RURAL LABOUR MARKETS AND SEASONALITY: A THEORETICAL AND EMPIRICAL ANALYSIS

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Acknowledgements

My supervisor, Debraj Ray, naturally heads this list. Chapters 5 and 6 of this thesis arise out of joint work with him. If this thesis has achieved any standard at all, it is because of his able and patient guidance.

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The help and sacrifice of my parents and my Chhordidi's help were of crucial importance to me. Ms. Vathsala and Ms. Ila Banerjee had made life bearable at a particularly difficult juncture.

I am afraid I have failed to name several good friends whose help mattered. Let me end by begging pardon from them and thanking them.

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Chapter 1

Introduction

1.1 Agricultural Labour and Economic Development

A large proportion of the labour force in India (that is, 66.56% of the main workers according to the Census of India, 1981) is engaged in agriculture. Just this simple fact would make a study of the functioning of agricultural labour markets highly important. But quite apart from this observation, there are several reasons for a detailed study of rural labour markets, particularly in the context of the problem of economic development.

A major issue facing developing economies is industrial growth. The agricultural sector can foster growth by creating demand for industrial products, by providing a supply of certain primary inputs, supplies of food for the growing industrial labour force, and possible a supply of capital. All of these issues necessitate, at some level, a study of rural labour markets. But there is a more fundamental fact, the agricultural sector provides a basic factor of production to the growing industrial sector: labour. One of the key factors influencing the supply of such labour is the functioning of the agricultural labour market.

My focus in this dissertation is on the role that *seasonality* plays in the functioning of labour markets. Specifically, I analyze two issues: the existence of involuntary unemployment in the casual labour market (in the sense that unemployed labourers are strictly worse off than the employed labourers) and the existence of long-term labour contracts (known in the literature as "labour tying") in agricultural labour

markets.I have chosen these two issues, in preference to other, less discussed issues primarily because of their obvious importance in determining the income level of rural agricultural labourers. An understanding of the issues of wage determination will also facilitate analysis of other important phenomena such as seasonal and permanent migration from villages. A secondary reason is the strong feeling, induced by the perusal of the theoretical literature on the subject, that the theme of seasonality has been underplayed in the context of casual labour and overexploited in the context of labour tying.

A study of various features of agrarian labour markets has also immediate normative implications. Economic development implies a right to a better life for the agents in the economy. In this context, the agricultural labour force cannot be ignored. Government intervention to improve their conditions requires knowledge about their socio-economic characteristics. Indeed, this subject has received much attention.[1] However, if the programmes are to be effective, knowledge is also required about the working of the *labour market*. In other words, policy intervention to bring about a change in the desired direction needs to be self-enforcing, without which it will either be a failure, or require constant monitoring to ensure success.

Consider for instance the legislation in India to abolish sharetenancy, under which the tenant could claim ownership rights on the plot cultivated by him. While this has had the effect of abolition of *formal* land tenancy contracts, and has led to an appreciable shortening of the period of duration of a contract, sharecropping has by no means disappeared. This means that it is still in the interest of agents to enter tenancy contracts and superficial action such as simple prohibition, can not stop them from entering these contracts.[2]

Another interesting example is that of public works to provide alternative employment to agricultural labourers. Such programmes have been observed to fail either because the existing wage structure or the existing seasonal pattern of agriculture was not taken into account. An example of the former may be found in the

[1]The Rural Labour Enquiries, the Continuous Village Surveys of the Agro-Economic Research Centre and also several studies based on secondary data such as the Population Census data and the National Sample Survey data.

[2]Bardhan [1988].

Famine Commission Report (Government of India [1898]) — labourers refused to join nearby social works programme because they were afraid of thereby lowering the "village wage".[3] Similarly, Rodgers [1975] finds that in spite of the proximity of public works, agricultural labourers complain of involuntary unemployment at certain times of the year, because the duration of the works coincided with the agricultural peak seasons. Public works in parts of Maharashtra, in contrast, have been successful because they are, in a sense, compatible with the existing pattern of employment and wages.[4]

It is possible to carry on indefinitely in a similar strain. But I think the above examples are sufficient to illustrate that development in an economy cannot occur ignoring the huge agricultural labour force. Further knowledge of agricultural labour markets is necessary for an upliftment of the conditions of the agricultural labour force.

1.2 Agricultural Labour Markets in India

The discussion above indicates the broad subject of coverage of this thesis: agricultural labour markets. I confine my attention to *wage labour*. The reason is simple: hired labour constitutes a large part of the labour input in agriculture. (See Table 1.1 below.) Compared to its importance, hired labour in agriculture has not received adequate attention either from theoretical or from empirical economists. While empirical economics has been mainly concerned with problems regarding socio-economic condition of labourers, the issues associated with interlinked contracts have received most of the attention from theoretical economists.

Insert Table 1.1: The proportion of hired labour in agricultural labour.

Accordingly, my thesis contains an *empirical and theoretical* study of labour contracts in agricultural labour markets. The 1983-84 survey of the village Palanpur in western Uttar Pradesh provides the primary data set for this study. The quality of

[3] For more on the "village wage" see Sections 2.2.5 and 2.3.5.

[4] Ryan and Ghodake [1984].

the data, together with the fact that Palanpur has been surveyed thrice earlier and that its labour market is not atypical of villages in that particular belt of western Uttar Pradesh led me to choose Palanpur as my primary data set. Being aware of the dangers of drawing conclusions on the basis of a single study, however careful, I collected information from a large number of other secondary sources. This exercise revealed that the structure of the labour market in Palanpur is similar to that of a number of villages, at least in the wheat growing region.[5] Dissimilarities, where they exist, fall within the scope of explanation.

Insert Figure 1.1: Fluctuations in the level of employment in wage labour in village Palanpur.

The empirical study of the agricultural labour markets at the micro-level highlights that the technology of traditional agriculture involves a great deal of *seasonality in labour use*. As an illustration, see Figure 1.1. Note that not only the number of labourers required but also the nature of the tasks exhibit seasonal variations. It turns out that labour contracts in agriculture are often designed to cope with this seasonal variation.

For instance, in Palanpur there are several peaks and troughs in the activity levels over the year, but the wheat harvesting season clearly stands out as the *peak season*, and the rest of the year can be called the *slack season*. The peak season sees a complete change-over to *piece rate* payments[6] in the casual labour market. Speed of completion being the most important consideration in the peak season, piece rate payment is clearly the incentive compatible form of payment. Both daily wage and piece rate payments coexist in the casual labour market in the slack season, and the choice of the type contract is determined primarily by the nature of the task to be performed.

Involuntary unemployment is rife in the slack season among casual agricultural labourers. However, there is a "going" daily wage during the slack season, which, as we shall see, appears to be higher than the reservation wage. In contrast, there is a

[5] For more on this, see Section 2.3 of this thesis.

[6] That is, payments conditional on the amount of output.

complete lack of any standards in piece rates for slack season tasks. In Chapter 2 below, I shall argue that under the assumption that labourers' reservation wages are reflected by the terms of the piece rate wages accepted by them, it emerges that the slack season daily wage is *significantly higher* than the reservation wages of labourers.

The information from secondary sources is in broad agreement with the data. There is a great deal of seasonality in the demand for agricultural labour. Alternative employment opportunities are few, particularly in the slack season. Slack season wages are usually lower than peak season wages. But there appears to be an element of *downward wage rigidity*.

While the above discussion refers to casual labour, long-term labour contracts are also common in agricultural labour markets. Such contracts are referred to as "labour tying" in the literature. In general labour tying provides some insurance to the labourer against income fluctuation. The employer benefits in having easy access to labour in the peak season and/or greater reliability of the tied labourers in carrying out tasks involving greater responsibility. Therefore, empirical data points out that, both employer and employee are guarded to some extent against seasonality by labour tying contracts.

This discussion has paved the way for theoretical modelling of labour tying as a response to seasonality. Indeed, the implicit contract theory, based on the postulate of different levels of risk-aversion for employers and labourers, would predict labour tying as *the* optimal response of employers in the presence of *any* seasonality. But, there was practically *no* labour tying in Palanpur. Interlinkage between the labour market and the tenancy markets was also inexistent. Section 2.3.6 below points out that both the form and incidence of labour tying exhibit regional patterns. This observation begs a theoretical explanation.

To summarize: the above discussion throws up two stylized facts, neither of which can be theoretically explained in a straightforward manner. (1) In the casual labour market wages exhibit downward rigidity. (2) There exist regional patterns in the incidence of labour tying, in spite of the seasonality in agricultural labour markets.

1.3 Seasonality and Rural Labour Contracts

The discussion in the previous section points out the existence of seasonality in agricultural labour markets and its influence on their functioning. Accordingly, the theoretical models put forward in this thesis make use of seasonality to explain the two stylized facts that arise from the examination of empirical data.

Of course, slack season and peak season contracts may be viewed as *isolated responses* to the current demand and supply conditions and to the type of operation currently in progress. However, there are strong grounds for treating them as interconnected. An obvious reason is that a particular scale of outlay in the sowing season implies a particular level of demand for labour in the harvesting season. Therefore, even the simplest model of a farmer's choice of input levels must take into consideration the fact that the levels of the slack wages and the peak wages are unlikely to be independent. While earlier economists' work contained the seed of this idea,[7] it was left to Bardhan (Bardhan [1979a]) to model this fact explicitly. Later economists such as Eswaran and Kotwal [1985], Guha [1989] explicitly modelled seasonality. The idea has also been widely exploited in the theoretical literature on interlinkages. However, it has certainly not been explored to the fullest extent in the context of wage labour, particularly *casual* labour. There are also other connections, to be introduced shortly.

