2.48	2.43	2.91	0.53	5.79	4.74	4.59
Karimnaga	2.13	35.06	1.35	39.73	2.62	1.38	-6.96	7.05	0.32	6.30	9.90	1.22	9.19	0.87	-0.82	2.46	2.82	0.67	6.52	5.26	3.19
Warangal	2.52	36.55	1.60	46.83	4.05	1.03	-8.86	3.07	-3.32	3.63	8.42	0.46	33.51	0.87	2.16	2.28	1.91	0.81	2.53	4.47	2.55
Khammam	2.47	30.85	0.82	53.56	3.94	1.26	-2.35	1.87	-2.65	2.28	3.23	1.61	11.03	0.73	-5.73	2.67	3.06	1.83	4.99	4.34	2.32
Nalgonda	2.46	34.45	0.84	45.27	3.88	1.29	-7.29	5.49	1.71	3.50	7.28	0.33	46.96	1.24	2.93	3.34	3.39	1.20	9.33	3.88	3.10
AP	0.32	33.45	-1.37	47.51	1.24	1.89	-3.65	3.22	-3.27	3.00	0.69	0.67	3.61	0.78	-0.62	3.33	0.62	1.02	1.37	5.13	1.48
India	0.30	48.15	-0.56	32.17	0.67	1.96	-1.88	0.47	0.44	2.20	-3.28	3.60	0.49	1.04	0.19	3.26	1.57	1.23	1.12	5.92	2.27
Mean	2.00	34.08	0.51	46.70	3.26	1.92	-1.73	3.32	-2.34	3.03	2.33	0.73	17.03	0.78	1.56	3.32	2.67	1.02	3.91	5.13	3.40
SD	0.42	8.84	1.01	9.25	0.71	0.77	3.28	2.68	3.25	1.18	3.92	0.80	12.56	0.23	2.67	0.75	1.24	0.33	2.24	1.04	1.48
CV	0.21	0.26	1.97	0.20	0.22	0.40	-1.90	0.81	-1.39	0.39	1.69	1.10	0.74	0.30	1.71	0.22	0.47	0.32	0.57	0.20	0.43

Notes: MW = Main workers men+women. %: Percentage of all Rural main workers in 1991. GR: Average Annual Percentage Growth Rates of the proportion between 1981 and 1991. CV: Coefficient of Variation (= Standard Deviation/Mean); SD = standard deviation.

Sources: Census of India (1991) Series -1, final population total paper 2 of 1992 p.155. Census of India 1991 India Series-1, Provisional Population Totals: Workers and their Distribution, Paper-3 of 1991 pp. 443-448.

Table 3: District-wide male share and growth rates in rural employment (farm and non-farm) activities between 1981 and 1991

		Cultivators		Agrl. Labour		Agrl. Allied Activities		HH Industry		Non-HH Industry		Mining & Quarrying		Construction		Trade		Transport		Services	
DISTRICT	**Growth of MW**	**% 91**	**GR**	**% 91**	**GR**	**% 91**	**GR**	**% 91**	**GR**	**% 91**	**GR**	**91**	**GR**	**% 91**	**GR**	**% 91**	**GR**	**% 91**	**GR**	**% 91**	**GR**
Srikakulam	1.18	38.14	-1.00	35.26	3.61	5.84	2.19	3.56	-2.24	2.06	-0.91	0.27	21.95	0.66	1.15	5.05	2.19	1.42	4.25	7.74	4.40
Vizianagar	1.33	44.78	0.00	29.18	2.64	3.25	1.81	3.77	-0.76	3.50	-1.01	0.34	7.07	0.78	5.03	5.23	3.64	1.66	4.69	7.50	5.67
Visakhapt	0.95	50.62	0.19	25.79	3.83	3.23	-1.11	3.20	-1.38	2.54	-4.19	0.52	7.92	0.95	-1.28	4.13	1.29	2.16	-1.48	6.87	3.31
East Goda	1.42	21.18	-2.15	53.27	3.92	3.00	-4.57	3.02	-2.79	3.41	-0.80	0.13	13.59	0.62	-0.07	5.83	1.31	1.66	1.57	7.89	5.59
West Goda	1.82	23.50	-1.49	51.58	3.42	2.41	0.29	1.82	-4.02	4.06	1.88	0.21	22.79	0.74	1.45	5.66	3.99	2.10	4.26	7.92	4.80
Krishna	1.37	28.31	-0.83	48.26	2.77	3.03	1.06	2.12	-2.86	4.20	2.66	0.41	26.11	0.96	0.73	4.56	3.18	2.70	2.25	5.43	1.75
Guntur	1.42	32.15	-0.75	46.29	3.14	2.05	-0.39	0.98	-9.04	3.85	0.73	0.68	12.99	1.22	3.97	4.69	3.54	2.00	4.38	6.07	3.48
Prakasam	1.27	35.87	-0.37	41.91	3.32	3.23	0.04	1.77	-7.10	3.16	0.88	0.32	10.55	1.50	1.03	4.14	1.69	1.52	1.32	6.58	3.66
Nellore	1.02	31.93	-1.07	42.81	2.34	4.41	1.48	2.62	-4.14	2.86	1.90	0.40	4.14	1.73	2.65	4.26	5.38	1.94	3.39	7.04	3.19
Chittor	1.21	46.50	-0.23	31.29	2.70	2.27	0.55	2.50	-2.18	3.43	0.60	0.59	22.97	1.04	1.30	4.08	4.40	1.83	5.94	6.47	5.04
Cuddapah	0.78	42.49	0.18	35.07	1.79	2.21	-0.71	2.78	-4.31	2.82	-1.22	0.70	1.09	1.31	-0.69	4.03	2.45	1.68	3.25	6.91	2.99
Anantapur	1.75	48.53	0.69	31.79	3.12	2.64	-0.21	2.55	-1.31	2.61	2.58	0.23	10.15	1.33	6.47	3.50	3.00	1.12	4.58	5.72	4.66
Kurnool	1.84	37.05	1.08	43.52	2.79	1.21	-2.10	1.80	-3.33	2.10	-0.85	2.30	6.59	1.14	2.66	3.70	1.38	1.24	2.27	5.93	2.97
Mahabub	1.83	50.76	0.73	29.61	4.70	2.98	-2.04	1.79	-7.94	3.49	7.17	0.45	13.90	1.21	4.46	3.85	2.44	1.26	5.79	4.59	3.12
RangaRed	0.75	42.98	0.64	28.28	3.31	3.43	-4.60	1.49	-11.44	6.33	1.50	1.87	20.03	1.84	-0.32	5.31	0.74	2.39	1.76	6.07	-1.33
Medak	1.55	48.98	0.41	29.13	4.09	2.20	-4.95	2.26	-6.44	5.57	7.51	0.62	39.28	0.85	2.65	4.13	3.16	1.12	3.58	5.13	2.53
Nizamaba	1.25	44.42	0.01	30.20	3.51	2.55	-3.36	4.40	-0.67	3.99	0.44	0.24	11.14	1.11	1.32	5.55	2.65	1.23	4.95	6.31	3.64
Adilabad	1.22	45.34	0.55	29.98	1.25	1.90	-3.97	2.92	-1.89	2.86	1.02	5.58	8.52	0.76	1.67	3.60	3.01	0.88	5.79	6.18	4.71
Karimnaga	1.31	41.00	0.74	30.27	2.06	2.34	-7.07	4.49	-3.88	7.14	8.94	1.85	7.86	1.35	-0.44	3.75	3.37	1.20	6.50	6.60	3.12
Warangal	1.33	44.15	0.50	33.09	3.10	1.60	-9.23	3.64	-4.37	5.42	9.34	0.61	33.19	1.28	2.52	3.20	2.09	1.36	2.47	5.64	2.58
Khammam	1.75	39.17	0.17	40.01	3.75	1.64	-3.45	2.31	-2.99	3.35	3.44	2.39	10.71	1.04	-4.67	3.47	2.89	1.31	5.02	5.31	2.65
Nalgonda	1.48	42.29	-0.01	31.17	2.91	1.77	-7.79	6.43	1.10	5.13	7.70	0.40	43.11	1.62	2.55	4.27	4.02	1.99	9.33	4.93	3.82
AP	-0.35	39.08	-1.42	37.33	1.73	2.66	-3.50	2.80	-4.68	3.81	1.09	0.84	9.15	1.12	0.09	4.39	1.37	1.64	2.04	6.33	2.04
India	-0.14	51.40	-0.70	26.35	0.94	2.08	-1.94	1.96	-3.74	4.03	0.54	0.53	0.79	1.30	1.06	3.99	2.01	1.62	1.54	6.74	2.43
Mean	1.36	40.01	-0.09	36.26	3.06	2.69	-2.19	2.83	-3.82	3.81	2.24	0.96	16.18	1.14	1.55	4.36	2.81	1.63	3.90	6.31	3.47
SD	0.32	8.32	0.82	8.23	0.82	1.02	3.22	1.22	2.99	1.35	3.68	1.24	11.29	0.34	2.38	0.77	1.14	0.47	2.24	0.95	1.49
CV	0.23	0.21	-9.00	0.23	0.27	0.38	-1.47	0.43	0.78	0.35	1.64	1.29	0.70	0.30	1.54	0.18	0.41	0.29	0.57	0.15	0.43

Notes and sources: As previously

Table 4: District-wide female share and growth rates in rural employment (farm and non-farm) activities between 1981 and 91

		Cultivators		Agrl. Labour		Agrl. Allied Activities		HH Industry		Non-HH Industry		Mining & Quarrying		Construction		Trade		Transport		Services	
DISTRICT	**Growth of MW**	**% 91**	**GR**	**% 91**	**GR**	**% 91**	**GR**	**% 91**	**GR**	**% 91**	**GR**	**% 91**	**GR**	**% 91**	**GR**	**% 91**	**GR**	**% 91**	**GR**	**% 91**	**GR**
Srikakulam	2.57	30.44	0.31	57.02	3.96	1.65	10.52	3.79	1.14	0.60	-3.91	0.19	50.71	0.07	1.07	2.77	2.56	0.03	-0.81	3.43	4.34
Vizianagar	3.09	39.44	2.17	49.91	3.63	0.63	4.23	2.74	4.23	0.58	-1.45	0.23	5.40	0.11	1.18	2.75	2.65	0.05	15.64	3.56	7.46
Visakhapt	3.25	49.32	3.83	39.62	3.35	0.65	-1.30	3.01	1.01	0.88	-2.10	0.33	8.76	0.25	-4.48	2.71	-0.45	0.05	-3.37	3.19	3.52
East Goda	1.82	7.90	-1.10	76.79	2.15	0.40	-3.88	4.12	1.14	1.20	-2.89	0.15	22.90	0.12	9.71	2.75	1.87	0.06	-0.88	6.51	4.31
West Goda	2.72	4.36	-1.72	81.85	2.81	0.75	6.60	2.62	1.53	1.41	1.75	0.19	0.00	0.05	8.92	2.33	6.17	0.07	11.94	6.37	4.56
Krishna	3.56	6.80	4.29	83.44	3.76	0.74	4.05	1.90	0.96	0.85	0.54	0.33	32.87	0.14	-6.45	2.04	2.86	0.06	3.35	3.71	0.85
Guntur	3.40	14.61	3.02	77.67	3.73	0.69	3.72	0.84	-3.43	0.95	-4.57	0.46	19.16	0.07	2.18	1.74	4.15	0.04	5.56	2.93	2.13
Prakasam	3.19	19.74	2.78	72.66	3.81	0.87	2.04	1.26	-3.01	0.98	-4.93	0.28	8.53	0.14	-6.43	1.34	0.21	0.04	1.87	2.70	1.69
Nellore	2.45	12.92	0.93	75.25	2.76	1.22	1.70	2.21	-0.57	0.89	1.04	0.48	7.20	0.14	-6.49	2.76	5.43	0.07	7.84	4.07	2.95
Chittor	2.86	36.89	2.45	53.10	3.00	2.06	4.87	1.81	0.93	0.87	1.87	0.23	22.96	0.19	-4.60	1.95	5.66	0.04	4.51	2.84	4.60
Cuddapah	1.56	20.42	2.14	69.25	1.78	1.21	5.15	2.43	-3.99	0.69	-4.54	0.37	-3.01	0.25	7.25	1.54	-0.75	0.05	1.28	3.80	1.57
Anantapur	2.87	30.17	2.36	62.47	3.13	0.49	-1.57	1.58	0.33	0.68	4.01	0.08	2.09	0.32	10.55	1.33	0.98	0.03	-0.33	2.85	6.13
Kurnool	2.93	18.39	3.92	73.65	2.86	0.37	3.03	1.44	-0.73	0.59	-3.01	1.61	4.89	0.13	7.83	1.07	-0.55	0.02	3.38	2.73	2.81
Mahabub	3.93	30.15	3.11	61.77	4.64	0.40	1.61	1.73	-3.99	2.35	9.01	0.19	13.15	0.29	8.49	1.16	2.44	0.03	5.32	1.94	2.25
RangaRed	2.37	31.65	1.96	58.05	3.17	1.00	1.37	0.99	-9.35	1.75	-0.59	1.40	17.30	0.48	0.79	1.65	-0.05	0.09	3.35	2.95	0.72
Medak	4.08	35.76	3.67	52.13	4.10	0.34	6.46	3.65	1.21	4.40	11.08	0.42	62.67	0.25	16.35	0.86	3.91	0.03	17.19	2.16	2.91
Nizamaba	2.66	30.58	1.37	38.54	2.65	0.13	-1.84	23.68	4.45	3.62	1.88	0.18	15.09	0.31	7.13	0.56	1.27	0.01	0.77	2.40	6.09
Adilabad	2.93	29.99	2.73	52.75	2.24	0.16	2.10	8.36	4.43	4.97	11.40	0.22	14.38	0.24	7.46	0.69	2.17	0.02	6.29	2.61	4.18
Karimnaga	3.26	27.76	2.56	51.37	3.05	0.19	-5.21	10.18	3.81	5.26	11.76	0.45	21.71	0.28	-2.77	0.86	0.33	0.03	7.18	3.62	3.36
Warangal	4.48	25.95	4.87	65.97	4.78	0.24	-4.40	2.27	-0.40	1.12	3.80	0.26	34.63	0.30	0.22	1.00	0.45	0.03	7.58	2.85	2.46
Khammam	3.79	17.33	3.73	75.59	4.12	0.64	4.69	1.16	-1.41	0.55	1.40	0.34	15.58	0.22	-11.13	1.35	3.80	0.04	3.54	2.77	1.37
Nalgonda	4.12	22.81	3.71	66.17	4.62	0.58	-4.58	4.09	3.29	1.09	4.78	0.23	71.49	0.69	4.36	1.97	1.61	0.04	9.04	2.33	1.15
AP	1.47	24.55	-0.46	63.23	0.19	0.67	-0.85	4.44	-1.26	1.71	0.54	0.38	8.38	0.23	-2.29	1.63	-0.93	0.04	0.00	3.21	0.03
India	1.54	38.58	0.44	48.83	-0.31	2.14	1.47	2.90	-2.64	2.30	0.87	0.28	-0.69	0.27	-7.04	1.08	-0.27	0.08	-3.13	3.53	2.02
Mean	3.09	24.70	2.41	63.41	3.55	0.70	1.79	3.90	-0.07	1.65	1.65	0.39	20.38	0.23	2.32	1.69	2.12	0.04	5.01	3.29	3.25
SD	0.73	11.35	1.65	13.06	0.83	0.49	4.15	4.97	3.34	1.49	5.28	0.38	19.58	0.15	7.07	0.74	2.07	0.02	5.19	1.16	1.82
CV	0.24	0.46	0.69	0.21	0.25	0.70	2.32	1.27	46.58	0.90	3.19	0.96	0.96	0.64	3.04	0.44	0.97	0.45	1.04	0.35	0.56

Notes and sources: As previously.

Table 5 presents some shares and growth rates of the traditional and modern RNFS. In relation to agriculture-related employment (cultivators, agricultural labour and agricultural allied activities), there are some differences across the districts and across gender. In total, Mahabubnagar has the largest portion of workers involved in agriculture whilst Karimnagar has the lowest. For males also, these two extreme districts represents the same highest and lowest figures. For females, Karimnagar is again low whilst Khammam has the highest share of female workers in agriculture. Karimnagar thus has the highest proportion of workers for both sexes involved with non-farm activities. This district is also of high agricultural and infrastructural development and is part of a newly irrigated district.

In relation to changes in the proportion of main workers involved with the agricultural sector, a decline has occurred in more than half of the districts (in 12 for total, in 17 for males) with the exception of females. The average annual declines, where they have happened are, however, relatively small (0.5 per cent in Karimnagar for totals, 0.55 per cent for males and females in Adilabad). Again, Adilabad is the district which has witnessed the fastest increase in RNFE for both sexes.