In both the models constructed below, I have assumed a competitive market structure.[8] However, indications of the nature of outcomes in the presence of a single, monopolistic employer have been provided in both the cases.

The co-existence of involuntary unemployment and wages exceeding reservation wages has been modelled first. Involuntary unemployment in the slack season is an endogenous outcome of the model. The model assumes that each labourer has a "notional fair wage" and assumes that the labourers exploit the tightness of the peak season labour market to engage in active, though uncoordinated protest against farmers who have been "unfair" in the slack. The protest is forthcoming subject to

[7] See Leibenstein [1957] and Rodgers [1975].

[8] The use of the competitive structure is motovated by the empirical observation that the presence of small farmers as employers freqently prevents the formation of collusion.

the materialization of favourable economic conditions in the peak.

The set of possible equilibrium wage configurations have been fully characterized for some specific cases of the model. In general there is a continuum of possible equilibrium wage configurations. All these equilibrium wage configurations, barring one, involve slack season wages higher than the reservation wages of labourers. An extension of this model also provides a simple explanation for the gap between daily incomes from piece rates and daily wage in the slack season. Various other extensions and implication are discussed.

An increased seasonality in this model enhances the possibility of the existence of wages above reservation wages. A change in technology, a change in supply conditions, or a change in the degree of uncertainty will have the same effect provided they increase the seasonality in the labour market. If farmers differ in their choice of techniques, then the above observation holds in the cross-sectional sense; that is, the farmer whose technology involves greater seasonality will be more likely to pay a higher wage.

A second model examines the equilibrium level of labour tying in the presence of seasonality and different levels of risk- aversion for labourers and farmers. These assumptions clearly facilitate the formation of implicit contracts. But an incentive problem embedded in the very nature of implicit contracts is likely contractual non-fulfillment by the *labourer* whenever more attractive alternative employment is available. Specifically, tying yields contractual wages that are *less* than peak spot wages. The employer needs to ensure that no labourer has an incentive to renege on the tied contract in the peak.

Incentive compatible equilibria in the labour market of the model described above are then characterized. Under the assumption that all tasks are perfectly monitorable, it is shown that there exists a *strictly* positive level of seasonality above which there will be labour tying and below which there will be none (despite the presence of *some* seasonality). Even in the presence of the required level of seasonality, the casual labour market will never be wiped out altogether. An enhanced level of seasonality in this model brings about an increased level of labour tying accompanied by an increase in incomes of tied labourers. This increase in income is

accompanied by a fall in the relative level of income fluctuations for tied labourers, who, as it turns out, are only *partially* insured against income fluctuations in an incentive compatible equilibrium.

This model provides an explanation for the breakdown of patron- client relations in terms of an increase in the exogenous quit rates of attached labourers. Such an increase brings about a lower level of labour tying accompanied by a higher level of fluctuations in the labourers' incomes.

An extension to include non-monitorable tasks — performed only by attached labourers — explains the empirical observation that attached labourers are appointed primarily by large farmers.

1.4 An Outline of the Thesis

Chapter 2 of the thesis discusses the empirical material on the functioning of agricultural labour markets. Chapter 3 of this thesis surveys the theoretical literature on labour contracts and casual labour in rural labour markets. Chapter 4 briefly recapitulates the contents of chapters 2 and 3 and paves the way for the presentation of the theoretical models of Chapters 5 and 6. Chapter 5 provides a theoretical explanation for the co-existence of involuntary seasonal unemployment and wages that exceed the reservation levels. Chapter 6 provides an explanation for variations in the incidence of labour tying in terms of seasonality, and Chapter 7 concludes the thesis.

Serial number	Country or region	Percentage of hired labour
1	Bangladesh	27 – 36*
2	Thailand	4 – 32**
3	Philippines	65 – 83
	India	
4	West Bengal	40 – 86†
5	Maharashtra	64 – 86‡

Table 1.1: Percentage of hired labour in agriculture, estimates based on case studies.

Notes:

* These figures pertain to casual labour only, if attached labourers are considered, the proportion rises to approximately 40%.

** The use of exchange labour is very high, 15% to 31 %.

† The data pertains to rainfed agriculture in Amravati district of Maharashtra.

‡ The data pertains to Hoogly district, West Bengal.

Sources:

1 – 3 : S. Hirashima and M. Muqtada (ed) [1989] *Hired Labour and Rural Labour Markets in Asia: Studies based on Farm-level data*, ILO, ARTEP, New Delhi.

4: C. R. Reddy [1985] 'Rural labour market in Varhad: a case study of agricultural labourers in rain-fed agriculture in India', WEP, REPRP No. 75, ILO.

5: A. Rudra [1973] 'Marginalist explanation for more intense labour input in smaller farms: empirical verification', *Economic and Political Weekly*, 8, 989–994.

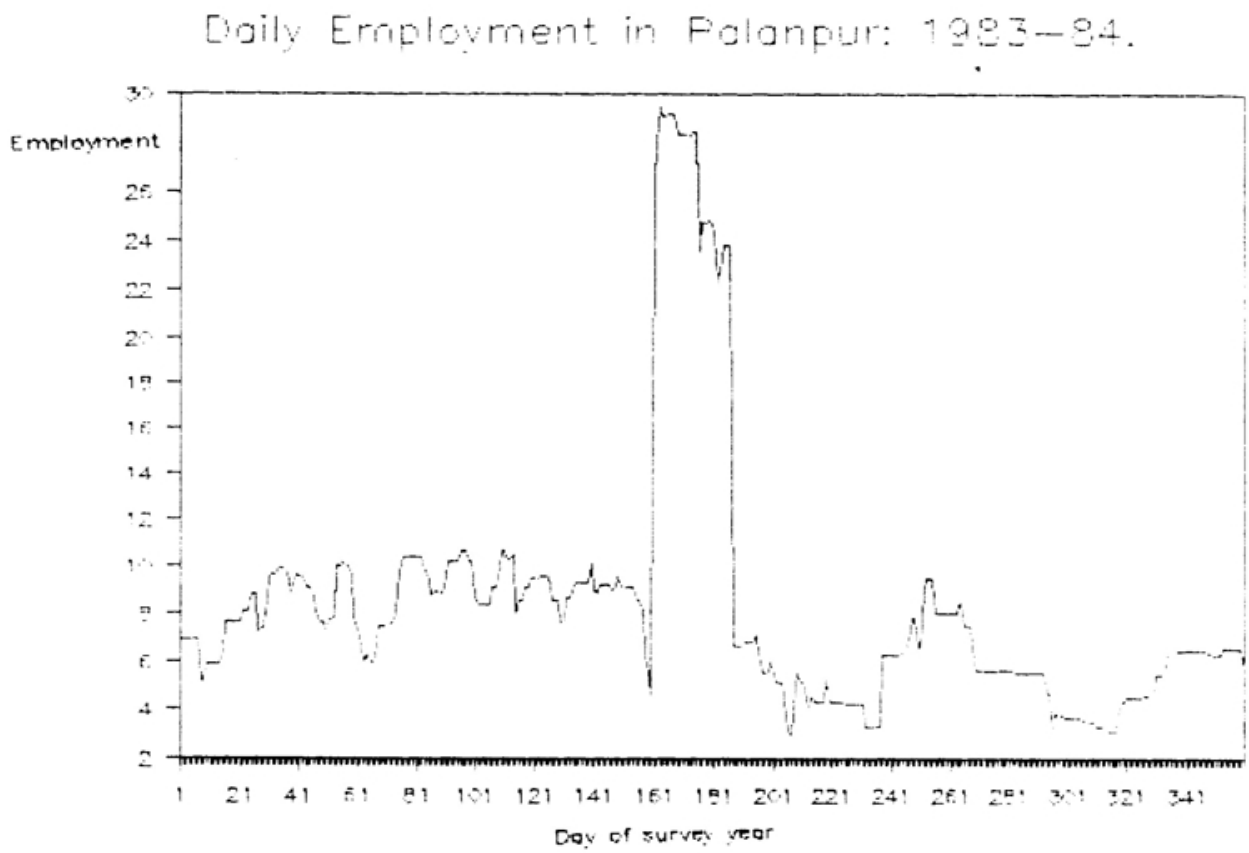

Figure 1.1: Fluctuations in the level of employment in wage labour in village Palanpur.

Chapter 2

Observations from Village Studies

2.1 Introduction

It was stated in the introductory chapter that the purpose of this thesis is to investigate the effect of seasonality on hired labour in agriculture. In this chapter I shall lay the necessary empirical foundations for the theoretical part to follow. The information provided here will be used to motivate the theoretical analyses of Chapters 4 and 5 and also to identify some stylized facts which will be used in the above-mentioned theoretical exercises.

Primary evidence on the labour market from the intensive survey of the village Palanpur[1] of western Uttar Pradesh in 1983-84 will be combined with secondary evidence from a number of other micro studies on Indian villages in the post-independence period. I shall describe the labour market of Palanpur village, and argue that it exhibits a number of qualitative features commonly observed in Indian casual labour markets. While this chapter will frequently digress from the narrow theme of seasonality, all the information will be shown to be relevant later. See Chapter 4 for an overview of the empirical material and its connection with the theoretical models in Chapters 5 and 6.

[1]The survey had been conducted by J. P. Drèze. Refer to Bliss and Stern [1982] and Ansari [1964] for information on the earlier surveys of Palanpur.