Turning to the traditional and modern breakdown of district non-farm employment, recalling here that we have taken a somewhat arbitrary decision in the separation of the 2 sectors, males dominate both sectors. We have equated predominantly traditional RNFE with HHI and other services and predominantly modern RNFE with mining and quarrying, non-HHI, construction, trade and transport. AP out performs India for share of total labour force in modern RNFE. The same pattern occurs for males. In contrast, in AP a smaller share of total workers is involved with traditional non-farm activities than in all-India, but the pattern is reversed for males, (9.1 per cent in AP compared to 8.7 per cent for India). For totals, Nizamabad has the greatest proportion of non-farm workers involved with the traditional sector, while Ranga Reddy has the highest proportion of non-farm workers in the modern sector. The fact that 26.08 per cent of females are involved in Nizamabad in the traditional sector helps to explain the high total share of traditional overall in that district. The district with the greatest share of female workers in the modern sector is Karimnagar, although the 6.9 per cent figure is far behind that of males (15.3 per cent).

The average annual changes in modern sector RNFE have been important for both males and females (4.5 per cent and 5.2 per cent respectively per year over the decade). AP is the state where the rate of total modern RNFE growth has been highest. The most pronounced increase in the modern sector for females has been Medak (almost twice the increase of males). Acute declines have occurred for females in the modern sector in Visakhapatnam and for males in Ranga Reddy. There are important differences between males and females in their employment in the modern sector. As many as 15 districts have witnessed a decline in the number of females involved in the modern sector and in 11 districts there have been declines in both the modern and traditional sectors simultaneously. We see later that the female RNFE is linked to an increase in female agricultural employment. The pattern is more consistent in the traditional sector where the decline in RNFE has been important for males, females and total.

Table 5: District-wide shares and growth rates (GR) in rural employment (farm and non-farm traditional and modern) activities (1981 and 91)

DISTRICT	Cultivators + Agri. labour +Agri. Allied (total for 1991) %	1981-91 GR (%/y)	Tradition (total 91) (%)	1981-91 GR (%/y)	Modern 91 (total)	1981-91 GR (%/y)	Cultiva. + Agri. labour +Agri. Allied (males for 1991) %	1981-91 GR (%/y)	Traditional 91 (male)	1981-91 GR (%/y)	Modern 91(male)	1981- 91 GR (%/y)	c+Al+Alli 91 (female)	1981-91 GR (%/y)	Traditional 91 (female)	1981-91 GR (%/y)	Modern 91 (female.)	GR
Srikakula	83.02	-0.04	9.74	0.28	7.24	0.08	79.24	-0.15	11.74	0.95	9.46	0.67	89.11	0.05	7.22	-0.04	3.66	-1.03
Vizianaga	82.07	-0.20	9.39	1.69	8.55	0.25	77.21	-0.34	11.5	1.84	11.51	0.88	89.98	-0.12	6.3	2.74	3.72	-1.02
Visakhapt	83.24	0.30	8.66	-0.01	8.1	-2.59	79.64	0.20	10.87	1.37	10.3	-1.90	89.59	0.30	6.2	-0.99	4.22	-3.81
EastGoda	79.38	-0.02	10.84	1.01	9.78	-0.85	77.45	-0.02	11.89	1.86	11.65	-0.73	85.09	-0.07	10.63	1.109	4.28	-1.16
WestGod	80.55	-0.22	9.5	0.61	9.94	1.35	77.49	-0.28	11.92	2.59	12.77	1.43	86.96	-0.17	8.99	0.83	4.05	2.13
Krishna	83.74	0.07	6.85	-1.67	9.41	0.70	79.6	-0.10	9.43	1.07	12.83	1.49	90.98	0.23	5.61	-2.57	3.42	-1.05
Guntur	85.59	0.08	5.71	-1.78	8.7	0.52	80.49	-0.12	10.07	2.48	12.44	1.59	92.97	0.21	3.77	-2.73	3.26	-1.93
Prakasam	86.06	0.27	6.54	-1.96	7.39	-1.14	81.01	0.10	10.58	1.18	10.64	0.20	93.27	0.37	3.96	-3.16	2.78	-4.91
Nellore	82.87	-0.12	8.43	-0.70	8.69	2.07	79.15	-0.25	11.04	0.87	11.19	2.53	89.39	0.004	6.28	-0.87	4.34	1.34
Chittor	84.22	-0.21	7.47	0.77	8.31	1.66	80.06	-0.37	10.47	2.75	10.97	2.10	92.05	-0.05	4.65	0.13	3.28	1.13
Cuddapah	83.42	0.17	8.56	-1.10	8.03	-0.44	79.77	0.05	10.91	0.65	10.54	0.15	90.88	0.33	6.23	-2.55	2.9	-3.14
Anantapur	86.78	-0.13	6.83	0.51	6.39	1.33	82.96	-0.23	9.72	2.26	8.79	1.89	93.13	-0.03	4.43	0.73	2.44	-0.24
Kurnool	86.19	0.12	6.25	-1.10	7.55	-0.40	81.78	0.05	9.93	1.76	10.48	0.15	92.41	0.14	4.17	-1.46	3.42	-1.58
Mahabub	87.25	0.12	5.21	-4.03	7.55	2.48	83.35	-0.002	8.59	-0.42	10.26	2.94	92.32	0.17	3.67	-4.95	4.02	2.63
RangaRe	81.27	0.48	6.08	-5.43	12.65	0.64	74.69	0.45	10.07	-2.45	17.74	1.21	90.7	0.33	3.94	-5.34	5.37	-0.13
Medak	83.65	-0.11	6.73	-2.72	9.64	3.49	80.31	-0.19	9.13	-0.70	12.29	3.89	88.23	-0.14	5.81	-2.19	5.96	6.22
Nizamaba	73.47	-0.38	17.88	1.62	8.65	0.25	77.17	-0.17	10.31	-0.02	12.12	0.78	69.25	-0.60	26.08	1.88	4.68	-0.29
Adilabad	79.51	-0.50	9.85	1.11	10.63	3.48	77.22	-0.55	10.18	1.94	13.68	3.17	82.9	-0.51	10.97	1.41	6.14	6.57
Karimnag	76.17	-0.40	12.31	-0.68	11.52	4.30	73.61	-0.45	10.6	-2.12	15.29	4.50	79.32	-0.40	13.8	0.42	6.88	5.16
Warangal	84.41	0.08	7.54	-2.76	8.05	2.61	78.84	-0.22	9.64	-1.74	11.87	4.16	92.16	0.27	5.12	-3.26	2.71	-1.56
Khamma	85.67	0.10	6.21	-1.91	9.12	1.73	80.82	-0.08	9.31	0.82	11.56	1.54	93.56	0.24	3.93	-3.20	2.5	-2.56
Nalgonda	81.01	-0.28	9.37	-0.19	9.61	3.09	75.23	-0.71	8.93	-1.70	13.41	4.57	89.56	0.15	6.42	-1.61	4.02	-0.53
AP	82.85	-0.04	8.35	-0.66	8.8	-1.32	79.07	-0.16	9.13	-0.03	11.80	1.62	88.89	0.05	7.12	-0.70	3.99	0.25
India	82.28	-0.14	9.6	2.10	8.12	1.03	79.83	-0.23	8.70	0.63	11.47	1.24	89.55	0.05	6.43	-0.38	4.02	-0.41

Notes and sources: As previously.

Table 6. separates the districts into 2 categories; those that have experienced an increase in the RNFS from those that have experienced a decrease. We are looking for some characteristics that can be easily identified to account for the RNFS performance. Neither the affluence nor the poverty of a district appears to be associated at the bivariate level with the share of non-farm employment within rural areas (through an examination of scatter plots and correlation matrices which is not reported in the paper). As a first step towards multivariate analysis we plotted the RNFE share against irrigation as a proxy for agricultural development and poverty as well as urbanisation.

The highest percentage decline in RNFE is seen in those districts in which urban population has grown very fast, namely Visakhapatnam and Ranga Reddy. This may be due to the fact that there has been rural migration to urban areas as a result of a decline in traditional industries, or maybe it is a means of accessing urban employment. It was observed in the scatter plot of RNFE and growth of urbanisation that the slackening of the rate of growth of non-farm is mainly due to the slackening of urbanisation. The coefficient of variation of female RNFE across districts increased considerably between 1981-1991. Certain transformations have taken place in districts that seem to have facilitated the establishment of agro-based industries which were labour and female-intensive (for example cashew kernel processing, tobacco processing, and fruit juice manufacturing industries). However these were mostly confined to districts already leading in RNFS share.

There has been relatively little change between 1981 and 1991 in the agricultural sector in AP and India. The share for males has declined and has been little compensated by the small increase for females, generally the total annual decline is in the order of 0.04 per cent for AP and 0.14 per cent for India. However, a point worth noting is that the average annual decline for males for AP is about a third of that observed for India.

Table 6. shows that, in terms of the 1991 proportions involved, there is again little difference between AP and India; the proportion of males in rural farm employment and that of females is a little bit lower in AP compared with India (79.07 per cent) compared with 79.83 per cent and 88.89 per cent and 89.55 per cent respectively.

For total, the ratio for 1991 is reversed but again is small (82.85 per cent in AP compared to 82.28 per cent in India) differences are more pronounced in relation to the performance of the predominantly traditional and modern sectors. The biggest change happened for the modern sector where the increase has been in excess of 1 per cent per year over the period; AP has done better than India for males (1.62 per cent compared to 1.24 per cent). In contrast, the situation for females in the modern sector remained stable and even declined in India. The modern sector accounted for about 11.5 per cent for males compared with about 4 per cent for females. The performance in the traditional sector has not been very good for either males or females in AP. Both witnessed declines although the extent of the change has been more pronounced for females. The traditional sector accounted for 9 per cent of employment for males and about 7 per cent for females in AP standing slightly above the India average, which is in fact caused by a very pronounced dispersion for females.

Table 6 enables a rough separation of characteristics specific to the two groups of AP districts regarding their RNFS performance. Focussing on those districts where RNFS has reversed one sees that there are clear trends on average by higher urban population over the decade and by very fast growth in the urban population between 1981 and 1991. Whereas the two groups of districts started in 1977-78 with a similar percentage of people below the poverty line, the districts in which the RNFS has decreased have performed better in reducing their poverty. Some districts have had an excellent performance (such as Ranga Reddy and Kurnool) nevertheless the districts that belong to the ‘RNFS increase’ group have also done very well so that the pattern is not systematic. As for per capita value of agricultural output, the figure has increased in real terms for both groups, but it has increased by much more for the 'RNFS decrease group’. In particular no district in this group has experienced a decline (compared with 3 districts in the other group).

Finally as expected those districts where the RNFS has declined we have seen the proportions of those involved in RNFE fall by 1.28 percentage points over the period 1981-91. The caveat existing with the data presented in the table which prevents one from drawing clear inferences is that fluctuations might have occurred during the decades considered.

In total the modern and traditional sectors had similar shares in AP (between 8 and 9 per cent in 1991), a breakdown hardly distinct from that of India (9.6 per cent and 8.12 per cent for modern and traditional) nevertheless there seems to be greater dispersion across districts for the traditional sector when compared with the modern sector.

Table 6: Changes in RNFS employment, in urban growth, in poverty and per capita value of agricultural output across as districts 1981 1991

Districts	% RNFE 1981	% RNFE 1991	Pattern of Change (percentage points)	% of urban Population 1981	% of urban Population 1991	Difference of urban Population (percentage points)	Decadal Growth rate of urban Population	% of Persons below Poverty line 1977-8	% of Persons below Poverty line 1987-8	Difference (percentage Points)	Per capita Value of Agricultural Output 1981	Per capita value of Agricultural output 1991 (1981 constant prices)	Difference (Rupees)
RNFS decrease													
Ranga Reddy	22.51	18.95	-3.56	24.29	47.12	22.83	209.19	74.03	32.25	41.78	614.81	817.24	202.43
Visakhapatnam	19.21	16.72	-2.49	31.28	39.76	8.48	61.70	70.28	35.32	34.96	742.14	828.95	86.81
Prakasam	16.25	14.09	-2.16	14.99	16.45	1.46	29.66	58.56	44.14	14.42	1168.71	1238.95	70.24
Cuddapah	17.96	16.52	-1.44	19.40	24.00	4.6	45.11	54.21	24.20	30.01	697.40	1108.92	411.52
Kurnool	14.83	14.06	-0.77	24.49	25.85	1.36	30.12	74.42	38.74	35.68	1026.45	1350.15	323.7
Warangal	16.25	15.69	-0.56	17.24	19.40	2.16	37.66	76.12	56.57	19.55	661.15	888.01	226.86
Khammam	15.22	14.68	-0.54	16.98	20.19	3.21	50.44	42.12	34.97	7.15	739.37	1133.53	394.16
Guntur	15.09	14.63	-0.46	27.53	28.93	1.4	25.51	45.72	37.73	7.99	1398.75	1891.83	493.08
Krishna	16.88	16.46	-0.42	32.54	35.83	3.29	33.45	46.95	27.68	19.27	1412.12	1483.26	71.14
Mahabubnagar	13.76	13.38	-0.38	10.93	11.11	0.18	27.79	73.14	80.08	-6.94	708.52	825.82	117.3
Average	**16.80**	**15.52**	**-1.28**	**21.97**	**26.86**	**4.83**	**55.06**	**66.56**	**41.17**	**20.39**	**916.94**	**1156.67**	**239.72**
RNFS increase													
Adilabad	16.35	20.5	4.15	19.32	23.14	3.82	51.80	82.15	49.14	33.01	586.41	605.30	18.89
Karimnagar	20.73	24.04	3.31	15.79	20.59	4.8	62.19	82.55	59.43	23.12	739.37	1133.53	394.16
Nizamabad	23.68	26.79	3.11	19.21	20.27	1.06	27.93	51.89	38.75	13.14	1040.88	1012.45	-28.43
Nalgonda	16.65	19.11	2.46	11.38	11.87	0.49	30.26	39.29	9.34	30.05	600.44	1733.49	1133.05
West Godavari	17.64	19.5	1.86	20.77	20.83	0.04	22.78	54.35	11.29	43.06	1701.61	1321.35	-380.26
Vizianagaram	16.3	18.11	1.81	15.94	17.20	1.26	25.90	-	51.52	-	742.14	828.95	86.81
Chittor	13.97	15.65	1.68	16.88	19.82	2.94	39.62	63.59	51.14	12.45	802.17	1103.44	301.27
Medak	15.4	16.76	1.36	11.97	14.50	2.33	51.49	77.54	41.39	36.15	658.92	726.26	67.34
Anantapur	12.1	13.28	1.18	20.81	23.51	2.7	40.81	77.84	74.51	3.33	866.76	1126.58	259.82
Nellore	16.12	17.32	1.20	20.76	23.81	6.05	35.95	60.66	60.05	0.61	873.66	1201.77	328.11
East Godavari	20.43	20.67	0.24	22.21	23.85	1.64	31.77	56.75	16.50	40.25	1114.09	1014.38	-99.71
Srikakulam	16.66	16.84	0.18	10.89	12.51	1.62	35.70	77.33	59.36	17.97	646.48	712.96	66.48
Average	**17.17**	**19.05**	**1.88**	**17.16**	**19.33**	**2.17**	**38.02**	**66.81**	**43.54**	**21.10**	**864.41**	**1043.32**	**178.91**
AP	**16.8**	**17.1**	**0.3**	**23.32**	**26.84**	**3.52**	**42.69**	**63.54**	**40.78**	**22.76**	**N/A**	**N/A**	**N/A**

Notes: % RNFS means Percentage of main workers in rural non-farm sector to total main workers in rural areas.- 'Pattern of change' means percentage change in RNFS between 1981-1991.

Sources: Census of India 1991, Andhra Pradesh, Population Totals, Series-2, pp. 10, 66-73 - Sudhakar Reddy (1991) 'Poverty and Agricultural growth in Rural Andhra Pradesh Inter District Analysis', CESS, Hyderabad

Table 7: Proportion of rural non- farm employment to total workers per district in Andhra Pradesh, 1981-1991:

DISTRICT	% RNFE 1981 total (1)	% RNFE 1991 total (2)	Pattern of Change in percentage points Total (3) = (2) - (1)	% RNFE 1981 Males (4)	% RNFE 1991 Males (5)	Pattern of Change in percentage points Males (6) = (5) - (4)	% RNFE 1981 Females (7)	% RNFE 1991 Females (8)	Pattern of Change in percentage points Females (9) = (8) - (7)
Nizamabad	23.66	26.53 [1]	2.87	21.54	22.43 [8]	0.89	26.47	30.76 [1]	4.29
Karimnagar	20.74	23.83 [2]	3.09	22.98	25.89 [2]	2.91	17.4	20.68 [2]	3.28
East Godavari	20.45	20.62 [3]	0.17	22.42	23.54 [5]	1.12	14.33	14.91 [4]	0.58
Adilabad	16.37	20.48 [4]	4.11	18.41	23.86 [4]	5.45	12.79	17.11 [3]	4.32
West Godavari	17.63	19.44 [5]	1.81	20.31	24.69 [3]	4.38	11.56	13.04 [5]	1.48
Nalgonda	16.64	18.98 [6]	2.34	19.18	22.34 [9]	3.16	11.79	10.44 [9]	-1.35
Ranga Reddy	22.5	18.73 [7]	-3.77	28.63	27.81 [1]	-0.82	12.26	9.31 [12]	-2.95
Vizianagaram	16.28	17.94 [8]	1.66	20.12	23.01 [6]	2.89	8.93	10.02 [11]	1.09
Nellore	16.12	17.12 [9]	1	18.84	22.23 [11]	3.39	10.65	10.62 [8]	-0.03
Srikakulam	16.65	16.98 [10]	0.33	19.53	21.2 [17]	1.67	11.31	10.88 [7]	-0.43
Visakhaptnam	19.2	16.76 [11]	-2.44	21.97	21.17 [18]	-0.8	13.07	10.42 [10]	-2.65
Cuddapah	17.95	16.59 [12]	-1.36	20.61	21.45 [13]	0.84	12.06	9.13 [13]	-2.93
Medak	15.71	16.37 [13]	0.66	18.18	21.42 [15]	3.24	10.51	11.77 [6]	1.26
Krishna	16.89	16.26 [14]	-0.63	19.55	22.26 [10]	2.71	11.08	9.03 [14]	-2.05
Chittor	13.97	15.78 [15]	1.81	16.89	21.44 p14]	4.55	7.52	7.93 [15]	0.41
Warangal	16.2	15.59 [16]	-0.61	19.39	21.51 [12]	2.12	10.3	7.83 [16]	-2.47

Khammam	15.21	15.33 [17]	0.12	18.5	20.87 [19]	2.37	8.68	6.43 [22]	-2.25
Guntur	15.09	14.41 [18]	-0.68	18.5	22.51 [7]	4.01	8.93	7.03 [19]	-1.9
Prakasam	16.26	13.93 [19]	-2.33	19.84	21.22 [16]	1.38	10.06	6.74 [21]	-3.32
Kurnool	14.84	13.8 [20]	-1.04	18.66	20.41 [20]	1.75	8.84	7.59 [18]	-1.25
Ananthapur	12.09	13.22 [21]	1.13	15.06	18.51 [22]	3.45	6.62	6.87 [20]	0.25
Mahabubnagar	13.77	12.76 [22]	-1.01	16.64	18.85 [21]	2.21	9.2	7.69 [17]	-1.51
Mean (AP)	**17.0**	**17.3**	**0.3**	**19.8**	**22.2**	**1.2**	**11.6**	**11.2**	**-0.4**
SD	**2.8**	**3.4**		**2.7**	**2.1**		**4.1**	**5.6**	
CV	**0.17**	**0.19**		**0.14**	**0.09**		**0.35**	**0.5**	

Notes: Figures in [ ] indicates the ranks. CV: Coefficient of Variation is (SD/Mean) and SD = standard deviation.

% RNFE Percentage of main workers in RNFS to total main workers in rural areas. % change in RNFS between 1981-91.

Sources: Census of India 1991 India Series-1, Provisional Population Totals: Workers and Their Distribution Paper-3 of 1991, pp. 443-448.

Census of India 1991 Andhra Pradesh Series-2, Paper-1 of 1991 Supplement Provisional Population Totals.

It can be seen from the Table 7 there is an increasing disparity across the AP districts in 1981 compared with 1991 (CV has increase from 0.17 to 0.19). When we look at the pattern for males there is more uniformity in the recent period in terms of the proportion in RNFE. This time the change is quite pronounced. The CV for males has gone down from 0.14 to 0.09 and for females has increased from 0.35 to 0.5. The pattern of RNFE is much more diverse across the AP districts than for males. It appears that there seems more spread in RNFE for females. The gender dimension of RNFE has become more pronounced during the decade that the data considered.

Differences that can be further seen between the districts show that there has been substantial variation across districts in the shares of non-farm employment in total employment. Differences in the proportionate changes on RNFE shares are summarised in Table 8.

For rural AP as a whole there is a small increase in the share in RNFS between 1981 and 1991 (Table 7). Even for males, there is a rise of 2.14 percentage points. Thus there are some trends of variations in rural de-industrialisation.

The central point is that during the period 1980-81 to 1990-91 in the districts where the RNFS decreased, the per capita value of agricultural output is high compared with districts in which the RNFS has increased. This suggests distress diversification overall. One possible inference is that in the districts where RNFS decreased, agriculture was booming and successfully attracted workers out of the RNFS. This made them shift and become less poor, which could be encouraging.

Table 8: District breakdown by changes in the proportion of RNFE to total workers, AP, 1981-1991.

Big falls in RNFS	Big rise in RNFS	Medium fall in RNFS	Medium rise in RNFS	Small changes
(> 2.44 percentage points)	(> 2.44 percentage points)	(1 to 2.44 percentage points)		(↑↓ < 1 percentage points)
For total RNFS workers				
Ranga Reddy Visakhapatnam	Adilabad Nizamabad Karimnagar	Prakasam Cuddapah Mahbubnagar Anantapur Kurnool	Chittor West-Godavari Vizianagaram Nalgonda	Srikakulam Nellore Krishna Medak Warangal East-Godavari Guntur Khammam
For male workers				
	Adilabad Medak Krishna Karimnagar Guntur Nalgonda Vizianagaram Nellore Anantapur Chittor West-Godavari		Prakasam Srikakulam Warangal Khammam Kurnool Mahbubnagar East-Godavari	Ranga Reddy Cuddapah Nizambad Visakhapatnam
For female workers				
Prakasam Warangal Ranga Reddy Cuddapah Visakhapatnam	Adilabad Karimnagar Nizamabad	Khammam Mahbubnagar Krishna Kurnool Nalgonda Guntur	Vizianagaram Medak West-Godavari	Anantapur Chittor Nellore Srikakulam East-Godavari

Source: Based on Table 7.

Table 8. separates the AP districts according to the extent of the changes between 1981 and 1991 in the proportion of RNFE to total workers. These changes are also summarised for all workers (male plus female). Whilst there is a broad similarity in the changes in RNFS proportions for the total as well as for males and females, there are some exceptions for female and male workers. Twelve districts show positive growth in the share of RNFS in total workers ranging from a minimum of 0.18 per cent to 4.15 per cent. Similarly there were ten districts showing declines ranging from 0.38 per cent to 3.56 per cent. The largest falls for the total occurred in the districts of Ranga Reddy and Visakhapatnam. Adilabad, in contrast experienced a big rise. The majority of the districts have experienced small changes (rise or decline); a smaller number of districts exhibited a medium rise or fall: Ranga Reddy, Visakhapatnam and Adilabad districts for total and for females, although when females are considered, the district of Nizamabad needs to be added.

The grouping shows a heavy decline for the two districts of Ranga Reddy and of Visakhapatnam. A location effect, namely nearness to an urban industrial growth centre, might have caused this. On the other hand, Adilabad has distinct agro-climatic endowments. The district also has a large forest area (over 7 lakh hectares forming 43.6 per cent of the total geographical area) which is an important source of income to the state. The forest also provides building materials for some industries and is a major supplier of firewood. The bamboo forests are located in industrial complexes in Sirpur, Kagaj Nagar and provide employment to the household industry outside the farm sector. The Sirpur paper mills, the silk factories, the Bellampally chemical and fertiliser factory and the cement factory in Mamcherial, are important large scale industries in the state. The district is rich in resources (particularly forests and minerals) as well as possessing a vast potential for agriculture along with the potential for the development of related industries. All these conditions worked favourably towards the growth of the RNFS in the rural Adilabad district. The pattern of change in the other two groups, medium and small is very complex and can be analysed better through econometric methods such as the regression models exposed in this chapter[4].

For total RNFE the CV suggests that there are increasing disparities across the state, whereas for males the CV shows that disparities are being reduced and a more uniform/homogeneous pattern is appearing. On the other hand for females there is a marked increase in dispersion.

2. FACTORS DETERMINING RNFE AND VARIABLES USED IN THE REGRESSIONS

This and the next section describe the determinants of a district's RNFE, viz., the ratio of RNFS main workers (those who have worked more than six months (183 days] in the year) to total rural main workers (throughout the paper 'workforce' refers to rural main workers). The hypothesised determinants are represented by variables listed in this section, and analysed by multiple regression. Section 3 provides further information on, and an evaluation of, the factors that are expected to determine the growth of RNFE share at the district level in AP. These factors can be grouped into two categories: agriculture related variables (1) commercialisation (2) irrigation (3) land holding size, and non-farm related variables: (4) urbanisation (5) incidence of poverty (6) village size (7) levels of literacy (8) infrastructure (9) per cent of bank branches in rural areas.

These independent variables are explained below.

Agriculture related variables:

Commercialisation (X_1)**:** This is measured in districts where non-food commercial crops predominate, employment opportunities in non-farm activities like processing, grading, and marketing, may be more widespread. The hypothesis is that since commercial crops are mostly market-oriented, a large area under commercial crops implies more opportunities for non-farm employment.

It may be observed that rice is often a commercial crop and that it involves a high proportion of RNFE activities. Greeley (1987) reports that about 25 per cent of the net value added that was embodied in rice at retail, in the Bangladesh villages in Chandina and Comilla that he surveyed, came from post-

[4] Deccan Chronicle Survey on Wednesday 19th April 2000 revealed that the villages in Mahabubnagar districts employ youth who are migrating to urban areas for work. Drought relief is also provided by the AP state government. There is hardly any agricultural work going on the villages, except in a few pockets where groundnut are being harvested. Vast stretches of dried-up fields lie fallow everywhere. As a result of lack of adequate and continuous power supply whatever crop was required in certain areas is almost lost. The voltage is too low to draw water from deep borewells and cannot water the crop. It is difficult to strike water in the borewell even at 200 feet. Severe drought causes the younger people to move away from Mahabubnagar.

harvest local RNFS activity. Where one draws the line here is arbitrary: winnowing, threshing, drying, husking and milling are all essential to turn the farm product into a consumable and are thus inherently agriculture-linked. However, the strength of local linkages depends on which commercial crops. Jute would generate more RNFE than rubber, processed usually far away for most added value. The main non-food commercial crops in AP are oil seed, groundnut and castor (occupying the first or second place in the country), sesamum, sunflower, chillies, sugarcane, mesta, cotton, and tobacco. These crops involve a lot of local processing employment for oil seeds, cotton and tobacco more than for rice. Thus, this study expects a positive relation between non-farm employment and the proportion of area under commercial crops to total cropped area.

Irrigation (X_2)**:** An increase in the irrigation ratio (percentage of gross irrigated area to gross cropped area) leads to changes in cropping patterns from less to more remunerative crops and to improvements in factor productivity. The net effect is increased value added, which eventually increases incomes in the agricultural sector. The hypothesis is that irrigation increased incomes in agriculture and that this will lead to an increase in the demand for non-farm activities through production and consumption linkages, thereby increasing RNFE. A. S Sirohi pointed out that an increase in the irrigated area will increase the real per capita income of all classes.

A village level study of Matar Taluk in the State of Gujarat conducted by Kumar (1984) during the period 1965-82, attempted to examine the relationship between the extent of irrigation and the level of non-farm employment. A sample of 28 villages obtained from Census data of 1961-81 was used. The cross section analysis does not suggest any meaningful relationship for any of the census years. Simple correlation coefficients were all negative though not statistically significant. Thus Kumar concludes that his analysis does not suggest any relation between irrigation and RNFS. As will be seen this result is different from the one we obtained whilst studying inter-district analysis.

Irrigation always raises farm labour (whether by intensifying double crop which allows more fertility leading to higher investment or by extensifying more land). Very strong local linkages are needed, if irrigation is to raise non-farm labour even more than farm labour (Hazell, P. and C. Ramasamy (1991)].

The hypothesised impact of irrigation is *via* its impact on output factor productivity and agricultural income. On the other hand it is also possible that in highly irrigated areas seasonal variation in the demand for farm labour is greatly reduced. This reduces the need for looking for alternative RNFE. The net impact of irrigation on RNFE is therefore difficult to specify a *priori*. A positive relation is hypothesised based on the presumption that the linkage effects will dominate. (This also implies that as total demand for labour farm and non-farm rises there will be a tendency to introduce labour-saving innovations in both sectors).

We argue that irrigation works as a separate effect only if, given agriculture output per person, and given yield, irrigation increases linkages to local RNFS. But irrigation also reduces seasonality of agricultural labour, cutting the need to seek RNFS work.

Land holding size (X_3)**:** The share of RNFE is hypothesised to vary inversely with the average size of the operational holding per person. The limited absorptive capacity of their operational holdings compels the poor, landless labourers and land poor farmers to go for RNFS. On the other hand the agricultural output or income creates greater demand for RNFS and generates surplus for investment in the RNFS. A substantial improvement will be to count irrigated land or the crop twice. Therefore it is argued that farm size may have positive or negative relationships with RNFE. Average farm size is estimated in hectares.

Non-farm related variables:

Levels of literacy (X_4)**:** Generally the impact of literacy on RNFS is expected to be positive (Chadha (1992)], but there is little evidence. However, non-farm activities are of two types, traditional and modern. In the case of traditional non-farm activities, literacy may be a deterring factor to participation or employment. In contrast it might have a favourable impact in the modern RNFS.

One would expect the level of education of a district to have a negative impact on labour supply. As the level of education increases, worker preferences for manual work changes. The level of education changes the workers attitude towards work. Disaggregated data results have to be examined to verify the hypothesis that modern sector non-farm employment may have a positive relationship with literacy.

We need to study the impact of literacy on RNFE separately for different categories, because some of them may require literate and skilled labour while others may require only unskilled labour. The sign may thus be positive for modern RNFE and negative for traditional RNFE. We have considered 7 different major categories of activities in addition to the aggregate picture. The level of literacy is estimated by calculating the proportion of literate population to total population.

Urbanisation (X_5) is the proportion of urban population to total population (see Table 9 for definition). There are two avenues through which urbanisation influences the rural share of workers in non-farm employment. On the supply side urban workplaces provide employment opportunities. Workers may actually reside in rural areas but physically move between these two segments. If rural-residing NFS workers commute to town, the RNFS proportion of rural activity and employment goes down but the proportion of rural residents engaged in non-farm production rises. Meanwhile, urban markets provide market opportunities for the products produced in the RNFS.

Urbanisation and infrastructure development are often complementary and occur simultaneously. Both can encourage non-farm activities in both the secondary and tertiary sectors and in neighbouring rural areas to satisfy non-local demands. Better and relatively inexpensive transport facilities enable members of rural households to commute to non-farm occupations in neighbouring urban centres (Basant and Joshi (1989)].

Urbanisation requires the services of rural artisans, semi skilled and illiterate casual labour to work in fast growing urban manufacturing and services; it creates demand for manufactured consumer goods and semi-finished raw materials of rural based.

There are two important ways in which urbanisation and RNFS are positively related. For the supply side, urbanisation promotes the RNFS by providing production support as well as location advantage. Meanwhile demand for rural non-farm products originates in the urban area. Both, small towns and large cities generally provide good markets for rural non-farm products. Shukla's empirical study (1991) provides the necessary support: the share of small towns in district urban population acts favourably upon the magnitude and share of rural RNFE.

Urbanisation is proportion of urban population (in a district) over 5000 persons. If RNFS establishments create much work and output in such places, then supply and demand for labour in the rural hinterland is reduced. Thus, the hypothesis is that the level of urbanisation will have a positive impact on RNFE.

Incidence of Poverty (X_6)**:** The incidence of poverty in a district is measured by the percentage of population below the poverty line[5]. The relationship between poverty and RNFE may be positive or negative. A high level of poverty may result in high level of RNFS due to 'distress diversification'. When agricultural development is not adequate, dependence on non-farm activity is likely to be relatively high, for survival. However, if these districts are extremely poor, effective demand may be so low that it prevents the development of RNFS rather than encouraging it. This may result in a non-linear relationship between incidence of poverty and the level of RNFE. In regions with a high incidence of poverty there will be a relative lack of demand for rural non-farm products, compared with regions of similar average consumption but less poverty i.e. the rich have higher savings/income ratio which inhibits the growth of non-farm opportunities while the poor have little effective demand. The initial hypothesis is that there will be an inverse relationship between the incidence of poverty and non-farm employment.