The approach that I adopt has a basic presumption: that micro studies can convey information on qualitative aspects that the more well-known macro-level surveys cannot. First of all note that the level of aggregation in a large survey rarely, if at all, goes below the state level. Yet as Appadurai [1989] points out, "Although Indian villages are not autonomous ... they are nevertheless *coherent, significant and fairly well-bound* locations for social and economic processes."[2] Direct observation as well as scanning of secondary evidence also reveals that the majority of transactions in a number of factor markets, such as the informal credit market, the tenancy market and the market for field labour, take place at the village level.[3] Therefore, a study of the economy at the village level is relevant, both for its own sake and also for the sake of a study of mechanisms that operate in the factor markets as a response to seasonality.

Certain economists, incidentally, challenge the very relevance of studying qualitative and relational aspects of village life. Their contention is that even sophisticated economic models, specified on the basis of information drawn from empirical studies are "inadequate and simplistic".[4] However, it is possible to reject *all* economic modelling and information-gathering on this ground. Therefore, this kind of criticism will be ignored.

There exists a debate on the relative merits of the "micro" and "macro" methods for the purpose of measuring socio-economic indicators.[5] The advocates of macro-level surveys argue that a good survey — which should be preceded by a pilot survey, preferably have local investigators and "encourage investigators to keep field notes of ... observations ... relevant for the broader objective of the survey"; should capture all the relevant qualitative as well as quantitative features as efficiently as an anthropological enquiry.[6] However, the fact remains that large scale survey results such as the results of the Population Census and the National Sample Survey throw little light on the qualitative aspects of the data. Micro studies, on the other hand,

[2]See also Rudra [1984] and Schlesinger [1981] in this context.

[3]For more on this see Sections 2.5 and 2.9.2 below.

[4]Srinivasan [1989].

[5]See Harriss [1989] for a discussion of the above terms.

[6]Srinivasan [1989].

are usually profuse in information, some of which may appear to be irrelevant at first sight, but are nevertheless of great interest to the social scientist. This profusion, while necessitating selectiveness, is particularly useful to the pursuer of *secondary information.*[7] A second reason is that it can be very difficult to get an unambiguous piece of information about apparently obvious matters such as the level of the casual wage, and micro studies are certainly at an advantage there.[8]

Some surveys, focusing on relational aspects *do* provide valuable information with the added advantages of larger coverage and use of sampling techniques. Some important examples (apart from the Agricultural/Rural Labour Enquiries) are the continuous survey of six villages in the semi-arid parts of Andhra Pradesh and Maharashtra by the International Crops Research Institute for the Semi-arid Tropics (ICRISAT) and the Bardhan-Rudra studies in the eastern Gangetic plains. Indeed, I have made use of these studies and after reading the rest of the chapter I hope the reader will be convinced that micro-level studies *do* lead to observations which are obscured at the macro-level.

Section 2.2 gives detailed information on various aspects of the labour market in Palanpur, my primary data set. Section 2.3 compares secondary level observations with primary level observations and Section 2.4 concludes the chapter. In particular, Section 2.2.3 reveals the absence of labour tying in Palanpur. Section 2.2.6 points out the existence of *seasonal involuntary unemployment* in Palanpur and Section 2.2.7 points toward a possible gap between the slack season wage level and the reservation wages of labourers.

2.2 The Palanpur Labour Market (1983–84)

2.2.1 The Village Background

Palanpur is situated in the Moradabad district of western Uttar Pradesh. The population of the village (960 in the survey year) was not particularly small by Indian standards, but it was sufficiently small to allow a census to be conducted on most

[7] Recall in this context, the laments of Srinivasan [1989] to the effect that much information collected in large-scale surveys are never processed fully or published.

[8] See Harriss [1989] in this context.

of the economic activities of the villagers as well as their population and household assets. This was, indeed, an important criterion for the choice of the village as a source of intensive data. The other important criteria were that it was a more-or-less typical village of the region and had been surveyed twice by the Agro-Economic Research Centre, Delhi.

This survey spanned a year from November 1983 to the beginning of December 1984. The time span was chosen so as to cover the *rabi* crop season of 1983–84 and the *kharif* crop season of 1984. Later, in January 1987, I conducted a questionnaire survey (with Drèze's help) with a view to verify some impressions on the labour market obtained from the data. The survey data, along with the responses to the questionnaire formed my information set. For further details on the data, see the Appendix.

A peculiarity of Palanpur (indeed, of the surrounding region) is that there were no very big farmers in the village. There were only four ownership holdings greater than 12.5 acres in size. The largest ownership holding was only 15.4 acres which just exceeds the lower boundary of the usually defined class of large farms. Therefore, for all practical purposes it may be said that Palanpur is a village of *small* and *middle farmers*. The total land owned by all the villagers combined was approximately 410 acres so that the pressure of labour on land was quite high.[9] The surveyors, in fact, noted that Palanpur belongs to a relatively poor belt of western U. P. with mostly *thakur* farmers, although it was flanked by richer areas, (with *jat* farmers dominant on the west and *yadav* farmers on the east) more typically associated in popular thought with western U. P., on both sides.

The pressure of labour on land was partly reduced by the proximity of towns where job opportunities were available for unskilled or semi-skilled villagers. Several villagers were employed on a fairly regular basis in small factories, bakeries and workshops. Many others had regular or casual employment in the railways. Yet others were rickshaw pullers, porters, or were engaged in other odd jobs in towns. Indeed, while responding to a discussion questionnaire in 1987 some farmers complained that all the good, strong workers had gone to work in the town. Although these farmers

[9]There were 143 households in Palanpur in the survey year, so that, upon equal distribution, only 2.13 acres of land would be available to every household of 5 members.

were not entirely correct, casual agricultural labour *was* one of the activities of last resort. Inside the village, income opportunities were very few, particularly for the landless. Shopkeeping, tailoring, carpentry, masonry and traditional caste occupations such as shaving or sweeping allowed a few households to make a modest living. The demand for such services and trade in Palanpur was not high enough to support new entrants in those fields. The access to skills such as carpentry or masonry was not available to everybody.

The remaining economic activity, *agriculture*, was certainly the most important economic activity in Palanpur. Most households participated in cultivation as owner-cultivators, tenant farmers or agricultural labourers (or any combination of these) so that Palanpur was primarily an agricultural village. With the advent of the new technology in agriculture, farmers were unwilling to lease land out to a landless partner, therefore, tenancy was no longer an option for the landless.[10] For more on tenancy in Palanpur see the Appendix. Also see Sharma [1990].

There were two major agricultural seasons in Palanpur, *rabi* and *kharif*. During the *rabi* season, farmers almost exclusively grew wheat. The *kharif* crop, consisting mainly of coarse grains (millet, sorghum, maize, ...), pulses and some rice was sown in June and July, and harvested from September to November. In addition, the shorter potato crop could be grown in between the *kharif* and *rabi* seasons.[11] Sugarcane was planted around March or April and harvested from December to February.

Insert Table 2.1: Total employment and average employment in Palanpur.

Wheat sowing, wheat harvesting, and the period immediately following the harvest were busy periods for casual labourers. Defining average employment in a period as the average number of persons employed per day in the period, it was observed that the wheat harvesting period was by far the busiest time of the year. In the wheat harvesting season the average daily employment recorded was 26.1, whereas

[10]The few landless households who managed to lease in land had the support of a (relatively) wealthy guarantor.

[11]This time of the year was locally known as the *zaid* season.

the average employment for the rest of the year was 6.9. See Table 2.1. Therefore, the *rabi* harvesting season will be referred to as the *peak season*. The rest of the year will be known as the *slack season*.

Although Palanpur was certainly far behind the more prosperous districts of Punjab, Haryana and parts of Uttar Pradesh in terms of agricultural productivity, its agriculture was undergoing rapid and continuous transformation. The 25 years since Palanpur had first been surveyed had seen a substantial spread of irrigation, multiple cropping, high-yielding seeds and chemical fertilizer. This technological transformation had also brought about an increase in the range and amount of agricultural implements used in the village such as Persian wheels, diesel engines, threshers and the like. The wealthier and more efficient farmers had purchased these and had also hired them out to other farmers when they did not need to use them.[12] Given all this, Palanpur in 1983-84 may be classified as an *"agriculturally advanced"* village following the classification of Bardhan and Rudra [1981]. However, agricultural advancement should not be confused with prosperity. Although not poor, Palanpur was not a terribly prosperous village.

I have already mentioned that agriculture was the most important economic activity in Palanpur. In the casual labour market, out of a total of 3297 days of work, 2223 days were spent on field work. Most of the non-field work involved construction or repair of buildings, and maintenance and repair of agricultural implements. Wages for *unskilled labour* was equal for both agricultural and non-agricultural tasks. But since most of the non-agricultural tasks involved a minimal amount of skill, the wages attached to those tasks were also typically non-standard, and they will dilute the clarity of observations.

Therefore, while discussing the characteristics of *wages*, I shall consider only intra-Palanpur, field work contracts. However, while discussing the characteristics of *labourers*, such as their reservation wages or income opportunities, I shall consider both field work and non-field work.

[12] Unlike some parts of West Bengal, no one purchased farm machinery with the sole purpose of renting.

the average employment for the rest of the year was 6.9. See Table 2.1. Therefore, the *rabi* harvesting season will be referred to as the *peak season*. The rest of the year will be known as the *slack season*.