Villages Size (X_7)**:** The proxy variable used for measuring the agglomeration size is the percentage of villages with more than 1000 people in a district. This variable mainly operates on the production side, specifically in manufacturing activities. It is supposed that regional industrial agglomeration/clusters provide extra benefits for RNFE, possibly due to transfers of technology, the availability of special inputs and a better or more organised business atmosphere. For the above reasons, RNF labour is more productive. This creates a greater demand for labour in the RNFS, and

[5] The poverty norm has worked at the Centre for Economic and Social Change (CESS) S. Sudhakar Reddy who has computed the head count measure which we have adopted. These are poverty ratios. Figures for 1980-81 and 1990-91 at district level used the available data. The alternative proxy for poverty in a district is the ratio of Scheduled caste and Scheduled Tribe population to total population. This variable is available for the year 1980-81 and 1990-91. However, the former is considered much better and is therefore used. The poverty line is Rs. 53.63 in the year 1980-81 and Rs. 107 in 1990-91.

perhaps a higher RNFS share at the district level. The coefficient of this variable may also be interpreted to reflect scope for scale economies or diseconomies in production as well as in distribution. The expected sign is positive.

If growth linkages matter more than distress diversification, then the help given to agriculture by good infrastructure in a district raises RNFS too.

percentage of bank branches in villages and road length in a rural district (X_8 and $X_{9)}$**:** As proxy variables for the infrastructure we have used road length per 100 square kilometres and rural banks per 100,000 people. Rural infrastructure also influences the supply costs (farm and non-farm). It also affects the articulation of supply and demand via cheap transport and information. But again this might work both ways, allowing urban areas, for instance, to destroy rural competition by cheaply entering at (low) marginal cost. In the case of Maharastra a negative relation was observed (Shukla, 1991). The author's explanation is interesting. He notes that investment in infrastructure in rural areas enhances the position of agriculture, at the cost of RNFE, through this is not counterproductive to RNFE. However, on balance we expect a positive sign for the coefficient.

Infrastructure is required for non-farm activities to develop. The availability of infrastructure facilities, such as roads, and banks will be high in areas which are developed. Rural infrastructure is hypothesised to have an influence upon the magnitude of NFE through the production or product supply side. I hypothesise that infrastructure help the growth of RNFS; therefore there is a positive relationship between ' percentage of villages with rural bank branches' and road length in square kilometres. The percentage of villages with rural bank branches was shown by Binswanger and Khandker (1995) to be a powerful explanatory of RNFS share and growth across districts in all-India (though not an explanation of agriculture variance).

Many studies (Hazell and Haggblade (1991); Shukla (1991 and 1992); H. P. Binswanger (1993) and G. Gangadhar (1997)] on RNFS emphasise the role of infrastructural facilities in promoting RNFS. One reason for such a positive relationship to exist is that infrastructure increases the responsiveness of non-farm economic activity to increased demand, derived from both agricultural and nearby urban growth centres. We have considered the two variables, road length and banking facilities to represent the available infrastructural facilities in a district. Transport and communications are vital links to the external world and the banking institution, which is a source of institutional credit, also facilitates RNFS. The earlier studies, especially Haggblade (1995), Shukla (1991) and Gangadhar (1997) all find a positive sign in their empirical exercise. We also expect a positive sign. In the study by Murty and Durga (1992) agricultural development, infrastructural development and overall development are all expected *a priori* to have a negative relationship with RNFE, while a positive sign is expected for the poverty coefficient. Definitions are given in Table 9 .

Table 9: Description of the variables used in the regression analysis:

	Variables	Definitions	Sources
X_1	% Commercial crops to total cropped area Commercialisation = % "non-food" crops / total crop.	Measures Commercialisation. % of area under commercial crops to GCA. The area under commercial crops in each district of AP for 1981-91 refers to crops which are used for Total condiments and spices (arecanuts, turmeric, ginger, garlic, coriander, tamarind); Total oilseeds Groundnut, sesamum, coconut, rape and mustard, sunflower, Total edible oil seeds (linseed, castor, niger seeds); Total drugs and Narcotics (coffee, Indian hemp, betel leaves, tobacco).	Season and crop reports 1980-81 and 1990-91, Directorate of Economics and Statistics, Govt. Of AP
X_2	Irrigation ratio = % irrigated area / total cropped area	Measures the potential irrigation (takes into account existing or planned irrigation command areas. An irrigation command area is an area which receives or which is expected to receive water from an irrigation system). % gross areas irrigated to gross sown area (in '000 Hectares).	Directorate of Economics and Statistics, Govt. Of AP 1981 and 1991
X_3	Average Farm Size in Hectares (operated).	Total operated land in a district/number of holdings in a district.	Statistical Abstracts of AP (1981 and 1991),Directorate of Economics and Statistics, Govt. Of AP, pp.114-116
	Non-farm variables		
X_4	Literacy rate	% literate to total population (males, females, total).	Census series-2, AP Primary census abstract part II B
X_5	Level of Urbanisation	Urban population as percentage of total population. Urban areas are defined to have the following characteristics: a minimum population of 5,000, a minimum population density of 400 persons per square kilometre, and at least 75 per cent of the male working population engaged in non-farm pursuits.	Census of India 1991, series-2 AP, paper-1 of 1991 final population totals
X_6	% Rural Population below the Poverty line (CESS)	The poverty norm has been developed by Centre for Economic and Social Change (CESS) S. Sudhakar Reddy computed the head count measure which we have adopted. We have used the poverty line is Rs. 53.63 (per person) in the year 1980-81 and Rs. 107 in 1990-91. .	Centre for Economic and Social Change, Hyderabad, poverty Project Monograph No.1, p. 60
X_7	% of Villages with population of 1,000 and above	% of villages with population 1000 and above in a district to total no. of inhabited villages.	Statistical Abstracts of AP (1981 and 1991) pp. 18-19

X_8	Infrastructure / Banks % of Banks that are rural in total number of banks in a district.	Percentage of villages with bank branches per 100,000 population. Measures the district-wise spread of commercial bank offices in AP in 1981 and in 1991.	Statistical Abstracts of AP (1981 and 1991)

.... continued on the next page

Table 9: (Continued) Description of variables used in the regression analysis:

X_9	Road length. Total length of roads / 100 km^2 Geographical area.	Road length per 100 square kilometres. (Roads maintained by the P.W.D (R&B), National Highways district-wise, 1990-91 (in Kms) and roads maintained by *zilla praja parishads* and by *Mandal praja parishads*).	Statistical Abstracts of AP (1981 and 1991), pp.189-190, 233-234
Y_1	Rural Workers in non-farm Activities as a % of total workers	Non-farm employment is measured by primary occupational status. Individuals are asked whether they worked in agricultural or non-agricultural activities for at least 183 days during the previous year. It is defined as (the ratio of non-farm workers divided by total rural main workers) * 100. Rural non-farm workers are defined as rural main workers[6].	Census of India 1991, series-2 Andhra Pradesh, Part II-B (I), Primary census Abstract general pp.110-129,
X_{10}	Dummy Variable	= 0 if t =1981 and = 1 if t =1991.	

[6] An alternative definition of workers includes subsidiary workers along with main workers. Such a definition was used by C. Samba Murty and C. Durga, 1989 We have chosen to use main workers only excluding subsidiary workers which is also the definition used by H.P. Binswanger and Khendkar (1995).

3. values and Key characteristics of the dependent and explanatory variables

A summary of the 1981 level, 1991 level, and pooled (1981-1991) values for all the dependent and independent variables are provided in Tables 10 and 11 respectively. Table 10 reports the results of tests for differences in means of the dependent variables among the 22 districts of AP between 1981 and 1991. The importance of these tests is to highlight which variables differed between 1981 and 1991.

First, we compare the means of dependent variables (at State level) between 1981 and 1991 to see if there are any statistically significant changes. t-values show that means for 1981 and 1991 for the dependent variables are not significantly different at 1 per cent except for mining and quarrying (see Table 10). Various types of non-farm employment, which are used in the OLS analysis as dependent variables, do not appear to have changed. There is also no significant difference between the 1981 and 1991 percentages of rural non-farm workers to either male or female workers.

Table 10: Descriptive statistics of the dependent variables (cross district averages of rural main workers whose primary occupation is in the sector) for 1981, 1991 and pooled.

	Dependent Variable	Mean for pooled sample 1981+91 (standard deviation) [C.V.]	Mean for 1981 (standard deviation) [C.V.]	Mean for 1991 (standard deviation) [C.V.]	t-value
$Y1_{i1t}$	Mining and Quarrying	0.53 (0.68) [128.30]	0.33 (0.47) [142.42]	0.73 (0.80)	3.89***
$Y2_{i1t}$	Male Mining	0.69 (1.02) [147.83]	0.41 (0.66)[]	0.96 (1.24) [129.17]	0.47
$Y3_{i1t}$	Construction	0.82 (0.29) [35.37]	0.85 (0.34) [44.71]	0.78 (0.23) [29.11]	0.05
$Y4_{i1t}$	Male Construction	1.14 (0.38) [33.33]	1.14 (0.42) []	1.14 (0.34)[29.82]	0.00
$Y5_{i1t}$	Transport	0.95 (0.37) [1.37]	0.88 (0.40) [45.45]	1.02 (0.33)[32.35]	0.10
$Y6_{i1t}$	Male Transport	1.47 (0.53)[36.06]	1.32 (0.56) [	1.63 (0.47) [28.83]	0.18
$Y7_{i1t}$	Other than Household Industry	2.92 (0.98)[33.56]	2.81 (0.75) [26.69]	3.03 (1.18) [38.94]	0.09
$Y8_{i1t}$	Male Non-HHI	3.62 (1.15)[31.77]	3.43 (0.81) [	3.81 (1.35)[35.43]	0.14
$Y9_{i1t}$	Trade	3.22 (0.73) [22.67]	3.11 (0.72) [23.15]	3.32 (0.75) [22.59]	0.08
$Y10_{i1t}$	Male Trade	4.09 (0.83)[20.29]	3.81 (0.82) [	4.36 (0.77)[17.66]	0.19
$Y11_{i1t}$	Household Industry	3.94 (2.44) [61.93]	4.56 (2.06) [45.18]	3.32 (2.68)[80.72]	0.44
$Y12_{i1t}$	Male Household Industry	3.69 (1.49)[40.38]	4.56 (1.23) [	2.83 (1.22) [43.11]	0.64
$Y13_{i1t}$	Services	4.79 (0.95)[19.83]	4.45 (0.73) [16.40]	5.12 (1.04)[20.31]	0.22
$Y14_{i1t}$	Male Services	5.72 (1.04)[18.18]	5.13 (0.75) [	6.31 (0.95)[15.06]	0.35
$Y15_{i1t}$	% Female NFE to Total Main Workers	11.38 (4.87) [38.05]	11.56 (4.09) [32.38]	11.19 (5.63)[43.70]	0.002
$Y16_{i1t}$	% Rural non-farm Workers as a % of Total Main Workers	17.17 (3.08) [16.98]	16.8 (2.82) [16.57]	17.33 (3.38)[17.71]	0.07

$Y17_{i\ 1t}$	%Male RNFE to Total Main Workers	21.00 (2.69)[13.31]	19.81 (2.72) [15.31]	22.21 (2.09)[11.39]	0.06
	Number of Observations	44	22	22	

Notes: - CV: Coefficient of variation

- Differences between 1981 and 1991 means.

- *** significant at 1 per cent, ** significant at 5 per cent * significant at 10 per cent

Table 11: Descriptive statistics of the independent variables for 1981, 1991 and pooled.

	Independent Variables	Mean for pooled sample 1981+91 (standard deviation) [C.V.]	Mean for 1981 (standard deviation) [C.V.]	Mean for 1991 (standard deviation) [C.V.]	t-value of the diff. between 1981-91
X_{1it}	% Commercial Crops to Total Cropped Area	25.06 (16.72) [66.72]	19.78 (11.21)[56.67]	30.35 (19.7)[64.91]	2.19***
X_{2it}	% Irrigation to Total Cropped Area	39.82 (19.52) [49.02]	36.80 (19.42)[52.77]	45.70 (19.58)[45.70]	1.03
X_{3it}	Average Farm Size (hectares)	1.77 (0.72) [40.68]	1.96 (0.82)[41.84]	1.58 (0.56)[35.44]	1.77**
X_{4it}	% Literacy to Total Population	28.68 (9.03) [31.49]	22.53 (6.08)[26.99]	34.93 (6.98)[90.98]	3.70***
X_{5it}	Urban Population as Percentage of Total Population	21.05 (7.69) [36.53]	19.35 (6.05)[31.27]	22.75 (8.85)[38.90]	1.49
X_{6it}	% Population below the Poverty Line	50.30 (19.00) [37.77]	58.14 (16.22)[27.90]	42.46 (18.63)[43.88]	2.98***
X_{7it}	Percentage of Villages >1000	57.87 (17.47) [30.19]	55.03 (17.61)[32.00]	60.71 (17.25)[28.41]	0.53
X_{8it}	Banks per 100000 Population	4.63 (1.21) [26.13]	3.82 (0.65)[17.02]	5.44 (1.10)[20.22]	0.53
X_{9it}	Infrastructure (total length roads) (kms)	0.60 (0.13) [21.67]	0.54 (0.13)[24.07]	0.67 (0.11)[16.42)	3.00***
X_{10it}	% Male Literacy to Total Population	39.11 (9.81) [25.08]	31.49 (5.91)[18.77]	46.73 (6.36)[13.61]	1.72
X_{11it}	% Female Literacy to Total Population	18.06 (8.86) [49.06]	13.29 (6.61)[49.74]	22.83 (8.33)[36.49]	1.59
	Number of Observations	44	22	22	

Notes: - CV: Coefficient of variation

- Differences between 1981 and 1991 means.

- *** significant at 1 per cent, ** significant at 5 per cent * significant at 10 per cent

Table 11 reports the summary statistics for the independent variables. Descriptive statistics were computed and the mean difference was estimated by the t-ratio. Five independent variables are statistically significantly different

at 1 per cent in 1981 and 1991: commercialisation, literacy, land holding size, percentage of population below the poverty line, and infrastructure (roads).

The reason why commercialisation is significantly higher in 1991, is that AP has emerged as one of the major rice surplus states and also as a major supplier of commercial crops such as tobacco, chillies, cotton, sugar-cane and groundnut. The area under sugar-cane has increased from 1.82 lakh hectares (1990-91) to 2.02 lakh hectares during 1991-92 (an increase of 11.0 per cent)[7]. Groundnut, the most important oilseed crop in AP, accounts for a substantial portion of the total Indian area under such crop. In 1991-92 this crop formed 19 per cent of the total cropped area in AP. Groundnut is mostly rainfed during the kharif and irrigated in the rabi season. All four districts in the Rayalaseema region, and the Mahabubnagar and Warangal districts in the Telangana region, jointly together accounted for 77.6 per cent of the total area under groundnut in the State during 1991-92[8].

4. REGRESSION Analysis

The form of equation used for average annual growth rates between 1981 and 1991 and for shares for the two years combined (pooled) for total, males and females as well as for the sub-sectors is described below. The hypotheses mentioned in this chapter were used to make inferences about the expected sign between the independent and dependent variables.

$$Y_{it} = a_o + b_1 X_{1it} + b_2 X_{2it} + b_3 X_{3it} + b_4 X_{4it} + b_5 X_{5it} \ldots\ldots b_9 X_{9it} + b_{10} X_{10it} + u_{it}$$

Where i denotes districts, and t the year of the observation (1981,1991) except for the growth equations.

Y_{it} = Rural workers in non-farm activities as a per cent of total workers
X_1 = Commercialisation defined as percentage of "non-food" crops / total crops
X_2 = Irrigation ratio defined as percentage of irrigated area / total cropped area
X_3 = Average land holding size in hectares
X_4 = Literacy rate (per cent)
X_5 = Urbanisation (per cent urban population)
X_6 = Percentage of persons below poverty line
X_7 = per cent villages with 1000 population and above
X_8 = Banks per 100,000 (hundred thousand) population
X_9 = Total length of roads per 100 kilometres geographical area
X_{10} = Dummy variable = 0 if t =1981 and = 1 if t = 1991 - only applies to pooled data
u = Disturbance term with the classical properties.

The empirical results obtained from the regression analysis are discussed in this Section. A correlation matrix of all the variables discussed earlier was constructed and main findings are reported in Section 4.1. The small sample size of data for 1981 and 1991 led to pooling of the data and a time dummy variable (X_{10}) was used in the equation. The results of backward step-wise regressions are presented below. First, the combined effect of the above variables on RNFE was estimated with the above equation. Given the analytical considerations discussed earlier, different combinations of independent variables were then introduced in the regression equations. For the combined analysis, district level data were used with 22 observations for 1981 and for 1991. One district (Hyderabad) was excluded from all the regressions since the entire district is urban.

4.1 The Determinants of Inter-District Variations in the Shares of RNFE (by totals and gender)

In order to understand the nature of the relationships between dependent and independent variables, a correlation matrix of all the variables was obtained (see Appendix Table 2). This exercise is helpful to check whether variables are "related" to each other, or move together. Typically a correlation coefficient r in excess of about 0.8 reflects a strong relation and indicates the risk of multicolinearity problems. RNFE in household industry, in the trade sector and in transport and services each exhibit some, albeit not too problematic a relation

[7] This, coupled with an increase in yield rate of 7 per cent in 1991-92, resulted in an all-time record of 150.57 lakh tonnes of cane (from 126.68 lakh tonnes of cane in 1990-91, an increase of 18.9 per cent).

[8] Over the years the area under oilseed cultivation (particularly groundnut), has expanded following a shift in the cropping pattern away from low-value food crops to cash crops. The area increased from 19.11 lakh hectares in 1987-88 to 23.94 lakh hectares in 1990-91 and to 24.81 lakh hectares in 1991-92.

(r varies between 0.63 and 0.71) with the RNFE of other sectors (mining, non-HHI and construction) respectively. There is also some correlation for RNFE growth data between HHI and services (r = 0.64). With regard to the growth of HHI, some correlation appears with the growth of female literacy (r = 0.65). Moreover urban growth correlates negatively with the growth of RNFE in the services sector (r = 0.62).

The original data suggested a negative correlation between irrigation and farm size and between poverty and literacy (with r = 0.61). Whilst in log form the correlation coefficient between literacy and poverty increased (to r = 0.58) and between irrigation and farm it decreased (to r = 0.64). The correlation is not important but might affect some of the reduced model results. There are in fact no serious correlation problems.

Is the direction of causation to RNFE, from the "independent" variables listed in our equation. The RNFS in a district might, in turn, determine any one or more of the independent variables (for example poverty). Where appropriate we return to this issue in the discussion of the regression results.

In the model[9] there is a common intercept for all districts and for 1981 and 1991. The slope coefficients are also common for all districts and both years. This implies that disturbance terms are independently and identically distributed. The appropriate estimation method is OLS applied to panel data. Further assuming normality for the disturbance term, all the important statistical properties of the k-variable linear model are valid[10].

Diagnostic tests were undertaken for all the regressions for normality of the disturbance term, heteroscedasticity and functional form. The heteroscedasticity test used was based on the regression of squared residuals on squared fitted values. It has a $\chi 2$ distribution with 1 degree of freedom. The computed values are presented in Table 12. The computed residuals are used to test for normality (based on the skewness and kurtosis of residuals). In a $\chi 2$ test with 2 degrees of freedom, the result possibly indicates a non-normal disturbance term. Similar results are observed for other categories of RNFE, as will be noted subsequently.

While estimating by OLS, in most of the cases non-normality was encountered, implying that an inference cannot be made regarding the statistical significance of coefficients. To overcome this problem, **we** plotted the residuals and looked for outliers. Then dummy variables were introduced into the model for those outliers.

The next problem was heteroscedasticity, error of variance was not constant, thereby violating one of the central assumptions of classical linear regressions model. White's (1980) heteroscedasticity corrected variance-covariance matrix was used to find the appropriate standard errors and these were used to make inferences about the significance of the variables in the model.

As for functional form, although it can be detected, the solution is not straightforward. It was found that log linear specifications removed the problem except in one case (viz., mining and quarrying), where little more can be done.

The estimated coefficients of the log regression equations of the selected variables for pooled 1981 and 1991 data for total, males and females are presented in Table 12. The data were tested against different models (quadratic, semi-log and log functions). Log form results capture diminishing returns and are therefore preferred and presented[11].

The right-hand side columns in the Table 12 give the most parsimonious model. This reports the results obtained from the stepwise procedure of SPSS where the variables are eliminated until the significance level of the remaining variables prevents further elimination[12]. The model passed all the diagnostic tests.

Total RNFE shares: The variables explain 52 per cent of the cross-district variation in total rural RNFE as a share of total employment. With the exception of the coefficients associated with commercial crops, literacy, big villages, and banks, all other coefficients have the expected signs. The irrigation ratio, significant at the 1 per cent level, is positively associated with non-farm employment. Urbanisation, road length and the year dummy are also positively associated with RNFE in AP although they are not significant. In the trimmed down version of the model, literacy rates become significant. For males it is significant in both versions. The negative sign for this variable might be related to literacy affecting the percentage of RNFE only once a certain level of development has been reached: traditional RNFE activities like toddy tapping, vegetable vending, canal labour and petty trade, require little education.

Farm size is significantly and as expected, negatively associated with RNFE.

---

[9] Our model corresponds to model (a) given in Table 10.1. of Johnston (1984 p. 797).
[10] J. Johnston Econometric Methods 3rd edition, (1984)
[11] All other results are with the author and can be shown upon request.
[12] These results were also obtained from Microfit 4.0. F-statistics suggest the significance of the model.

The sign for commercialisation is the opposite of that predicted, but is not significant. This could imply that districts with rapid agricultural growth had better absorption of labour in the farm sector itself, and thus less spill-over effects into the RNFS. However the negative sign may be due to the fact that rural towns have not been included in the analysis. Alternatively, the problem may be that rice is a strongly 'commercial crop' in some high RNFE districts, although in fact it is not here. The remaining variables (including road length, and people below poverty line), have the expected signs but are found be insignificant, even at the 10 per cent significance level.

The RNFE elasticity to literacy is -0.179. Such strong impact is unlikely to run causality from literacy to RNFE; a 1 per cent increase in the percent of literate population would decrease the percent of RNFE by 0.179 per cent. One possible explanation is that of the two types, modern and traditional RNFE, at the district level traditional RNFE outweighs the modern RNFE, where traditional RNFE require less education. The result for literacy support the wider/overall 'development linkage' (ODL) hypothesis that traditional RNFE share rises with lower levels of literacy.

Irrigation indicates overall economic growth and is expected to be positively related with the RNFS. In the case of totals, the regression coefficient for irrigation is 0.13, and is statistically significant at 1 per cent level in explaining district-level RNFE shares. This result for irrigation suggest that higher agricultural productivity (associated with irrigation) is linked to a high RNFE share. The analysis confirms the hypothesis that growth linkages from irrigated agriculture lead to modern RNFE.

When we look at male and female non-farm employment separately, the coefficient is significant at the 1 per cent level for males. This corroborates other research findings [e.g., Murty C.S. and Durga (1989) and Parthasarathy, (1998)].

Average farm size elasticity of RNFE is -0.136. A 1 per cent increase in the average farm size would decrease the total share in RNFE by 0.136 per cent. This relationship is as expected and significant at the 5 per cent level. This implies support for the hypothesis (AGL) that the traditional RNFE share rises with distress diversification.

Further our results differ from those obtained by earlier researchers in the sense that they found no clear-cut significant relationship between poverty and RNFS i.e. earlier researchers did not find a significant relationship either.

When the percentage of males in RNFE is used as the dependent variable, the model explains 44 per cent of the variance. For males, our results show that irrigation, literacy, year dummy and district dummies for Ranga Reddy and Nizamabad are significant.

Irrigation is again positively associated with RNFE and now a 1 per cent increase in total irrigation would increase the RNFE by 0.13 per cent. Among male workers it is likely that increased agricultural development provided more avenues of RNFE compared with females. In contrast, however, there is again a negative association between literacy and the RNFE share. The results for males only provide support for the hypothesis (AGL) in the case of irrigation and ODL (overall development linkages) in the case of literacy.

When considering the share of females in non-farm employment, about 58 per cent of the variance was explained. In the reduced model, a negative relation between the percentage of people below the poverty line and percentage of RNFE was found (statistically significant at the 1 per cent level). Our model suggests that a 1 per cent decrease in female poverty will increase RNFE by 0.20 per cent. Poor women are less likely to be in the RNFS, but there is no such significant relationship for men (or for totals). A similar negative relation in the case of the percentage of villages was found, which is also statistically significant at the 1 per cent level. It implies that a 1 per cent increase of bigger villages will decrease RNFE by 0.21 per cent. It could be the case that (in rural villages) mobility among females is generally low and in small villages family norms are more likely to confine women to look after household activities.

For females three variables (per cent of banks, per cent of people below the poverty line and per cent of big villages) are significant at the 1 per cent level. The RNFE per cent of banks elasticity is -0.442. For females the coefficient associated with banks is negative and significant, an increase in banks would apparently decrease female RNFE. Similarly as female RNFE increases, poverty decreases. The percentage of big villages shows a negative relationship with female RNFE. It is not likely to be a direct and negative causal relationship. The results for big villages and percentage of bank branches in the case of female labour (both for women only) oppose the hypothesised growth linkages (AGL) relationship. There is no apparent explanation for this result

We got a completely different set of significant explanatory variables for male and female RNFE shares and total, male year dummy and farm size.

From the results, it may be inferred that irrigation and poverty are important determinants of non-farm employment at the district (macro) level. However, the coefficients are not elastic and not consistent, depending

on the variables considered. Meanwhile, the percentage of males in the RNFS is also significantly associated with agricultural development.

Initial results pointed out problems of normality with the residuals, which meant that valid inferences could not be made with the help of standard errors. In order to tackle this problem we identified the outliers in the initial model. Three districts, namely Ranga Reddy in 1981, Nizamabad in 1981 and Nizamabad in 1991 were outliers and as a result we included district dummy variables for them.

The estimates with the dummy variables resulted in normality of errors. The $\chi^2(2)$ JB (Jarque-Bera) (1987) test for normality was computed at 1.86 against the critical value of 5.99 at the 5 per cent level. This made valid inferences possible (district dummies for the outliers were found to be highly significant at the conventional level, i.e. 5 per cent). One possible explanation for the 2 districts to be outliers is that they are very close to urban centres and are characterised by relatively important rural-urban migration. It might consequently, be possible that rural non-farm is being replaced by informal employment in the urban city centres. It is not captured by urbanisation variable for the pooled data but it captured with disaggregated data in Table 13.

A year dummy was included to see whether there was a significant change in RNFE between the 2 periods. For total and for female RNFE the year dummy was not significant, implying the absence of change. However, the dummy for males was significant at the 5 per cent level and the coefficient is positive indicating that male RNFE increased significantly between 1981 and 1991 reflecting some change. It means that the same explanatory variables led to more RNFE for men (but not for women or total) in 1991 than in 1981.

An interesting result for the pooled sample is that the variables which had a significant impact on male RNFS were different from those that mattered for female RNFS. It suggest that agricultural development as a proxy for irrigation may absorb more male labour in to the RNFS whereas distress conditions push females out of agriculture due to poverty.

Aspects affecting the male RNFE slope are as follows: irrigation is positively significant supporting growth linkages, literacy is negatively significant, 1991 year dummy is positively significant and the Ranga Reddy dummy for 1981 is negatively significant.

Areas affecting female RNFE are percentage of bank branches in villages, poverty, and big villages which are all negatively significant supporting distress diversification. For Nizamabad the district dummy for both years 1991 and 1981 is negatively significant.

Areas affecting total RNFE are the following: irrigation is positively significant, literacy of males and females is negatively significant, farm size is negatively significant, and the district dummies for Ranga Reddy for 1981, and Nizamabad for 1991 are both negatively significant.

The district of Nizamabad is well endowed in the sense that the agricultural economy is dominated by paddy cultivation. Although Nizamabad recorded high poverty levels by occupational classes in rural areas in 1977-78 and in 1987-88 (for agricultural labour, poverty levels were found to be above 55 per cent with a high incidence of poverty), (Sudhakar Reddy, 1991). This could explain the negative sign for 1991 for totals, and for both years' female figures.

The positive sign for Ranga Reddy for the year 1991 was probably caused by two reasons: (a) Self-employed in non-farm household occupational groups Ranga Reddy recorded with high poverty levels by occupational classes in rural areas in 1977-78 but not in 1987-88 (district with poverty levels above 55 per cent is the district with high incidence of poverty); (b) A change has taken place in the rank order of Ranga Reddy in poverty levels. Ranga Reddy improved its position following the percolation of industrial growth, and is moreover surrounded by the capital city Hyderabad.

Table 12: Estimated coefficients of multiple regression of the logged percentage of non-farm to total employment in rural areas and selected variables for 1981-91 (pooled data):

Variables lnY = % RNFE	Total 1	Male 2	Female 3	Total 4	Male 5	Female 6
Variables						
Constant	4.734 (10.22)***	4.561 (10.36)***	6.564 (6.56)***	3.941 (14.06)***	4.142 (12.69)***	6.742 (10.39)***
ln Commercial Crops	-0.004 (-0.09)	-0.008 (-0.20)	-0.086 (-1.17)			
ln Farm Size	-0.069 (-0.82)	-0.052 (-0.73)	-0.036 (-0.25)	-0.136 (-2.19)**		
ln Irrigation	0.126 (2.14)**	0.091 (1.96)*	0.024 (0.21)	0.125 (2.63)***	0.130 (4.25)***	
ln Bank	-0.147 (-1.71)	-0.090 (-1.32)	-0.439 (-2.74)***			-0.442 (-3.81)***
ln Poverty	-0.083 (-1.72)	-0.058 (-1.44)	-0.131 (-1.54)			-0.199 (-2.87)***
ln Literacy	-0.274 (-1.85)	-0.328 (-2.02)**	-0.030 (-0.18)	-0.179 (-2.88)***	-0.277 (-2.84)***	
ln Urbanisation	0.058 (0.88)	0.069 (1.26)	-0.024 (-0.20)			
ln Road Length	0.083 (0.84)	0.007 (0.088)	0.138 (0.77)			
ln Big Villages	-0.040 (-0.53)	0.007 (0.10)	-0.174 (-1.41)			-0.214 (-2.60)***
Year dummy	0.071 (1.14)	0.142 (2.49)**	0.086 (0.83)		0.133 (2.79)***	
District dummies						
Ranga Reddy 1981	-0.442 (-3.48)***	-0.494 (-4.62)***		-0.489 (-3.98)***	-0.523 (-5.21)***	
Nizamabad 1991	-0.312 (-2.37)***		-1.111 (-4.54)***	-0.294 (-2.44)**		-1.208 (-5.80)***
Nizamabad 1981			-0.808 (-3.34)***			-0.849 (-4.14)***

$\bar{R}^2$	0.52	0.44	0.56	0.49	0.44	0.58
F =	4.894***	4.049***	5.56***	9.364***	9.607***	12.63***
Heterosceda sticity χ^2 (1)	0.563	0.615	0.666	0.705	0.168	0.685
Normality χ^2 (2)	1.669	1.868	2.763	3.069	0.893	2.377
Functional Form χ^2 (1)	1.969	0.339	1.029	0.525	0.888E-3	0.394

Notes: - The figures in brackets are t-values; - Number of observations: 44;

- *** significant at 1 per cent; ** significant at 5 per cent;* significant at 10 per cent.

4.2. The Determinants of Inter-District Variations in the Shares of RNFE (by industry (seven categories only)

The estimated coefficients of the multiple regression analysis of the district shares of RNFE (pooled) Log equation for seven distinct non-farm sectors are reported in Table 13. Four districts viz. Nizamabad, Ranga Reddy, Khammam and Kurnool were outliers and as a result we created four district dummy variables for them. These district dummies are significant at a conventional 5 per cent level.

A series of possible explanations for these to be outliers can be advanced. First, the dummy of Ranga Reddy is negatively significant. The district was adjacent to the 100 per cent urbanised state capital of Hyderabad. The rural people of Ranga Reddy district commuted in 1981 to take up the advantage of employment offered by the non-HHI and construction activities. Over the decade, development might have taken place in that district with the consequence that people shifted RNFE activities in that district. Another explanation for the dummy being significant in 1981 and not 1991 might lie with progressive spillover effects which were induced by the Nagarjuna Sagar Project. Khammam is a newly irrigated district with increases in incomes which increases the demand for construction RNFE. For Nizamabad, a negative sign indicates that the possibility of involvement in the RNFE HHI sector might be declining so that employment is available in the urban areas by commuting from the villages. Kurnool is in the Rayalaseema region. Tirupathi is a big Indian pilgrim centre. Activities in the pilgrim centre would give a positive boost to the non-HHI in the Kurnool rural district.

To explain the share of RNFE as well as the growth in the RNFS between 1981-91, we first used a multiple regression model and estimated coefficients using the standard OLS method. At this first stage some of the independent variables included in the regression equation were not significant. The number of independent variables was then reduced using step-wise backward regression as before.