Although Palanpur was certainly far behind the more prosperous districts of Punjab, Haryana and parts of Uttar Pradesh in terms of agricultural productivity, its agriculture was undergoing rapid and continuous transformation. The 25 years since Palanpur had first been surveyed had seen a substantial spread of irrigation, multiple cropping, high-yielding seeds and chemical fertilizer. This technological transformation had also brought about an increase in the range and amount of agricultural implements used in the village such as Persian wheels, diesel engines, threshers and the like. The wealthier and more efficient farmers had purchased these and had also hired them out to other farmers when they did not need to use them.[12] Given all this, Palanpur in 1983-84 may be classified as an *"agriculturally advanced"* village following the classification of Bardhan and Rudra [1981]. However, agricultural advancement should not be confused with prosperity. Although not poor, Palanpur was not a terribly prosperous village.

I have already mentioned that agriculture was the most important economic activity in Palanpur. In the casual labour market, out of a total of 3297 days of work, 2223 days were spent on field work. Most of the non-field work involved construction or repair of buildings, and maintenance and repair of agricultural implements. Wages for *unskilled labour* was equal for both agricultural and non-agricultural tasks. But since most of the non-agricultural tasks involved a minimal amount of skill, the wages attached to those tasks were also typically non-standard, and they will dilute the clarity of observations.

Therefore, while discussing the characteristics of *wages*, I shall consider only intra-Palanpur, field work contracts. However, while discussing the characteristics of *labourers*, such as their reservation wages or income opportunities, I shall consider both field work and non-field work.

[12] Unlike some parts of West Bengal, no one purchased farm machinery with the sole purpose of renting.

2.2.2 The Casual Labourers and Employers

Most households in Palanpur (107 out of 143) found themselves hiring labour at one time or other of the survey year. Of course, the amount of labour hired over the year varied considerably between households; and was more or less positively related to land endowment. See Table 2.2 below. The pool of employers was a large and fluctuating one. Some forty-one households had hired at least ten labour-days during the survey year.

Insert Table 2.2: Average labour hired versus size of employer's landholding.

Farmers of Palanpur enjoyed little monopsony power. Considering the ten highest labour demanding households, (or 9.34% of all employer households) it was found that they accounted for 48.41% of the total labour demand in the survey year.[13] The largest employer accounted for 19.17% percent of the total employment in the survey year. Incidentally, he is also the largest money lender and the second largest landowner in the village. Even this farmer, however, did not appear to exercise a great amount of control over the overall wage structure. There is anecdotal evidence that he had attempted to cut wages in earlier years, but after falling temporarily, the wages rose again.

Collusion among farmers to fix or change wages was not observed. In response to the Discussion Questionnaire, several farmers said that collusion among farmers was not possible because agricultural operations cannot be delayed indefinitely. In fact, in the wheat sowing season, a few labourers, preferred for their skill in the particular task, managed to coax some of their more generous employers into paying them a higher wage. This should not be confused with a general rise in casual wages.[14]

The labourers in Palanpur were not organized and could not act collusively on wage issues either. In that case one would expect the labourers to take advantage of the above situation to bargain for a general increase in wages in the wheat sowing season. The surveyors' observations as well as responses to the Discussion Questionnaire, whose details are reported in Appendix, bear this out.

[13] This comes nowhere near Bardhan and Rudra's [1981] criterion for monopsony/oligopsony power; viz. at most seven employers account for 100% of the employment in the village.

[14] Even these labourers did not always get a higher wage for sowing wheat.

Before closing this issue, I think it is important to mention that although there was no collusive action, a labourer who accepted a wage cut (a farmer who raised the wage) came under *severe* criticism from other labourers (farmers) for that action. This social pressure surely played a role in the decision making of the agents, and I will consider this in my later analysis.

Some 114 individuals participated in agricultural labour on a causal basis within the course of the survey year. There were 26 women and children among them. But the number of persons who may be classified as regular casual agricultural labourers was quite small. On the basis of employment in wage labour for at least 30 days in the survey year, only 31 people qualify as casual labourers. Of these 6 were either employed outside Palanpur for most of the year, or allocated most of their time to non-agricultural labour. Therefore, only about 25 people seem to have been available for casual agricultural labour on a regular basis.

This seems strange in the light of the information put forward in Section 2.2.1 above that casual agricultural labour is the most important form of hired labour in the village. In spite of that, the small cultivators, rather than the landless, appear to dominate in this category.[15] This indicates that agricultural labour was one of the *least preferred activities* for Palanpur residents.

One child and only *one* adult female participated in wage labour for more than 30 days in the survey year.[16] Even the lone adult female who appears to have been a regular casual agricultural labourer was not one in the true sense of the word, because in Palanpur, social taboos prevented females from accepting wage employment on their own. They could work side by side with the adult males of their family on piece rate jobs. Women and children's slack season activities are typically weeding, and transplanting rice. Altogether their participation in casual labour was very limited in the survey year.

In the peak season, however, the labour force was very considerably augmented by women and children and by the participation of many adult males normally working outside the village. (This is not in contrast to the phenomenon of isolation

[15]Out of the 29 landless households in Palanpur in the survey year, only 7 could be described as agricultural labour households.

[16]Persons below 15 years of age are considered as children.

because, as mentioned before, villagers who were not regular agricultural labourers *did* perform casual labour from time to time. The farmers did not need to call outsiders to complete the task.) There were *no* migrant labourers. Thirty-five people are recorded to have participated in wage labour for at least 10 days (out of 26) in the peak season. This represents a 40 percent increase in the labour force.[17] Among these seasonal entrants in the labour force, there are 9 women and children. Interestingly, almost all of them come from the low *teli* and *jatab* castes, and *none* from the *thakur* caste.

2.2.3 Labour Tying and Interlinkage in Palanpur

I have already mentioned that monopolistic or monopsonistic powers were absent in the village, as were collusive actions of any kind. The surveyors did not observe any element of extra-economic power operating in the labour market either.

Any labourer who *precommits* his labour to some particular farmer for a number of days (at least a month) will be known as a tied labourer or an attached labourer. Heterogeneity of labour, and particularly of attached labour in the Indian context has been pointed out as early as 1957 in Thorner and Thorner [1957]. Rudra [1982b] has also brought this fact to notice. Bardhan and Rudra [1981] have later tried to define a systematic classification of attached labourers, and classified them into five sub-categories. I use a less detailed classification for the sake of convenience.[18] The two categories are: *fully tied labourers or farm servants* and *semi-tied labourers.*

Fully attached labourers are those tied labourers who work *exclusively* for one employer during the entire period of attachment. The farm servant may get a monthly salary, a lump-sum wage for the entire period of service, a lump sum loan of the entire salary, or some combination of these (in addition to food and clothing, which they usually get). The semi-tied labourers are those who give the employer "tying" them the first priority as concerns the allocation of their time. In other words, they

[17] Possibly due to misreporting, 6 regular casual labourers were not present among these. If they are included, then the expansion in the labour force is not 40 percent, but 64 percent.

[18] It will be useful for the purpose of classifying secondary evidence of heterogeneous quality later in this chapter. Chapter 6 will reveal that there is also a theoretical ground for making this particular distinction.

will drop *all other work* if this particular employer wants their service. Otherwise, they can work for any employer. This arrangement may continue indefinitely, or a fixed number of days. The basis for such attachment may be a loan, an assurance of consumption credit, land allotment, tenancy, an assurance of steady employment during the slack season, etc.

In Palanpur there were *no* farm servants. Some young *thakur* farmers said that there had been servants in their families when they were young and there was a shortage of family members to work on the land. Currently the pressure of labour on land has increased, and the introduction of mechanical chaff-cutters has greatly reduced labour demand. Data from earlier surveys, however, reveals that farm servants have always been rare in post-independence Palanpur.

Insert Table 2.3: Credit labour interlinkage in Palanpur.

There was only one semi-tied labourer in Palanpur. He was tied by the biggest employer in Palanpur (whom I have already mentioned in the previous section). The labourer received standard wages[19] and interest-free consumption credit. These loans were repaid by labour evaluated at the standard wage. He was employed by this farmer for 112 out of the 118 days on which he was employed in Palanpur. You can see from Table 2.3 above that precisely four other labourers worked for their creditor for a significant proportion of days. But they worked for standard wages and the loans were repaid in the usual way.

This table covers only 16 households whose members *were* in service of their creditors. Members of another 19 households *did* participate in the casual labour market but were not in debt with any Palanpur villager. Members of yet another 32 households which were *in debt* with some Palanpur resident, did perform some casual labour, but not with their creditors. Therefore it is obvious that (i) the majority of labourers have *not* worked at any time of the survey year for any of their creditors; (ii) even for other labourers, the total number of days spent working for their creditor was very small. More importantly, in *every* case, the wages prevalent in the labour market were paid.

[19] For more on the standard wage see Section 2.5.

Insert Table 2.4: Tenancy-labour interlinkage in village Palanpur.

Insert Table 2.5: Tenancy-credit interlinkage in village Palanpur.

The first four columns of Table 2.4 above gives an idea about the extent of inter-seasonal labour tying in Palanpur, on the basis of assurance of employment. The average probability of employment of labourers in the slack season is approximately 25 percent. Therefore, a tied labourer whose only basis of attachment is continuity of employment will surely want to be assured of employment for at least 10 percent of the days in the slack season, that is, for at least 33 days. Only two labourers fulfil the above criterion. One is the above-mentioned case of labour tying. In the other case, the partners were father and son, and the surveyors suspect that they were misreporting the facts.

The interlinkage of *labour and tenancy* is even more clearly inexistent, as can be seen from the last column of Table 2.4. The main exception is that of the rather complicated deal between a man and his separated son mentioned above.

For the sake of completeness some data on *tenancy-credit* interlinkage is also included here. See Table 2.5. You can see that common partnerships in tenancy and credit markets are not frequent. Besides, the fact that two households are simultaneously credit and tenancy partners does *not*, by itself, indicate interlinkage — the two deals may have been struck separately. In fact, tenancy-credit interlinkage is also rare with the exception of one money-lender who cultivates the land of his debtors as interest. For more on credit and tenancy in Palanpur, see Sharma [1990] and Drèze, Lanjouw and Sharma [1990].

2.2.4 Isolation and Search in the Labour Market

As a rule, casual labour was hired on a strictly daily basis, and search was carried out by the employers, who used to contact the labourers in the labourers' houses during the evening of the day preceding the actual performance of the task.

In cases of extreme hardship, an unemployed labourer with no alternative prospect of gainful employment would sometimes approach one of the bigger farmers in the village and beg the latter to provide him with some work. But that was a

rare situation. As a rule there was no active search by labourers within the village. Cases of anyone going to other nearby *villages* in search of work have *never* been observed. In the towns, however, the labour market operated in a relatively impersonal manner, and occasionally frustrated casual agricultural labourers did try their luck at the *adda* or the informal exchange in town.

Seasonal migration of labourers to more prosperous parts was not common in Palanpur, either. In the survey year, one man had reportedly gone to Punjab for harvesting rice, but later discussions with labourers revealed that the majority of them had not even heard of such a thing.

At certain times of the year, employers would not find as many labourers as they would like to employ at the going wage in Palanpur. In such cases they would *occasionally* resort to employing labourers from nearby villages (particularly from the nearby village of *Bhoori* where labour was usually plentiful and cheap). However, the hiring of outside labour in Palanpur was a marginal phenomenon. It occurred only when labour was not available in the village, and even then it was far from common. When employers could not find labourers in Palanpur, they would make greater use of family labour, and even accept some delay in the progress of agricultural operations.

An important corollary of this discussion, to which we shall return, is that for practical purposes the agricultural labour market in Palanpur can be considered to be *"closed"*. Inter-village labour hiring was rare and, in particular, did not appear as a viable solution to the problems of temporary excess of demand or supply. Of a total of 2467 days of casual wage labour performed by Palanpur labourers for field work, 2346 days were inside Palanpur, and outside labour was hired by Palanpur labourers for field labour for only 45 days. Usually labourers were brought from outside for specialized tasks such as the repair of agricultural machinery or buildings. Labourers working outside Palanpur were also involved mostly in non-agricultural activities.

Keeping this in mind I shall henceforth focus on intra-Palanpur labour contracts.

2.2.5 Systems of Payment

There were several types of reward systems for casual labour in Palanpur. They can be classified broadly into two categories: *daily wages* and *piece rates*.[20] A special type of piece rate reward is *harvest shares* (for harvesting wheat, and, occasionally, rice). The daily wage system was the most frequent reward system, and it will be described in some detail before noting the distinguishing features of the other systems.

Under the daily wage agreement, a labourer was offered a specific wage for a day's work. The task involved would also be mentioned at the time of hiring. There was a common understanding of what sort of hours a day's work meant at different times of the year. Thus, a daily wage labour contract typically involved *standard hours* and the labourers were almost invariably *supervised* by a member of the household of the employer (who worked along with them). The daily wage system may therefore be safely looked upon as a time rate of payment.

Just as the length of the day was not a matter for bargaining, nor was the wage, An offer of employment on a daily wage basis was usually understood to imply the "standard rate" of payment prevailing throughout the village at the time.

Insert Table 2.6: Frequency table of daily (money) wage rates paid in Palanpur in the survey year.

Thus in normal times, a *single* daily wage applied to *all* adult males in the village for a "normal" day's work, irrespective of the identity of the partners involved. This happened in spite of the *known* differences in the quality of labourers which, the farmers agreed, could not be ironed out by supervision. *If*, however, the proposed task was of a special nature, such as requiring longer than "normal" hours or working in chilly winds, bargaining sometimes took place. But there was *no* ambiguity regarding the standard rate of remuneration, and the overwhelming majority of daily wage contracts did concern a "normal" day at the *going wage*.

Typically a going wage (in money terms) remains unchanged for an extended

[20] Exchange labour is ignored here — it was very rare in the survey year, and mainly confined to the growing of sugarcane.

period — for a few months to a few years. There are, however, short transition periods during which the standard itself undergoes a change and then a uniform wage can no longer apply. During the survey year, for instance, a single standard (Rs. 7) applied from the beginning of the field work (October 1983) until the wheat harvest (April 1984); and another norm (Rs. 9) applied from a little after the wheat harvest until the end of the survey year in November 1984. Even the first re-visit of the survey team to Palanpur in January 1986 found the wage unchanged. This occurred in spite of wide fluctuations in activity, employment, and prices. See Table 2.6 above. Thus, besides being uniform over persons, daily wages also appear to be, to a great extent, *rigid over time in money terms.* I shall return to this in Section 2.7.

Insert Table 2.7: Relative importance of daily wages and piece rates.

Although a majority of work in Palanpur was performed under daily wage system, a significant proportion of tasks were performed under the *piece rate* system. Under this system a labourer was paid a specific amount for completing a specified unit of work. Some examples of such contracts are weeding one bigha[21] of land for Rs. 5, or harvesting wheat for a $1/20^{th}$ share, etc. Perhaps for this reason. there were *no standard rates* per unit of piece rate work, particularly in the slack season. Piece rates for weeding, for instance, varied from Rs. 4 per bigha to Rs. 6 per bigha.

The use of piece rates for contracts is most common for harvesting wheat, which is almost exclusively paid for at piece rates. Hired labourers receive one "bundle" out of every twenty bundles of wheat they assemble. This typically allows them to earn far more per day than they do during the rest of the year. See Table 2.7 for the average wages received by labourers in the survey year. When a field is very sparse so that gathering one bundle is unusually time consuming, labourers are sometimes allowed to keep one bundle out of fifteen instead of twenty. However, labourers typically work for longer hours in the peak season. A part of the increase in income is due to this factor. This system has existed for several decades. Clearly the farmers make use of the incentive compatible nature of a piece rate contract to ensure speedy

[21] 6.4 bighas = 1 acre in Palanpur.

completion of work with minimal supervision.

Sugarcane harvesting is also a community activity. The reward for harvesting sugarcane is simply the sugarcane leaves which serve as fodder but have no market value, and two juicy sticks of sugarcane. Note that sugarcane harvesting is a slack season activity and this system of payment conveniently circumvents any question of paying the going wage to the labourers and reduce the farmer's labour costs considerably.

Table 2.8: Table of activity versus type of contract.

While these factors (incentives for faster work, saving of supervision costs and saving of wage costs) greatly recommend the use of piece rate contracts, its greater use is inhibited by another consideration. Piece rate contracts can entail serious problems of quality control. It would make little sense, for instance, to hire labourers to sow a field on a piece rate basis: they would have little incentive to exercise care with the seed rate, depth of sowing or the spacing between furrows and in the worst event they would cut down the seed rate and steal some of the grain! Clearly, the relative importance of these four considerations will vary strongly according to the identity of the employer. Piece rate contracts are particularly frequent for activities such as weeding, digging and construction. See Table 2.8.

In sum, both daily wages and piece rate systems of payment exist in Palanpur. In the slack season daily wage payments are far more common, particularly for field work. In the peak season, almost all payments are piece rate payments. There is *one standard rate* which applies to almost all slack season daily wage contracts. There are *no* standard piece rates, however, for slack season tasks. There is a standard piece rate for the most important activity in peak season, wheat harvesting. Daily wage payments were very few in the slack season, and they were of a non-standard nature.

2.2.6 Involuntary Seasonal Unemployment

The above discussion shows that the agricultural labour market of Palanpur was virtually closed and search was carried out by the prospective employers. Besides,

the agricultural cycle was one of prolonged slacks interrupted by short periods of intense activity. Labourers differed widely in their skill, strength and diligence. However, at times of high labour demand, there is little scope for discretion in the choice of labourers, and the prospective employer simply goes from one casual labourer's house to the next in search of an employee. At times of slack demand, however, the employer can afford to be choosy and try to pick up labourers whom he knows to be better skilled or easier to supervise.

Under these circumstances, one expects *rationing* to be a frequent characteristic of the state of the labour market, and it will be argued that this is strongly confirmed by observation. At times of slack labour demand, willing labourers would be forced to sit idle. Sometimes a frustrated labourer had access to gainful occupations, eg. cultivating his own fields. Unemployed labourers also occasionally attempted to find work on a casual basis in a nearby town. Far more frequently, however, they were reduced to "forced leisure". Involuntary unemployment was particularly rife during the slack periods of the agricultural cycle (typically between the harvesting and sowing seasons).

Within the slack season there was considerable fluctuation of employment per day. The average employment during the wheat sowing month or the post harvest month was about 11 man-days. It is interesting to note that on an average at most half the number of regular casual labourers (approximately 25 in number) could be employed every day. Yet both the labourers and the farmers (as well as the surveyors) describe this period as a relatively busy part of the year. For the entire slack season (that is, the entire survey year except for the wheat harvesting season) average employment was approximately 6.9 man-days, which implies that for a part of the year, average employment must be way below the figure of 6.9. The daily wage, however, showed very little response to this wide fluctuation in employment. Throughout the *rabi* slack, that is, from the beginning of *rabi* sowing upto the start of wheat harvest, the daily wage remained fixed at Rs. 7 or, equivalently, Rs. 6 and a meal. (Re. 1 was the established exchange rate for a meal.) Note that the extra employment was not accompanied by a fluctuation in the slack wage.