In disaggregating total RNFS into seven categories we followed the categories specified in the 1981 and 1991 Census: mining, household industry (HHI), other than household industry (NON-HHI), construction, trade, transport and services. Of these, some are wholly or predominantly modern (i.e. non-HHI. trade, transport and services) whilst others are wholly or predominantly traditional (i.e. HHI, construction) groups of activities. The present results have a higher adjusted $\bar{R}^2$ as well as a consistent pattern of signs and level of significance for many variables.

The variables eliminated in the backward stepwise regression procedure as not significant in influencing the dependent variable were urbanisation, road length and commercial crops. One reason for this may be that some of the included variables (e.g., irrigation, poverty and literacy) may have captured the influence of these factors. A second reason is that total non-farm employment may only capture the net impact of certain sectors. This aspect will be clarified in the disaggregated picture.

The estimated coefficients for logged (pooled) districts shares of RNFE in total employment are presented in Table 13. for seven sectors. The coefficients of irrigation at the 1 per cent level and urbanisation at the 5 per cent level are found significant in the RNFE mining sector. For this sector we found functional problems and heteroscedasticity problems. We tried to solve it by using different models such as semi-log, and quadratic functions and by identifying the outliers.

For the HHI sector, banks, irrigation, literacy, poverty and district dummy Nizamabad are significant. HHI is considered as mostly a traditional activity. As expected this variable is negative and significant at 5 per cent level. Literacy has a positive effect for the modern sectors such as those mostly covered: trade, transport and services. The hypothesis we considered was proved. Banks for HHI on the other hand show a negative relationship.

Urbanisation has a positive effect on mining, non-household industry and transport as expected. The outliers of district dummies Ranga Reddy, Khammam 21, and Nizamabad are significant. Ranga Reddy district is situated in a suburban area of 100 per cent urbanised district i.e. Hyderabad. This dummy for Ranga Reddy has a negative effect on RNFE. It is understandable that the rural people of Ranga Reddy district can very easily commute to the urbanised district of Hyderabad and take the available transport facilities, so the relationships are negatively affected. The four districts of Kurnool, Ananthapur, Chittor (Tirupathi) and Cuddapah are collectively known as Rayalaseema. In the case of Chittor (Tirupathi), as it is the biggest pilgrim centre in India, it contributes to a host of informal trades and commercial activities such as milk, flower, fruit and vegetable vending; transport; petty trade; pan shops; and hotels, which account for the highest concentration of non-farm activities in the rural Kurnool and urban Ananthapur.

In the district of Kurnool, self-employed categories in non-farm household occupations were experiencing high poverty levels across different occupational classes, especially within rural areas, in 1977-78. By 1987-88, poverty levels in this category had declined. Also 'Other labour' and all occupational groups combined (self-employed in non-farm, agricultural labour, other labour, self-employed in agriculture, others, all occupational groups) high poverty was recorded in 1977-78 but this was reduced by 1987-88. This could explain the positive sign in 1991 for non-HHI activities. In 1981, in Khammam district, the dummy variable was negatively significant but was not so in 1991. The reason could be Khammam is a newly irrigated district. More irrigation provides more incomes and thus leads to construction. Moreover Khammam district was recorded with high poverty levels (above 55 per cent) by occupation class in rural areas in 1987-88 in the group of agricultural labour and other labour but not in 1977-78.

This sub-section can be concluded by looking at the significant variables which we have identified. We separate those variables depending on whether they support or oppose our central hypothesis which is 'distress diversification' to traditional RNFE, or growth linkages to modern RNFE. We also emphasised that it is not always possible to identify for each variable whether there will be support either for or against the hypothesis we tested. The percentage of bank branches, negatively significant for HHI was important for regression for regressions of RNFE logged (pooled) sub-sectors. Farm size was positively significant for construction (which supports the hypothesis) and negatively significant for trade and services (which also supports the hypothesis). Irrigation is negatively significant for mining and positively significant for HHI, non-HHI and construction. Literacy is negatively significant for HHI (supporting the hypothesis), non-HHI, and positively significant for the trade and transport sectors (which also support the hypothesis). However, literacy is also positively significant for service sectors (which opposes the stated hypothesis). Poverty is negatively significant in affecting HHI, trade and transport RNFE. Urbanisation effects are positively significant for mining, non-HHI and transport sectors. The percentage of bigger villages is positively significant for non-HHI, and negatively significant for trade and transport sectors. The year dummy is positively significant for non-HHI and negatively significant for trade and transport sectors.

The conclusion is that irrigation is significant positively for HHI supporting the strict growth linkages hypothesis (AGL) to modern RNFE. The percentage of villages with banks is negatively significant for HHI which supports the wider development linkages (ODL) hypothesis. Farm size is positively significant for construction and may suggest that distress linkages decline as average farm size rises. it is negatively significant for other services sector against suggesting agricultural distress linkages to this traditional RNFE sub-sector. Poverty is negatively significant for trade and thus supporting the 'wider linkages hypothesis' (ODL). Literacy is positively significant for trade, and transport sectors but negative for HHI, supporting the 'wider overall distress diversification hypothesis. Literacy, positively significant for services, which lead to distress diversification (ODD).

Urbanisation is positively significant for mining, non-HHI and transport and this positive connection support the wider hypothesis (ODL), that development raises the modern RNFE share. The size of villages is positively significant for non-HHI, which supports only the wider hypothesis (ODL) not AGL. The results showed irrigation has a significant bearing on the composition of RNFE.

Table 13: Districts shares of RNFE in total employment: Estimated coefficients logged (Pooled) for seven sectors:

ln(Y) / (X)	Mining	HHI	NON-HHI	construction	Trade	Transport	Services	Mini	HHI	NON-HHI	Constrict	Trade	Transport	Services
Constant	-2.113 (-0.55)	8.261 (6.02)***	1.839 (1.62)	-0.743 (-0.62)	1.303 (1.99)*	-2.056 (-2.37)**	0.989 (2.02)**	-1.815 (-1.11)	7.177 (6.51)***	0.568 (0.72)	0.142 (0.23)	1.501 (2.70)***	-1.517 (-1.89)*	1.121 (4.85)***
ln banks	-0.567 (-0.79)	-0.609 (-2.38)**	-0.232 (-1.16)	0.128 (0.58)	0.097 (0.79)	0.202 (1.24)	-0.131 (-1.43)		-0.529 (-2.34)**					
ln comm. crops	-0.523 (-1.35)	0.174 (1.32)	0.023 (0.21)	0.225 (1.83)	-0.004 (-0.06)	0.087 (0.99)	-0.315 (-0.63)							
ln farm size	0.008 (0.01)	-0.144 (-0.59)	-0.083 (-0.41)	0.231 (1.02)	-0.103 (-0.83)	-0.014 (-0.09)	-0.104 (-1.12)				0.424 (2.69)***	-0.144 (-1.89)		-0.241 (-4.77)***
ln Irrigation	-0.913 (-1.84)	0.196 (1.12)	0.179 (1.30)	0.304 (2.03)**	0.073 (0.86)	0.186 (1.66)	-0.010 (-0.16)	-1.044 (-3.60)***	0.231 (1.96)*	0.277 (2.87)***	0.194 (1.77)*			
ln literacy	0.282 (0.23)	-1.149 (-2.61)**	-0.876 (-2.63)***	-0.586 (-1.60)	0.358 (1.74)	0.668 (2.45)**	0.560 (3.65)***		-1.100 (-4.59)***	-0.844 (-3.16)***		0.372 (2.62)***	1.039 (4.93)***	0.302 (5.30)***
ln poverty	0.471 (1.11)	-0.325 (-2.28)**	-0.148 (-1.25)	-0.005 (-0.04)	-0.128 (-1.77)	-0.209 (-2.19)**	-0.035 (-0.65)		-0.240 (-1.86)*			-0.143 (-2.28)**	-0.208 (-2.39)**	
ln road length	-1.435 (-1.64)	0.193 (0.65)	0.134 (0.541)	-0.064 (-0.24)	-0.097 (-0.64)	0.036 (0.18)	-0.055 (0-49)							
ln urbanisa-tion	1.208 (2.13)*	-0.165 (-0.85)	0.337 (2.13)**	0.345 (2.00)*	-0.048 (-0.50)	0.293 (2.29)**	0.012 (0.17)	1.167 (2.55)**		0.336 (2.31)**			0.213 (1.78)*	
ln villages	-0.436 (-0.69)	-0.431 (-0.20)	0.307 (1.74)	0.226 (1.16)	-0.256 (-2.35)**	-0.345 (-2.40)**	-0.204 (-2.51)**			0.284 (2.14)**		-0.222 (-2.74)***	-0.425 (-3.86)***	
year dummy	2.123 (3.98)***	-0.045 (-0.24)	0.354 (2.34)**	0.101 (0.62)	-0.155 (-1.69)	-0.351 (-2.90)***	-0.063 (-0.92)	1.333 (4.22)***		0.361 (2.76)***		-0.163 (-2.26)**	-0.355 (-3.44)***	
Nizamabad 1991		-1.488 (-3.80)***							-1.463 (-4.04)***					
Ranga Reddy 1981			-0.683 (-2.21)**	-0.715 (-2.12)**						-0.723 (-2.51)**	-0.587 (-1.89)*			-0.461 (-3.78)***
Khammam 1981				-0.977 (-2.87)***							-0.748 (2.47)**			

Kurnool 1991			0.668 (2.15)**							0.660 (2.28)**				
$\overline{R}^2$	0.45	0.60	0.25	0.24	0.38	0.66	0.54	0.44	0.62	0.29	0.27	0.43	0.65	0.62
F	4.51***	6.87***	2.20**	2.16**	3.63***	9.251***	6.134***	12.33***	14.750***	3.483***	4.926***	7.53***	17.22***	24.69***
Hete $\chi^2(1)$	0.976	0.710	0.033	1.262	1.742	0.563	0.010	2.432	1.655	0.148	0.087	0.607	0.249	3.066
Normality $\chi^2(2)$	0.211	1.948	0.116	0.818	0.672	0.759	1.76	0.209	1.402	0.749	1.622	2.167	0.228	1.008
Function. $\chi^2(1)$	2.576	0.008	1.924	1.474	1.398	0.351	2.448	1.718	0.985	1.822	1.067	1.993	0.148	1.710

4.3 The Determinants of Inter-District Variations in the Growth (1981-91) of RNFE:

Table 14 reports the estimates of the RNFE growth model. Three separate regressions were run: one each for total, males and females in RNFE. Columns 1, 2, and 3 give the estimates of the full model and columns 4, 5 and 6 report the results of our most parsimonious model. Looking at these columns only, it is found that for the whole sample (male + female) the growth of RNFE is significantly associated with commercial crops, literacy, road length and urbanisation. However, both the commercial crops and urbanisation variables bear unexpected signs. The results suggest that a 1 per cent increase of commercial crops in total crops decreases the growth of RNFE by 0.119 and that a 1 per cent increase of urban population in the total population decreases the growth of RNFE by 0.4 per cent. The literacy rate came out very strongly to influence the RNFE positively. A 1 per cent increase in literacy will apparently increase the growth of non-farm employment by 0.5 per cent.

The estimated model was significant and explained 47 per cent of the variation in the dependent variable. The diagnostics for the final results did not show any problem at the conventional level. The initial model specification proved to be problematic. In particular the test for normality failed, making it impossible to infer anything about the significance of the variables. However, this problem could be tracked down to one important outlier. When we added a dummy variable for this district, the problem was removed. As can be seen in Table 14, the district dummy Warangal is positively significant justifying the use of a dummy variable in the model. Warangal has a big railway junction which connects Hyderabad to Vijayawada and leads to the new Delhi route. The floating traffic creates more RNFE in small rural towns. With this reason Warangal shows a positive sign and relatively high RNFE growth.

Separate regressions for males and females were also estimated. For males the growth of RNFE is significantly influenced by road length and urbanisation (column 5). However, once again the urbanisation variable bears an unexpected sign. The result suggests that a 1 per cent increase in urbanisation decreases the growth of RNFE by 0.343 per cent. This implies that more RNFE is available in rural towns. Road length appears to influence RNFE positively as a 1 per cent increase in road length will increase the growth of RNFE by 0.21 per cent. The estimated model was relatively more significant than total explaining 55 per cent variation of the dependent variable. The district dummy was negatively significant. The reason is in Srikakulam (outlier) district may be that the predominance of *Khadi* (cloth manufacturing) and village industries, cashew industry and coconut fibre is available outside the villages.

A separate regression for females is also estimated. Column 6 shows that for females the growth of RNFE is influenced by growth of female literacy, growth of percentage of rural banks and growth of irrigation. The important point is that growth of irrigation bears an unexpected sign. The result suggests that a 1 per cent increase in the growth of irrigation decreases the growth of female RNFE by 0.3 per cent. On the other hand, a one percent increase in the growth of female literacy increases the growth of female RNFE by 0.3 per cent. 1 per cent increase in the proportion of commercial crops in total crops is associated with a decrease in the growth of female RNFE by 1 per cent. This is also possible because commercial centres are located near rural towns. Females might not be in a position to take the advantage of rural town employment. The results also suggest that 1 per cent increase in the growth of banks increases the growth of female growth of RNFE by 6 per cent. Location of banks will solve some of the financial constraints and induce the growth of female RNFE.

The district dummy Karimnagar is negatively significant. This could be due to the sharp contrast between the district's north-west zone (comprising mandals Jagtial, Vemulavada) and north-east zone (comprising mandals viz., Dharmpur Mahadevpur and Mahamamtram). The former zone has recently experienced agricultural transition. Its labour market is well developed; the daily wage rate is around Rs. 40 for males and Rs. 22 for females, which are both higher than their corresponding minimum wage rates fixed by the government. Underemployment is virtually absent and the bargaining strength of labour is strong. The labourers in JRY works are paid the ruling market wage rate rather than the recommended minimum wage rate. There is no visible poverty in the developed pocket and poverty alleviation programmes seem to be efficient. For instance, the living conditions of traditional communities such as 'golla' (shepherd community) and 'yerukala' (pig rearing community) improved due to both overall development of the region and the support given under IRDP. Incidentally, the absence of rural industrialisation in this developed zone is clearly visible. In contrast to the developed belt of Karimnagar, the economic activities in the tribal belt (Kharmapur, Mahadevpur, Mahamantram) are underdeveloped and are mostly subsistence oriented. A labourer gets employment for about four

months during the busy season at a wage rate of Rs.15 for males and Rs. 10 for females. One can see survival mechanisms being adopted by the labourers in the off-season.

The incidence of poverty is the highest recorded for all classes in Srikakulam in coastal Andhra in 1978-88. This could be the reason for the negatively significant district dummy.

The conclusion is that for males, RNFE growth between 1981 and 1991 is adversely and significantly affected by urbanisation. This result opposes the narrow growth linkages (ADD) hypothesis whereas the fact that infrastructure (road length), which is positively significant which, in turn, supports the wider (ODL) hypothesis. For females, the percentage of bank branches and literacy are positively significant, which also supports the wider (ODL) hypothesis. However, commercialisation and irrigation are negatively significant which opposes the narrow growth linkages (AGL). For totals the commercial crops and urbanisation are negatively significant. This suggests distress diversification (ADD). Literacy and infrastructure (road length) are positively significant, which supports the ODL hypothesis. We emphasise that log pooled data and growth regression results differ in some of the signs of the independent variables. For instance, literacy is positively significant in growth models whilst negatively significant for log pooled data. Urbanisation is negatively significant for growth models but positively significant for log linear models. There are possible explanation for these different results. These models are different and use different degrees of freedom (smaller degrees of freedom for the growth models). Nevertheless, the differences in the sign for literacy can possibly be explained as follows: in log linear models certain non-farm occupations where traditional non-farm dominates may not require much education whereas in the growth process of growth (where growth linkages are strong) higher literacy levels might be required which induces modern non-farm employment. Another caveat of our analysis might lie with omitted variable(s) that could further explain some of the variations of the dependent variable.