Insert Table 2.9: Number of days of wage employment for casual agricultural

labourers.

Calculations of proportion of days in employment (that is, employment in wage labour) for individual labourers yielded much lower figures for slack season than for peak season. See Table 2.9.

The labourers' responses to the following questions are most significant. They were asked — 1)"for how many days in a year do you get work ?" and 2) "for how many days in a year would you like to work ?" Most of the replies to the former question were along the line "we are more or less sure of being employed in the wheat sowing season and the wheat harvesting season. Otherwise it is a few days sprinkled here and there." (In Hindi they said *"mahine mein do-char din"*.) To the latter question the ready reply was 'everyday!'.

2.2.7 Evidence that Slack Wages Exceed Reservation Wages

The discussion in the previous section indicates the existence of involuntary unemployment in the slack season, that is, at the *going wage* a number of people who were willing to work, did *not* get work. I have also mentioned that the daily wage was *rigid* in money terms. Although some flexibility was introduced in the system by price movements and piece rate wages, the response of labourers to the questions of willingness to work shows that markets did not clear.

This is, of course, perfectly compatible with a text-book situation where labourers are "on their supply curves", or, in other words, are being paid their reservation wages, so that labour supply falls to zero with the slightest downward movement in wage. I shall argue in this section, that this was not the case in Palanpur, at least.

Recall that one distinguishing feature of piece rate contracts are the strong flexibility (over time and across individuals) of *both* earnings per task and, more importantly, earnings per day. Bargaining commonly took place about the rate of reward per task, if only because the precise nature of the task varied from one contract to another. Since the rate of reward was a matter for bargaining anyway, competition on the basis of reservation prices inevitably crept in as well. There being no standard piece rates in the slack season, there was no possibility of censure for lowering the

"going rate", either. Thus while a poor unemployed labourer would be very reluctant to accept work for a daily wage lower than the "going wage", he might well accept piece rate work at a rate which implies very low daily earnings indeed. In the slack season, piece rate wages for field work were often much lower than the going daily wage, which indicates that the going wage was above the reservation wages of *some* labourers at least.

It is possible to argue that this kind of test is inappropriate. After all, a piece rate contract permits a greater consumption of leisure by the worker, for he can work at his own pace. Therefore, a lower piece rate wage might only serve as compensation for this, with total worker utilities equalized under both contracts. However, in a situation of *widespread* unemployment such as the one considered here, a significant gap between the two types of wages cannot simply be explained by higher leisure consumption under one of the contracts. With unemployment, the marginal utility of leisure is close to zero. If there is a significant additional income to be gained, an unemployed person will sacrifice his abundant leisure time to do so.

Insert Table 2.10: Frequency table of piece rate wages.

To compare piece rate incomes with daily wages, it was necessary to find some daily wage equivalents for piece rate payments. In an attempt to correct for inter-contract variations in effort per day,[22] average speed (eg. average number of bighas weeded per day) was calculated separately for each type of task (such as weeding, digging, harvesting, etc.) and the rates for each contract multiplied by the relevant average. The figures thus obtained were used for comparison with daily wages. They will be referred to as *piece rate wages*. See Table 2.10 to get an idea of the extent of variability in these.

First it was tested statistically using the Wald-Wolfowitz run test whether the piece rate wages and the daily wages could have come from the same distribution. The test was carried out separately for both slack and peak seasons. All the results were negative, the null hypotheses being rejected at one percent level of significance. This implies that the vector of piece rate wages and the vector of daily wages can

[22] Days recorded had been standardized by the surveyors to number of full working days.

not be seen as two samples from the same parent distribution. A test for comparing the means of the two distributions revealed that in the slack season, average piece rate wage for field work was *significantly below* average daily wage. In fact 87% of the piece rate wages were below the average daily wage.

It may be argued that a labourer may work for poor wages if his labour has been "tied" by some means, be it through an interlinked contract with some other factor market, or a case of labour-tying through a guarantee of steady employment (an implicit contract). Durations of field work contracts were short (at most 3 to 4 days) in Palanpur. Instances of common partnerships in labour and tenancy markets, or labour and credit markets were also few. Recall the discussion in Section 2.4. So, this possibility may be ruled out.

The average piece rate wage could be lower than the average daily wage if 1) labourers *in general* worked at a slower speed when they were paid according to piece rates, or 2) in general the *terms* of the piece rate contracts were worse for labourers.

I shall argue that the latter is the case.

A discussion with farmers in Palanpur revealed that most farmers felt labourers hurry too much while working on piece rate contracts and quality, *not speed,* is likely to suffer. Indeed, many farmers said they opted for labour hire on piece rates when they needed a large amount of work to be completed in a short time.[23]

So it must be the case that the daily wage equivalents of piece rates were lower. The reader can consult Table 2.7 for the differences in average wages. The *rabi* slack saw the piece rate wages fall to even less than Rs. 4 per day on occasions as against a daily wage of Rs. 7. See Table 2.10. It is difficult to imagine that differentials of this magnitude reflect a preference for leisure in a situation of unemployment.

These observations indicate, in particular, that *the going slack wage in Palanpur was above the reservation wages for many casual labourers.*

Quite apart from this implication, it is of some independent interest that piece rate contracts may yield substantially lower incomes. The model put forward in Chapter 4 might throw some light on this finding.

[23]The interested reader may see Reddy [1985] for a discussion on the allocation of contracts between several types such as daily rates, share rates etc.

2.3 Other Studies: a Review

In this section I compare the salient features of the labour market in Palanpur with those of a large number of villages using various studies conducted by economists, sociologists and anthropologists in different parts of India over the last few decades. I shall argue that in spite of important inter-regional variations, an impressive number of "core features" are shared by labour markets in many parts of the country.

The description of the previous section highlights the following features of the casual labour markets in Palanpur (among others):

1. *Casual labour* is the most important type of agricultural labour contract. Adult males dominate overwhelmingly in numbers in the casual labour market.

2. The village labour market is largely *closed*. *Search* on the casual labour market is carried out by the *employers*.

3. Two forms of wage payments exist side by side: *daily wages, and piece rates.* Piece rates are most commonly used for tasks involving speed and observable output.

4. A *uniform* daily wage rate (the going wage) normally applies to all adult male labourers throughout the slack season, but piece rates in the slack are flexible.

5. The labour market is characterized by *seasonal unemployment.* Less productive workers are especially vulnerable to forced leisure.

6. Involuntary unemployment coexists with higher than reservation wages in the slack season.

7. There is very little interlinkage of labour and credit or tenancy markets. Inter-seasonal labour-tying is also rare. Individual employers have no monopsonistic power *and* no explicit collusion exists among either employers or labourers.

These observations are based on field work carried out in Palanpur but they also apply to nearby villages, which were frequently visited by the surveyors. Their possible generality for other parts of India will now be examined. Due to constraints

of space it is not possible to give here a detailed account of the entire empirical evidence in all its complexity. An assessment of the main findings, relevant for this thesis, is offered here.

2.3.1 Casualization of labour relations

A plethora of studies have described the erosion of traditional labour relations and, in particular,the increasing dominance of casual labour among different types of labour contracts. However, while the gradual disappearance of "patronage", exchange labour, labour-tying arrangements and non-contractual labour relations have been very widely noted, it is questionable whether this trend towards casualization has been convincingly explained.

Several authors, notably Breman [1974], insist on the growing reluctance of *employers* to honour their traditional obligations, but others such as Vyas [1964], attach greater importance to the growing desire of labourers to have the freedom to seize newly available alternative employment opportunities. The relative importance of these two factors, and their own origins, remain insufficiently explored. Similarly, the rarity and decline of exchange labour has been widely noted but not often analyzed.

To elaborate: labour may be classified in five broad types: family labour, exchange labour, farm servants, casual labour and migrant labour. While most farm households in India use family labour, very few rely exclusively on it. The need for outside help arises partly out of the necessity to supplement family labour. A more important reason (according to Bharadwaj [1974] and Rudra and Mukhopadhayay [1976]) is the fragmentation of labour markets; with members of different age-sex categories performing different tasks.

Exchange labour, or the practice of exchange of an equal number of days between two households without any cash transaction, seems to have largely disappeared within an increasing trend toward market exchange.[24] This process had set in as early as the nineteen fifties. An interesting exception was reported from Karnataka. Due to increased participation of women and children in the labour market, who were more willing to participate in exchange labour than wage labour, the use of

[24]See Kandasamy [1964], Harper [1958], Nair et. al. [1984], Binswanger et. al. [1984].

exchange labour was on the *increase*.[25]

Now, as in the past, farm servants are very common, although they are numerically less important than the casual labourers except in the pockets where agriculture is highly mechanized.[26] Note that the servant-employer relation is essentially one of contractual exchange and involves *minimal patronage*. The contract may be terminated at any point of time by either party, and its duration is frequently one year or just one crop season.[27]

In many parts of India, the problem of seasonality is tackled *partly* through the use of migrant labour. Inter-regional migration of labour exhibits many interesting features such as the relation between the leader and members of the migrating groups, their practice of travelling on known routes, (sometimes) the specialized nature of tasks performed by them. I eschew that discussion here. I only want to emphasize two things: the migrant labourers only supplement the available labour supply in the peak season and labour migration described here is different from day-to-day labour mobility between neighbouring villages.

This discussion highlights the importance of casual labourers who emerge as the strongest group by the process of elimination. The reader may point out that the foregoing discussion ignores sharecropping as a means of smoothing out disparities in labour endowment. Briefly, I do so because with the advent of mechanized farming techniques, and the new laws giving ownership rights to the cultivator, this aspect of sharecropping has become less important.[28] Besides, as in Palanpur, it may be frequently observed that the one farmer is a *lessor and a lessee* at the same time. Surely this also points out that sharecropping involves considerations other than finding an incentive compatible labour hiring scheme.

Before moving on to features of casual labour markets and wages, I want to put in a word on the absence of female labourers. Having said that social taboos are at work to prevent women (and children) are from entering the labour market on

[25]See Rao [1984].

[26]See Bhalla [1987] and Bharadwaj [1974].

[27]See Binswanger et. al. [1984], Bailey [1957], Reddy [1985], AERC [1964], Rao [1984], Bardhan and Rudra [1981], Leaf [1984] among others.

[28]See Jodha [1984], Reddy [1985] and Bhalla [1976] among others.

a regular basis the labour market. recall that they *do* participate in harvesting. It has been noted that women do frequently "drop out" of the labour market in the slack season.[29] Therefore, while social taboos are very important, it may be possible to integrate Palanpur within a framework which evaluates the relative importance of social and economic factors in a female's decision to enter the labour market. Secondly, it has been suggested again by Bardhan [1984] that participation of women in agricultural labour is more common in rice-growing regions than in wheat-growing regions. This is also in agreement with our finding.

2.3.2 Labour mobility

Let me first discuss the more easily observable features of the labour market. The isolation of village labour markets is quite common in India.[30] The main form of labour hiring across villages seems to be migrant labour.[31] However, there *are* villages where labourers maintain regular "contacts" with outsiders to gain employment.[32] Interestingly, in neighbouring Bangladesh, village labour markets are not closed in general. An explanation suggested by Cain and Mozumder [1980] follows: "Bangladesh is extraordinarily densely populated, villages merge into one another and boundaries are blurred ... While such physical density does not in itself ensure labour mobility, it makes mobility outside the village boundaries more likely".

Perhaps it is a consequence of the closed nature of village labour markets that search on the labour market is typically carried out by the employers. It is the duty of the farmer (or his farm servant) to contact the casual labourers at their houses to "call" them.[33] To quote from Binswanger et al. [1984], "Workers generally do not go and ask farmers for work ... It seems that asking for work puts one in a poor bargaining position." Exactly similar views have been expressed by Palanpur villagers as well.

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[29] Bardhan [1984].

[30] Hopper [1957], Rodgers [1975], Rudra [1982a], Hatti and Raagaard [1985], Bardhan and Rudra [1986], ICRISAT [1987].

[31] This aspect has been discussed in Kandasamy [1964], Rudra [1982a], Binswanger et al. [1984], Hatti and Raagaard [1985], and others.

[32] See Rao [1984].

[33] See e. g. Binswanger et. al. [1984], Leaf [1984], Hopper [1957], Rudra [1982a].

2.3.3 Systems of payment

Different forms of wage payments such as daily rates and share (piece) rates coexist in almost *all* the village studies. Sometimes the contract is a "combination" of the two types when the task is given to a group of people. The farmer may be paying a piece rate to the group-leader, but the leader pays the members of the group a daily wage.[34]

Like Palanpur, piece rate payments are most common for harvesting and similar tasks in which *speed* is important and *quality* does not suffer due to speed. *Harvesting*[35] and *transplanting*[36] are most commonly given out on piece rates. But the *same* task may be given at piece rates or daily rates depending on the identity of the employer.[37] The considerations involved appear to be *very* similar to those observed in Palanpur: speed, quality control, supervision costs, and wage costs. A highly developed and quite complex system of allocation of tasks between piece rates and daily wages has been observed in the Varhad region of Maharashtra. The interested reader is referred to Reddy [1985].

2.3.4 Seasonality in wages and employment

As I have already mentioned in Chapter 1, seasonality is embedded in the technology of traditional agriculture. It remains to examine to what extent this is reflected in rural wages and employment.

Wages in agriculture are frequently task-specific, and seasonality manifests itself through wage variation according to tasks. In other words, the daily wages for peak season tasks such as harvesting or transplanting is usually higher than daily wages for slack season tasks such as weeding.[38] If there is a general shift to piece rates in

[34] See Hopper [1957], Rao [1984], Binswanger et al. [1984], Reddy [1985], and Hatti and Raagaard [1985].

[35] See Leaf [1984], Rao [1984], Bardhan and Rudra [1981], Rodgers [1975], Jose [1973], Bailey [1957], Freeman [1977], Muthiah [1970] and Gough [1981].

[36] Rao [1984], Binswanger et. al. [1984], Reddy [1985].

[37] Kandasamy [1964].

[38] Weeding is a peak season task in some regions and in those places the wage rate for weeding is high.

the peak season then the daily incomes derived from these piece rates is higher.[39]

Sometimes there is a rise in the general daily wage level by a fixed differential in the peak season.[40] In regions with highly developed agriculture, such as in parts of Haryana, bargaining enters into the fixation of the new wage level;[41] but, as a rule, bargaining is rare. Ryan and Ghodake [1984] point out seasonal variations in wages in the ICRISAT villages, but they do not specify the exact form it takes. In parts of Gujrat, West Bengal and Bihar, no labourer gets more than half a day's work in the slack season and the wage, of course, is appropriately low.[42]

Certain villages, in contrast show *absence of seasonality*[43] in wages. Bardhan and Rudra [1981] observed that in 42 out of 110 West Bengal villages surveyed by them, the daily wage remained unchanged for different operations on the same crop. Rodgers [1975] expressed surprise at the absence of seasonality in wages in 5 of the 7 villages studied by him. This absence in seasonality was more common in villages with low labour demand or low cropping intensity.

Having discussed the issue of seasonality in wages I shall move on to the issue of seasonality in employment. My aim will be to show that labourers are subject to *involuntary unemployment.*

Different authors have drawn attention toward the above in different ways. Breman [1974], [1985], Rao [1984], and others have described the extremely low opportunities of finding wage employment in the agricultural slack season. Nair et. al. [1984] and Ryan and Ghodake [1984] have pointed out that the "probability of market employment" varies considerably in the course of a year for agricultural labourers. In the large bibliography of village studies compiled by Connel [1975] it may be seen that Indian labourers are employed gainfully only for 6 to 9 months in a year on average. Rodgers [1975] points out that in spite of the proximity of

[39]See AERC [1964], Breman [1974], Bailey [1957], Freeman [1977], Kandasamy [1964], Rao [1984], Reddy [1985] and Vyas [1964] for evidence in support of these assertions. Also see Government of India [1952], [1960].

[40]See Rudra [1982a].

[41]Bhalla [1976].

[42]Rodgers [1975], Rudra [1982a] and Vyas (ed) [1964].

[43]The reader must keep in mind that wages are often a combination of cash and kind payments. By absence of seasonality I mean the components of this cash-kind combination remains unchanged.

public works, the labourers were involuntarily unemployed *by their own perception* for certain parts of the year. It has been argued by some economists, notably Paglin [1965], on the basis of Farm Management Survey (henceforth, FMS) data that there is no unemployment because agricultural labourers are employed for 280 or more eight hour days. However, this sort of argument is falsified by Rodgers' observation or the direct observations in Palanpur (cited in Section 2.2.6).

Let us consider now the self employment opportunities of the labourers in the slack season. Self employment most often means activities with very low remuneration. Sheila Bhalla has described them as "make work" activities in the sense that they would not prevent a labourer from accepting wage employment, *if* it were available. IRDP programs to provide remunerative self-employment opportunities to the poor are frequently a failure because of lack of interest by authorities. Usually the loan fails to reach the targeted population, or there is no follow-up from the side of the government.[44] The risks involved in taking a loan are also a serious discouragement.

While I cannot provide evidence on whether or not the labourers were *involuntarily* unemployed, the above discussion does point out that they were unemployed for a considerable part of the year because of lack of alternate income opportunities. Although there is some seasonality in wages, there is always a doubt if the wage always falls to the level at which the labourer would be *indifferent* between income and leisure.

2.3.5 Wage rigidity

I shall discuss two aspects of wage rigidity in this subsection. The uniformity of wages *across labourers* and *over time*. While it is not possible to give detailed econometric tests of wage rigidities on using heterogeneous secondary data, I shall attempt to exhibit that such wage behaviour cannot be explained in terms of the Arrow-Debreu model of an economy, in a straightforward way.

The issue of wage flexibility over time is a difficult one and few of the avail-

[44] See Nair et. al. [1984], Madan and Madan [1984], Ghate [1984], Drèze [1990] etc. in this context.

able micro studies are detailed and careful enough to provide strong evidence on this point. One must distinguish here, of course, between money and real wages. Regarding the former, the issue of how, when and why the standard money wage shifts is considered carefully in only a very small number of studies; generalization is therefore difficult. The issue of wage uniformity across labourers is a simpler one and therefore is tackled first.