Table 14: District growth rates of RNFE in total employment: Estimated Regression Coefficients for 1981-1991 for total, males and females:

Y = % RNFE	Total (col.1)	Males (col.2)	Females (col.3)	Total (col.4)	Males (col.5)	Females (col.6)
Constant	-5.204 (-3.91)***	1.763 (1.48)	4.371 (1.84)**	-4.118 (-3.39)***	3.003 (4.19)***	4.282 (2.26)**
Banks	0.088 (1.32)	0.078 (1.25)	0.621 (3.88)***			0.561 (4.69)***
Commercial crops	-0.118 (-1.63)	-0.052 (-0.84)	-0.116 (-1.03)	-0.119 (-1.91)*		-0.174 (-2.44)**
Farm size	0.002 (0.02)	-0.038 (-0.52)	-0.150 (-1.19)			
Irrigation	-0.048 (-0.49)	-0.084 (-0.95)	-0.358 (-2.43)**			-0.328 (-3.04)***
Literacy	0.735 (3.44)***	0.420 (2.06)**	0.233 (1.18)	0.535 (2.96)***		0.277 (1.75)*
Poverty	0.036 (0.90)	-0.015 (-0.46)	0.039 (-0.71)			
Road Length	0.159 (1.22)	0.218 (1.86)	-0.062 (-0.29)	0.270 (2.38)**	0.207 (2.36)**	
Urbanisation	-0.280 (-1.71)	-0.222 (-1.50)	0.038 (0.15)	-0.407 (-3.37)***	-0.343 (-3.12)***	
Bigger Villages	-0.479 (-2.01)**	-0.357 (-1.54)	-0.070 (-0.21)			
District dummies						
Warangal 20	2.634 (2.73)**			1.911 (2.42)**		
Srikakulam 1		-3.249 (-3.97)***			-2.906 (-4.11)***	
Karimnagar 19			-7.709 (-3.87)***			-7.232 (-4.49)***
$\overline{R}^2$	0.48	0.59	0.57	0.47	0.55	0.65
F =	2.963***	4.041***	3.743***	4.668***	9.469***	8.775***
Heteroscedasticity. $\chi^2(1)$	3.065	1.449	2.164	2.563	0.478	1.401
Normality $\chi^2(2)$	1.072	1.052	1.417	1.144	0.046	0.916

Functional Form $\chi^2(1)$	0.101	0.00753	1.807	0.221	3.855	2.616

Notes: - The figures in brackets are t-values;

- Number of observations: 44.

- *** significant at 1 per cent ** significant at 5 per cent * significant at 10 per cent.

4.4 The Determinants of Inter-District Variations in the Growth (1981-91) of RNFE (by industry seven categories)

Table 15 presents the RNFE growth regressions by industry (7 categories). Here also the method used for explaining the growth of RNFE by categories between 1981-91 is the standard OLS method. In these models also we found the problems of normality of residuals and identified outliers in the initial models. We included district dummies for them. The estimates with the district dummies made valid inferences possible. However, there is a functional form problem for the mining equation. The crucial problem is that the statistical test can only identify problem but cannot suggest any solution to it. The alternative is to try different kinds of functional forms and to check whether the problem remains. In our case, we tried logarithmic and semi-logarithmic transformations of the model. Different kinds of quadratic forms were also estimated. In none of the attempts could the problem of the functional form be tackled. Thus although we acknowledge the problem, given the information at hand probably we can do very little about it. Diagnostics did not show any problems at the conventional level except for the mining sector, so we are cautious in interpreting this particular model. The most striking result is that urbanisation was found to be robustly significant in all 7 sectors. In all the sectors it had an unexpected sign. A 1 per cent increase in percentage of urbanisation is associated with a decrease in the growth of RNFE by 4.7 per cent for mining, although in other sectors the relationship is less strong. Once again, this implies that urbanisation (whether or not it creates non-farm employment in rural towns only), tends to reduce the growth of its share in villages.

Irrigation is significantly positively associated with mining, non-household and transport sectors and with the service sector negatively. The growth of mining and quarrying is significant at the 1 per cent level influenced by commercial crops, irrigation and urbanisation. The coefficient for mining is very big. The district dummy Khammam is significant and positive at the 10 per cent level. Khammam district is newly irrigated. The hypothesis is that the new irrigation provides extra income for rural people and that income enhances demand for construction. For the household industry model the growth of HHI is significantly influenced by urbanisation and literacy. The result suggests that a 1 per cent increase in urban population decreases the growth of HHI by 1.2 per cent. Surprisingly, literacy growth came out very strongly to influence the HHI positively. A 1 per cent increase in literacy will increase the growth of HHI by 1.8 per cent. For the non-household industry only 3 variables - irrigation, poverty and urbanisation - influenced non-HHI. The surprising result is poverty, which is positively significant only in the non-HHI model. This suggests that a 1 per cent increase in poverty increases the growth of non-HHI by 0.2 per cent. Though the coefficient is small, there is the possibility of absorbing casual labour in the non-HHI. For the construction model, banks, road length, and urbanisation are significant. We can see a positive relationship between infrastructure and construction. Urbanisation may, on the other hand, negatively influence construction in rural areas. Trade, commercial crops, urbanisation, bigger villages and the Nellore district dummy are negatively significant. Whereas road length and literacy are positively significant. This result suggests that literacy and infrastructure are essential for modern trade RNFE. For commercialisation, urbanisation and bigger villages the negative effect suggests that trade employment is urban based. For the transport sector, irrigation, road length and literacy, the positive effect suggests that linkages from agricultural development and infrastructure are significant. The impact of commercialisation, urbanisation and bigger villages have a negatively significant effect on transport, the reason being that transport is urban based. The Warangal district dummy is positive because it has a big railway junction which might have caused the growth/expansion of rural transport. For services, which is also a modern sector, model literacy is positively encouraging. This result is as we expected. Urbanisation and irrigation are negatively associated with services. In this service sector irrigation generates more farm employment.

The conclusion for this sub-section is that the percentage of bank branches is positively significantly for the growth of construction RNFE, and this supports the wider (ODL) hypothesis to modern RNFE. Commercial crops are negatively significantly for mining, trade and transport sectors. Agricultural development (irrigation) is positively significant for mining, non-HHI transport supports growth linkages (AGL) and negatively significant for services (which supports our central hypothesis). Poverty is negatively significant for non-HHI growth. Urbanisation is negatively significant for all the sectors and bigger villages are for trade and transport are negatively significant. Infrastructure development (road length) is positively significant for construction, trade and transport, supporting 'wider' overall development linkages for these modern sectors and the central hypothesis Literacy is positively significant for trade, and transport and services are negatively significant for HHI (which supports the wider ODL hypothesis).

Table 15: Regression results for growth in the share of rural non-farm employment to total employment (1981-91):

X \ Y	Mining	HHI	NON-HHI	Construct.	Trade	Transport	Services	Mining	HHI	NON-HHI	Construct.	Trade	Transport	Services
Constant	-22.663 (-1.17)	-11.440 (-3.82)***	0.674 (0.21)	1.331 (0.47)	1.629 (0.80)	-6.075 (-2.86)***	0.261 (0.28)	-8.971 (-0.67)	-9.320 (-3.96)***	2.206 (2.29)**	0.133 (0.06)	4.378 (3.35)***	-5.640 (-2.29)**	1.025 (1.17)
Banks	1.274 (1.36)	0.004 (0.02)	-0.150 (-0.60)	0.220 (1.54)	0.089 (1.05)	-0.063 (-0.43)	0.040 (0.54)				0.285 (2.25)**			
commercial crops	-2.255 (-2.20)*	-0.215 (-0.84)	-0.356 (-1.31)	-0.169 (-1.11)	-0.191 (-2.10)**	-0.394 (-2.52)**	-0.030 (-0.36)	-2.410 (-4.11)***				-0.207 (-2.73)***	-0.348 (-2.83)***	
farm size	-0.730 (-0.66)	0.027 (0.10)	0.154 (0.50)	0.004 (0.02)	-0.031 (-0.30)	0.094 (0.54)	-0.120 (-1.32)							
Irrigation	4.270 (3.17)***	-0.378 (-1.14)	1.55 (4.41)***	0.466 (2.11)*	0.112 (0.90)	0.634 (2.97)***	-0.460 (-4.40)***	4.769 (4.37)***		1.537 (5.66)***			0.582 (3.11)***	-0.427 (-4.32)***
poverty	-0.359 (-0.74)	-0.120 (-0.94)	0.284 (2.12)**	0.067 (0.88)	0.038 (0.74)	0.069 (0.81)	-0.028 (-0.70)			0.212 (1.87)*				
road length	-0.762 (-0.44)	0.211 (0.46)	0.071 (0.15)	0.265 (0.96)	0.170 (1.04)	0.462 (1.64)	0.180 (1.25)				0.492 (2.07)**	0.285 (2.05)*	0.450 (2.03)**	
urban	-3.605 (-1.60)	-0.821 (-1.44)	-1.447 (-2.39)**	-1.097 (-3.24)***	-0.409 (-1.99)	-1.061 (-3.02)***	-0.324 (-1.80)*	-4.694 (-2.91)***	-1.068 (-2.94)***	1.312 (-2.94)***	-0.547 (-2.26)**	-0.382 (-2.50)**	-0.926 (-3.25)***	-0.378 (-2.65)***
villages	0.518 (0.17)	-0.003 (-0.003)	-0.641 (-0.78)	0.364 (0.79)	-0.716 (-2.37)**	-1.203 (-2.34)**	-0.229 (-0.93)					-0.474 (-1.80)*	-1.149 (-2.54)**	
literacy	0.829 (0.30)	2.33 (3.25)***	1.003 (1.33)	-0.303 (-0.72)	0.511 (1.90)	1.436 (3.13)***	0.840 (3.73)***		1.820 (3.77)***			0.419 (1.88)*	1.283 (3.29)***	0.791 (4.20)***
District Dummies														
Nellore					-2.219 (-2.27)**							-2.575 (-2.79)***		
Nizamabad	20.689 (1.88)*							16.931 (1.79)*						
Warangal					2.172 (1.77)*	6.372 (3.07)***							5.663 (3.29)***	
Khammam	16.861 (1.57)			7.528 (4.52)***				18.180 (1.91)*			6.730 (4.21)***			

Ananthapur				-5.971 (-3.21)***							-5.433 (-3.41)***			
R^2	0.40	0.39	0.53	0.69	0.47	0.52	0.71	0.51	0.48	0.60	0.67	0.49	0.60	0.70
F=	2.28**	2.48**	3.63***	5.189***	2.718**	3.303***	6.589***	5.447***	10.84***	11.302***	11.462***	4.370***	5.41***	17.26***
Heterosk.	0.018	0.362	1.149	0.534	0.016	1.609	0.241	3.060	0.216	0.301	1.901	0.071	2.814*	2.398
Normality	0.722	0.426	1.448	0.161	0.927	0.702	0.247	0.960	1.417	0.755	0.786	0.067	0.414	0.437
Functional	4.341**	0.033	0.495	1.033	0.819	0.310	1.449	3.915*	0.202	0.190	2.068	0.805	0.186	1.830

Notes: - The figures in brackets are t-values; - Number of observations: 44;

- *** significant at 1 per cent; ** significant at 5 per cent and * significant at 10 per cent.

For construction, corrected Normality Khammam 21 has coefficient. = 7.172 and t = (3.74)***.

For males White's Heteroscedasticity adjusted S.E's (not reported here) only changed the significance of the dummy variables.

5. Elasticities of RNFE for total, males, females and for seven sectors

Table 16 part -2 . To find out the size of the separated impact of each variable on the RNFS we have calculated partial elasticities of different significant explanatory variables with respect to the growth of RNFE for total, males and females and for 7 sectors. Elasticities have been calculated only for the significant variables up to the 10 per cent level. This has been done by comparing the mean scores obtained for each variable. They are at the point of means.

Irrigation is elastic for mining, non-HHI, transport and inelastic for females and services sectors. A 1 per cent increase in irrigation increases the growth of RNFE by 0.51 per cent in trade, by 1.21 per cent in non-HHI, and by 0.27 per cent in transport. On the other hand, irrigation decreases the growth of RNFE by 3.05 per cent for females and by 0.23 per cent for other services. Women who are in a poor household are less likely to be in the RNFS. A 1 per cent increase in urbanisation will result in a decrease of the RNFE trade sector by 0.21 percent, in other words trade elasticities of RNFE is 0.21 (i.e. relatively inelastic). Table 16 Part 1: presents estimated significant coefficients of multiple regression of the districts shares of RNFE in total employment: logged data results for 1981-1991.

Table 16 Part 1: Estimated significant coefficients of multiple regression of the Districts shares of RNFE in total employment: logged data results for 1981-1991 (Pooled) total, male, female and for seven sectors:

Variables Y = % RNFS	pooled Total	pooled Males	pooled Females	mining & quarrying	HHI	non - HHI	construction	trade	transport	services
Constant	+(***)	+ (***)	+ (***)		+ (***)			+ (***)		+ (***)
com crop										
villages			- (***)			+ (**)		- (***)	-(***)	
Irrigation	+ (***)	+ (***)		- (***)	+ (*)	+ (***)	+ (*)			
farm size	- (**)						+ (***)	- (***)	- (**)	- (***)
Poverty			- (***)		-(*)			- (**)	-(**)	
Literacy	- (***)	-(***)			- (***)	- (***)		+ (***)	+ (***)	+ (***)
Urbanisation				+ (**)		+ (**)			+ (*)	
Road length										
Bank			- (***)		-(**)					
Year dummy		+ (***)		+ (***)		+ (***)		- (**)	- (***)	
Ranga Reddy	- (***)	-(***)				- (**)	-(*)			- (***)
NIzamabad	- (**)		-(***)		**-(***)**					
Khammam							+(**)			
Kurnool						+ (**)				

Notes: - The signs of the significant variables only are reported above.

- *** Significant at 1 per cent; ** Significant at 5 per cent and * Significant at 10 per cent

Table 16 Part 2: Regression results for growth in the share of non-farm employment to total employment (1981-1991) [elasticities shown in brackets)

Variables (1980-90 Growth rates)	Total	Males	Females	mining	HHI	non - HHI	construction	trade	transport	services
Constant	- (***)	+ (***)	+ (**)	+ (***)	-(***)	+ (**)		+ (***)	- (**)	
Banks			+ (***) [0.38]				+ (**) [0.63]			
commercial crops	- (*)		- (**) [3.35]	- (***) [0.54]				- (***) [3.88]	- (***) [0.34]	
Irrigation			- (***) [3.05]	+ (***) [0.51]		+ (***) [1.21]			+ (***) [0.27]	- (***) [0.23]
Literacy	+ (***) [12.71]		+(*)		+ (***) [3.65]			+(*)	+ (***) [1.54]	+ (***) [1.09]
Poverty						+(*)				
Road length	+ (**) [3.20]	+ (**) [2.25]					+ (**) [1.80	+ (*) [1.78]	+ (**) [0.27]	
Urbanisation	- (***) [3.00]	-(***) [2.32]		- (***) [0.40]	- (***) [0.66]	- (***) [0.82]	- (**) [0.51]	- (**) [0.21]	- (***) [0.34]	- (**) [0.16]
size of villages								-(*)	- (**) [0.34]	
Srikakulam		- (***)								
Nizamabad				+(*)						
Warangal	+ (**)								+ (***)	
Khammam							+ (***)			

Ananthapur							- (***)			
Karimnagar			- (***)							
Nellore								- (***)		

Notes: - Elasticities have been calculated from the regression coefficients: Elasticity = Mean value of the Variable / Mean RNFE multiplied by the regression coefficient of the variable. The signs of the significant variables only are reported above.

- *** Significant at 1 per cent, ** -Significant at 5 per cent, * Significant at 10 per cent

Summary and Conclusions

18 per cent of the rural labour force in AP in 1990-91 was engaged in RNFE as their prime occupation. As such, RNFE plays a crucial role in providing additional employment and in generating additional income to rural people, particularly to the poor and to those with little land. RNFE encompasses a wide variety of activities, although services, trade and manufacturing predominate.

The main conclusions of this chapter is that the share of RNFE was lower in the 1980s in AP than in India. Moreover, the share of RNFE grew more slowly in the 1980s in AP than elsewhere in India, despite slower improvement in output (and in labour absorption) in agriculture.

The analysis of the share of RNFE in total employment (farm + non-farm) reveals that the share of RNFE in AP increased marginally between 1981 and 1991. While employment in the manufacturing sector has increased sharply, employment in household industry witnessed a decline. However, considerable differences are seen across districts, both in RNFE structure and trend: 12 out of 22 districts experienced a decline in the shares of RNFE in total employment between the two periods. In the period and for these districts, the proportion of people below the poverty line has also decreased: the falling rural non-farm share may be due to the facts that (1) urbanisation has possibly absorbed some of those engaged in RNFS (more than in the other 10 districts) activities and (2) the per capita value of agricultural output and employment has also increased faster 1981-1991, the share of the RNFS in the total rural workforce has increased faster for male than for female employment. The analysis of the changes in RNFE omits possible effects of urban non-farm employment on the rural workforce.

The regression results reported in this paper are summarised in Table 16 Part 1 & 2. Linkages between the RNFS and the levels and growth of agricultural productivity in the districts of AP are either weak, or else there are positive linkages in some districts but negative (distress) in others, so overall no strong link is found.

Conclusions for log total RNFE shares, males and females

There are some distinct issues: (1) The variables which explain inter-district differences in RNFE are not the same for males and females and (2) Females have a lower mean RNFE share than men. One interesting result (for the pooled sample for 1980 and 1990) is that the variables significantly associated with male RNFE were different from those that were significant for female RNFE. The conclusion (for the log pooled sample for 1980-90) for totals (males + females) is that irrigation is positively significant, and farm size and literacy negatively significant, in explaining a district RNFE share. For males also irrigation is positively significant and literacy is negatively significant. However, for females only infrastructure (percentage of villages with bank branches), big villages and poverty are negatively significant. The results for irrigation suggest that higher agricultural productivity (related to irrigation) is linked to a high RNFE share growth for male workers. The analysis of determinants of RNFE confirm the hypothesis that growth linkages from irrigated agriculture lead to modern RNFE. The results for farm size support for the hypothesis (AGL) that traditional RNFE share rises with distress diversification for those with little or no land.

Literacy supports the wider/overall ‘development linkage’ (ODL) hypothesis that traditional RNFE share rises with lower levels of literacy. The result, for males only, supports the AGL hypothesis in the case of irrigation and ODL in the case of literacy.

The results for big villages and percentage of bank branches in the case of female labour oppose the hypothesised growth linkages (AGL) relationship. There is no obvious explanation for this result. Some other variables which we could not consider might be of importance and, could explain further variations in the dependent variable.

It seems that females tend to be absorbed more in agricultural work whereas males tend to seek opportunities in RNFE perhaps because, in seeking the available limited opportunities in RNFS, males take advantage of their greater mobility. Also individual behaviour is affected by social norms and those norms differ between sexes. Ellis (1988:167) points out that the division of labour between women and men is socially, not biologically, determined, and that it is also susceptible to change. What we observe in AP today is the outcome of past and current social conventions which emphasise the productive role of women within the household and family unit (i.e. make them less mobile). I

assume that mobility matters more in seeking work in RNFE than in agriculture. The reason is non-farm employment is limited.

Conclusions for disaggregating sub-sectors of RNFE:

The conclusion for the log pooled sample for the share of the seven sub-sectors is that irrigation is significant positively for HHI, supporting the strict growth linkages (AGL) hypothesis to modern RNFE.

Non-HHI and construction RNFE categories are negatively significant for mining. The strong mining link can be explained by technical reasons. Mining requires lots of water, which is much harder in very watery soils. Percentage of villages with banks is negatively significant for HHI, which supports the wider 'development' linkages (ODL) hypothesis. For traditional household industry the fact is that irrigation is significantly positive. This is surprising, but percentage of villages with banks is negatively significant for HHI and supports ODL. If HHI is 'modern' the reverse is true. Binswanger and Khandker (1995) find that the percentage of villages with banks at the all-India level highly positively significant for total RNFS per cent - credit may be a key constraint on modern and traditional RNFS alike (but not on agriculture as argued by Binswanger and Khandker 1995), cutting across the "growth linkages versus distress diversification" debate. Farm size is positively significant for construction (and may suggest that distress linkages decline as average farm size rises) and negatively significant for other services, again suggesting agricultural distress linkages (ADL) to this traditional RNFE sub sector.

Poverty is negatively associated with percentage of employment in trade, which tends to rise as poverty falls; if trade is a 'modern' subsector of RNFE this supports the 'wider linkages hypothesis' (ODL). For such sectors so does the fact that RNFE literacy is positively significant for growth in such sectors as trade and transport. Conversely, it is negative for HHI, supporting the 'wider' ODD distress diversification hypothesis. The fact that the literacy is positively significant for services, however, opposes my hypothesis that rural services, which are predominantly tradition-oriented, are linked to distress diversification (ODD).

Urbanisation is positively significant for mining, non-HHI and transport; since for non-HHI urban options may pull away rural non-farm workers, this positive net link provides a specially strong indication in support of the wider hypothesis (ODL), that development raises the modern RNFE share. As urbanisation increases employment is generated for the remaining resident rural non-farm people; nearby villages take advantage of modern local - not just urban - employment opportunities.

The size of villages is positively significant for non-HHI, which supports only the wider hypothesis (ODL), not AGL. The argument is that demand for the products of RNFS is higher in larger villages. The real argument is that different bits of activities, in a big village, provide enough demand to 'take in each other's working' across sub-sectors of RNFE. This is plausible a sort of 'economies of scope' but has nothing obvious to do with strict 'growth linkages' from agriculture to RNFE.

However, village size is negatively significant for trade and transport shares in employment - so, if big villages are those with prosperous agricultural development, these sectors are mainly 'modern', not 'traditional'.

The strict agricultural growth-linkages (AGL) and ODL hypothesis is supported for total RNFE share and male RNFE but not for ADD. For females RNFE share opposes the AGL hypothesis and supports the ODD hypothesis.

Conclusion from the growth of RNFE shares regressions

The results for the total labour force is that urbanisation and commercialisation are negatively significant. This implies that the districts with high growth of urban share, and of agricultural commercialisation, tend to show slower growth of total RNFE. This suggests that distress diversification (ADD) hypothesis supports. Literacy and infrastructure, being positively significant, support the ODL hypothesis. For males, infrastructure is also positively significant, as are growth infrastructure (banks) and literacy for females, also supporting the wider (ODL) hypothesis, but commercialisation and irrigation are negatively associated which opposes the growth linkages hypothesis. It seems that as irrigation expands women wage workers find additional employment chiefly in farming itself.

The agricultural distress diversification (ADD) and overall growth linkages (ODL) hypotheses are supported for total RNFE growth. For males growth, the ODL hypothesis is supported but not the AGL

hypothesis. For females, there is some support for the wider (ODL) hypothesis but not for the AGL hypothesis.

Conclusions for all the seven sub-sectors growth regression results

Urbanisation is strongly negatively significant. In explaining district level RNFE shares of mining, non-HHI transport urbanisation is positive whereas for growth, the association with urbanisation is negative in all the sub-sectors. The negative growth relationship implies that NFE is mostly urban based. There is no obvious explanation for this negative relationship but lack of urbanisation, which implies that fewer non-farm employment opportunities for rural residents (because they cannot commute to town centres) may be associated with greater distress diversification in rural RNFE. There is a positive link for levels but negative link for growth across districts.

The growth in the percentage of villages with banks has a positive association with RNFE growth for construction only, supporting the wider (ODL) hypothesis to modern RNFE. Agricultural commercialisation growth is negatively significant for growth in mining, trade and transport. In the case of mining one would not expect a direct link to agriculture. The negative relationship suggests that mining employment has grown fastest in areas of low agricultural potential supporting ADD. The negative relationship between agricultural commercialisation and employment growth in trade and transport is very surprising. More agricultural surplus surely has to mean more trade and transport, not less. On the other hand agricultural development (irrigation growth) is positively significant for non-HHI and transport employment growth supporting growth linkages (AGL), but is negatively significant for services. This also supports our central hypothesis, that agricultural development leads to growth linkages in modern RNFE and distress diversification in traditional RNFE.

Poverty growth is positively significant for non-HHI growth. However, this pattern runs against the hypothesis stated. Infrastructure development (road length) is positively significant for construction, trade and transport supporting 'wider' ODL for these modern sectors and hence our central hypothesis. Growth of literacy is positively significant for HHI, which is surprising, and has no obvious explanation. For transport and services employment growth however, literacy is positively significant, supporting the wider (ODL) hypothesis for these modern sectors. However, districts with faster growing "village size" tend to have slower growing employment shares in trade and transport, opposing ODL and the central hypothesis.

From the RNFE growth we have obtained partial elasticities (the size of proportionate effects at the mean). From the results, it may be inferred that RNFE is a positive effect from relatively high levels of rural bank branches, from irrigation. From literacy and from infrastructure. The negative effects obtained from commercialisation is wholly negatively signed. The percentage of big villages and poverty is negatively signed, literacy positively, infrastructure (roads) positively, whereas locations in areas with more urbanisation are negatively related to RNFE growth. The elasticities indicate that growth in some of the RNFS variables does not have a strong effect on RNFE (totals and sub-sectors) growth. Perhaps in most cases the effects of the variables on employers' demand for RNFS labour, absolutely or relatively to farm labour, are of opposite sign to the effect on the employees' willingness to supply such labour, absolutely or as compared to farm work. However, literacy should raise both supply of and demand for, modern RNFE labour.

The overall results for total RNFE share support the hypothesis that there is a positive linkage effect from expanded irrigation (i.e. districts with 1 per cent more irrigation increase RNFE share by 0.13 per cent share at point of mean, or districts with (A) per cent faster growth in irrigation area secured (B) per cent faster growth in RNFE share or both to RNFE). This is especially true for male RNFE compared to females in both modern and traditional sectors. Similarly, poverty reduction has quite a high impact in promoting RNFE. One of the other findings is that growth of literacy is positively associated with modern RNFE growth in districts, and negatively associated with traditional RNFE growth in districts. The problem, though, is that education affects both labour supply and labour demand in different stages of socio-economic and technological development. Making inferences about its effect and relation with development level can only be tentative; in other words, its influence needs to be considered cautiously. We expect education to raise modern RNFE share, lower traditional RNFE share, in early and late stages of development. The district level data analysis in most respects supports the hypothesis that growth linkages (AGL) are the main explanation for high shares in, and the growth of, 'modern' RNFE, and distress diversification (ADD) for 'traditional' RNFE. Also in most respects this supports the wider hypothesis (ODL) that linkages are the main explanation for high shares in and growth of , modern RNFE, and overall distress diversification (ODD) for

traditional RNFE. An increase in investment on irrigation, and infrastructural facilities coupled with large scale non-farm activities would generate a significant increase in non-farm employment.

BIBLIOGRAPHY

Basant, R. and Joshi, H. (1989) 'Non-Agricultural Employment in Rural Gujarat: Some Evidence from an Agriculturally Developed Region'. India: Paper presented at the seminar on Non-agricultural Employment in India: Trends and Prospects, The Gujarat Institute of Area Planning, Ahmedabad.

Binswanger, H. P. and Khandker. S. (1995) 'The Impact of Formal Finance on the Rural Economy of India', *Journal of Development Studies',* Vol. 32, No. 2 pp.234-62.

Binswanger, H. P. *et al* (1983), *Thailand: Rural Growth and Employment,* The World Bank, Washington D. C.

Census of India (1991) Government of India, Provisional Population Totals, AP, Series 2, Paper-1, Supplement Table 6A, pp. 66-73.

Census of India (1991) Series -1, final population total paper2 of 1992 p.155.

Census of India 1981, series-1 India, General Economic Tables, (Tables B.1 to B.5) pp. 242-245.

Census of India 1991 Andhra Pradesh Series-2, Paper-1 of 1991 Supplement Provisional Population Totals.

Census of India 1991 India Series-1, Provisional Population Totals: Workers and Their Distribution Paper-3 of 1991, pp. 443-448.

Census of India 1991, Andhra Pradesh, Population Totals, Series-2, pp. 10, 66-73

Chadha, G.K. (1992) 'Non-farm Sector in Rural China: Trends and Variations in Labour Productivity', Asian Regional Team for Employment Promotion, New Delhi, ILO, World Employment Programme.

Ellis, F. (1988) *Peasant Economics - Farm Households and Agrarian Development.* Cambridge, U.K.: Cambridge University Press.

Gangadhara Rao, G. (1997) Rural non-farm Employment in India, Spellbound Publications, Rohtak, India

Greeley, M. (1987) *Postharvest Losses, Technology, and Employment: The Case of Rice in Bangladesh*. Boulder and London: Westview Press.

Hazell, P. and Haggblade S. (Oct.-Dec. 1991) 'Rural - Urban Growth Linkages in India', *Indian Journal of Agriculture Economics*, Vol. 46, No. 4, pp. 515-529.

Hazell, P. and Ramasamy C. (1991) *The Green Revolution Reconsidered: The Impact of High-Yielding Rice Varieties in South India*. Baltimore and London: Johns Hopkins University Press,

Jarque, C. M. and Bera, A. K. (1987) 'A Test for Normality of Observations and Regression Residuals', *International Statistical Review*, Vol. 55, pp. 163-172.

Murty, C. S. and Durga C. (Oct.-Dec. 1992) 'Rural Non-Farm Employment with Reference to Employment in Handloom Weaving in Andhra Pradesh', *Manpower Journal*, Vol. XXVIII, No. 3, pp. 1-22

Parthasarathy, G. (Jan-March 1987) 'Changes in the Incidence of Rural Poverty and Recent Trends in Some Aspects of Agrarian Economy', *Indian Journal of Agricultural Economics*, Vol. 42, No. 1, pp. 1-21.

Ramsey, J. B. (1969) 'Tests for Specification Errors in Classical Linear Least Squares Regression Analysis', *Journal of the Royal Statistical Society*, Series B, Vol. 31, pp. 350-371.

Reddy, S. S. (1991) 'Poverty and Agricultural Growth in Rural Andhra Pradesh' Inter District Analysis, Centre for Economic and social studies, (CESS) Poverty Project Monograph No.1.

Statistical Abstracts of AP (1981 and 1991),Directorate of Economics and Statistics, Govt. Of AP, pp.114-116

Unni, J. (Jan. 1991), 'Regional Variations in Rural Non- Agricultural Employment: An Explanatory Analysis', *Economic and Political Weekly*, pp 109-122.

Vibhuti, S. (Nov. 1991) 'Rural Non-farm Activity - A Regional Model and its Empirical Application to Maharashtra', *Economic and Political Weekly*, Vol. XXVII, No. 45, pp.2587-95.

White, H. (1980) "A Heteroscedasticity Consistent Covariance Matrix Estimator and a Direct Test of Heteroscedasticity", *Econometrica*, Vol.48. pp. 817-818.

Appendices

Appendix Table 1: Classification of non-farm activities

Category	**Description**
Mining and Quarrying	This sector covers mining of coal and lignite, extraction of crude petroleum, production of natural gas, mining of iron ore, metal ores uranium, thorium ores, non metal ores.
Non-household Manufacturing	This sector includes manufacture of food products, beverages, tobacco, cotton textiles, wool, silk, jute, wood, paper, leather, repair of capital goods. Generation, transmission and distribution of electricity, generation and distribution of gas, steam distribution, water supply.
Household industry (HH)	An industry conducted by the head of the household himself or herself and/or by the members of the household at home or within the village in rural areas. Household industry relates to production, processing, servicing, repairing or making and selling of goods. It does not include professions such as pleader, doctor, barber, musician, dancer, weather man, washer person, astrologer, or merle trade or business, even if such professions, trade or services are run at home by members of the household.
Construction	This sector includes construction of buildings (residential and non-residential) construction and maintenance of roads, buildings. Construction and maintenance of power plants except hydroelectric plants and all other activities allied to construction.
Trade	This sector covers wholesale / retail trade in cereals, pluses, fruits and vegetables, cotton, jute, wood, paper, machinery equipment. Restaurants, hotels, resting houses, mess, lodging places.
Transport	This sector includes all types of land, water, and air transport and services incidental to transport.
Other services	This includes public administration and defence services, sanitary services, education and scientific research services, health and medical services, religious services, recreational and cultural services, personal services like laundry, cleaning, dyeing, hair dressing. Postal, telegraphic, wireless, signal communication, courier activities other than post. Godowns, warehousing of agricultural products without refrigeration and cold storage, other storage and ware housing facilities. Banking and similar types of financial institutions, provident fund, insurance, real estate, business services.

Source: Government of Andhra Pradesh, (1992), Report on third Economic Census 1990, Directorate of Economics and Statistics, pp 9-10.

Appendix Table 2: Correlation Matrix of all variables used in the log-linear model at district level:

Variable	*RNFE*	*male*	*female*	*comcrop*	*irri*	*farm*	*pov*	*lit*	*urban*	*villages*	*roadleng*	*banks*
rnfe	1											
male	0.69	1										
female	0.89	0.36	1									
comcrop	-0.39	-0.21	-0.35	1								
irri	0.40	0.27	0.33	-0.37	1							
farm	-0.36	-0.32	-0.28	0.36	-0.61	1						
pov	-0.26	-0.47	-0.02	0.12	-0.36	0.24	1					
lit	-0.04	0.35	-0.20	0.26	0.49	-0.30	-0.62	1				
urban	0.11	0.39	-0.05	-0.06	0.08	-0.10	-0.37	0.36	1			
villages	-0.16	-0.05	-0.10	0.15	0.22	0.19	-0.22	0.41	-0.03	1		
roadleng	0.22	0.36	0.11	0.00	0.39	-0.49	-0.33	0.47	0.29	-0.11	1	
banks	-0.04	0.30	-0.12	0.24	0.02	-0.08	-0.43	0.52	0.31	-0.03	0.37	1

Note: There are no correlation problems that were deemed worth reporting.