Starting from nebulous statements such as "the daily rates ... market appears to give everybody a chance to participate on nearly equal terms",[45] to definite statements such as "there is no scope for any wage differential, although a number of workers known for their physical strength and stamina are most sought after"[46] indicate or state absence of individualized wages for casual labour in villages.[47]. I stress that this uniformity persists in spite of *known differences* in the work performance of labourers and it is almost inevitably accompanied by seasonal unemployment for labourers with a poor reputation. I repeat, the casual labour market sees no undercutting even in the slack season. Rudra [1982a] and Bardhan[48] agree that (conscious or unconscious) class-solidarity of workers is an important factor.

Some exceptions to this rule have also been observed. Rudra [1982a] observed more than one wage rate for certain operations for adult males in one village. He states, however, it is a departure from the rule. Similarly, at tobacco harvesting time in Ankodia village or at harvesting time in Totegadde village of Karnataka Verma [1964] and Harper [1958] respectively observed wages becoming "almost competitive". See also Harriss [1989] in which there is a cautionary note to those who are too enthusiastic about (age-sex specific) wage uniformity in village-level casual labour markets.

There are indications that the standard wage is often more rigid downwards rather than upwards. Binswanger et al. [1984] argue that "[the] large yield or

[45] Pg 146, Binswanger et al [1984].

[46] See pg 37, J.B.Verma in Vyas (ed) [1964].

[47] See also Rodgers [1975], Rudra [1982a], Bardhan and Rudra [1981], Bardhan [1984], Narasimhan [1959], Reddy [1984], Vyas (ed) [1964], AERC [1964], Rao [1984], Bailey [1957], Breman [1974] and Nair et al [1984]

[48] See pg 71, Bardhan [1984].

quality reductions caused by delays in agricultural operations such as sowing, weeding and harvesting appear to result in competitive pressures on the labour demand side that makes collusion unsuccessful", and Kandasamy [1964] reaches a very similar conclusion. I have not encountered symmetric observations for downward wage movements, and indeed Rudra [1982a] and Bardhan and Rudra [1981] present strong evidence that undercutting of wage is rare. These findings are in accordance with the observations in Palanpur.

Surely the existence of involuntary unemployment together with this kind of wage rigidity indicates the likelihood of the standard slack wage exceeding the reservation wages of *some* labourers, at least.

2.3.6 Labour tying, collusion and interlinkages

First let me offer a word of explanation as to why I am treating the above mentioned topics together. There is frequent overlapping between labour tying and interlinkages. In fact, distinguishing between credit labour interlinkage and labour tying is difficult. As such I shall not distinguish between *pure* credit-labour interlinkage, in the absence of interlinkage with any other factor market, and labour-tying. Therefore these two topics are dealt together. Secondly, monopoly power of farmers is closely connected with both collusion and interlinkages.

Very few studies find any evidence of *explicit collusion* by employers or labourers, except in West Bengal and Kerala where it is essentially a by-product of political activities. Monopoly power, however, appears to operate at a significant level in West Bengal.[49] Binswanger et al. [1984] found that *attempts* by employers to collude were common in the ICRISAT villages but were usually unsuccessful and of little concern to labourers. The pool of employers is often stressed to be large and to include many small farmers in most parts of India.[50] Kandasamy [1964] reports that actions of small farmers usually lead to wage increases during peaks, because they are more concerned with getting urgent jobs done than with the possible disruption of wage "standards". (They hire very little labour anyway). Such observations also rule out

[49] See Bardhan and Rudra [1981].

[50] Harper [1958], Rao [1984], Rudra [1982a], Binswanger et al. [1984], Reddy [1985].

"implicit" collusion by employers, or at least, among employers with different sizes of land holdings.

In some pockets, however, there is differential wage payments by smaller and larger landlords, with the latter category inevitably paying lower wages.[51] A strong caste factor was seen to be functioning in both cases. No symmetric evidence exists to rule out implicit collusion on the part of labourers since, as we have seen, money wages are commonly rigid downwards.

Interlinkages may occur between a number factor and/or product markets. I shall concentrate only on interlinkages which involve the *labour* market. It has been empirically observed that the labour market, if at all, is interlinked with credit and land markets. Accordingly, only these two types of interlinkages are discussed here.

Let me first discuss labour tying and credit-labour interlinkage. As already mentioned in Section 2.3.1, although casual labourers contribute the bulk of labour to agriculture, attached labourers are also very common. Although several factors, economic and social, enter a farmer's decision to tie labour, they are commonly kept for two reasons: to perform special tasks[52] or to reduce the trouble involved in labour recruitment in the peak season.[53] Of course, simple cost-saving also plays a role — particularly in the decision to recruit semi-attached labourers.[54]

Note that semi-attached labourers' contracts inevitably have a *inter-seasonal* dimension to it. The contract lasts for at least one crop season and the labourer gains in terms of assured employment or consumption loans in the slack season, and the landlord gains in terms of assured labour supply or cheaper labour in the peak season. A fully attached labour contract may last for less than one crop season. See, for instance, Bailey [1957] and Binswanger et. al. [1984]; in both cases a fully attached labourer is kept for only the "ploughing season" (which, incidentally, is the depth of slack) and the contract terminates in the beginning of the peak season. Secondly, while semi-attachment appears to be the more primitive form of labour

[51] See Breman [1974] and Madan and Madan [1983].

[52] Bailey [1957], Binswanger et. al. [1984], Freeman [1977], Reddy [1985], Rudra [1982a], Sundari [1981].

[53] Bardhan and Rudra [1981], Breman [1974] and Sundari [1981].

[54] Bardhan and Rudra [1981] and Breman [1974] find that semi-attached labourers are frequently paid a lower wage as compared to the going wage in the peak season.

tying in agriculture,[55] semi-attached labourers are conspicuous by their absence from some parts,[56] and are less important (numerically) than fully attached labourers in West Bengal.[57]

Fully attached labourers are usually found on large farms.[58] The terms and conditions of fully attached labourers exhibit wide variations — the broad form often depending on the region. Their duties usually do not include domestic work and include ploughing, looking after animals and recruitment and/or supervision of casual labourers.[59] Partially attached labourers, particularly in north India, do not perform any special tasks, by contrast.[60]

The duration of a fully attached contract may be one crop season, a year or three to five years.[61] Incidence of hereditary labour tying and bonded labour seems to be unimportant in most parts of India — except Bihar.[62] In fact, Reddy [1985] and Binswanger et. al. [1984] point out that circumstances (such as a loan for marriage) which would earlier mean certain entry into semi-bonded labour, do not carry the same implication now.

Unlike casual labourers, the attached labourers' wages are frequently personalized[63] although Sundari [1981] and Breman [1974] observed village-specific rates for attached labourers. Attached labourer are usually paid a fixed wage (as against a share). Again, there are regional variations in this and Freeman [1977] found share rate payments in Orissa.[64] The wages of fully attached labourers usu-

[55] See Hopper [1957], Breman [1974], Gough [1981].

[56] See Jodha [1984].

[57] Bardhan and Rudra [1981].

[58] Bell and Srinivasan [1985b]. Basant [1984] and Bharadwaj [1974].

[59] Sundari [1981] and Bhalla [1976] have found the existence of a two-tiered structure among attached labourers where one or two are engaged in a supervisory capacity.

[60] Only Breman [1974], Gough [1983] and Sundari [1981] mention partially attached labourers performing special tasks.

[61] See, for instance, Bardhan and Rudra [1981], Binswanger et. al. [1984], Bailey [1957], Bhalla [1976], Kandasamy [1964], Vyas [1964].

[62] Bardhan and Rudra [1980].

[63] Bailey [1957], Bardhan and Rudra [1981], Kandasamy [1964], Leaf [1984], Rudra [1982a].

[64] In fact, traditionally there used to be both a fixed and a share component to the payment of attached labourers. See Government of India [1960].

ally include meals, clothes and other kind components,[65] although Binswanger et. al. [1984] found evidence to the contrary in one of the villages surveyed by them. The wages of partially attached labourers usually do not include any such perquisite, although exceptions such as *halis* of Gujrat may be seen.[66]

The daily wage equivalents of attached labourers may be higher or lower than the casual wage. Binswanger et. al. [1984] show that the daily wage equivalent for attached labourers is higher than the daily wage equivalent for casual labourers in five out of the six ICRISAT villages, whereas Rudra [1982b] finds daily wage equivalents for attached labourers are lower. On the basis of FMS and ALE data, Basant [1984] and Ghosh [1980] come to a conclusion similar to Rudra: in most Indian states, the daily income of attached labourers are lower than casual wages. However, it cannot be disputed that attached labourers have an edge over casual labourers in terms of *assured employment*, and in some cases, availability of consumption credit. The availability of consumption credit, however, depends frequently on the degree of personal trust between labourer and employer.[67] In backward parts of Gujrat and Maharashtra, however, such credit is available.[68] While the state of labour-attachment may appear equally,[69] more,[70] or less[71] favoured status, the above discussion implies and authors agree that there is *greater security* in becoming an attached labourer, particularly a fully attached labourer.

Therefore, labour-credit interlinkage operates in two ways, one: consumption credit is provided to (a favoured) farm servant. Two: the labourer offers his labour as collateral in order to get loans. While Bardhan and Rudra [1981] typically point out small, consumption loans taken in this manner, Binswanger et. al. [1984] mention that this is a way of earning a lump-sum amount which the labourer could not get together in any other way.

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[65] See AERC [1964], Bailey [1957], Rudra [1982], Sundari [1981], Vyas [1964] and others.

[66] Breman [1974].

[67] Bardhan and Rudra [1981], Kandasamy [1964].

[68] Breman [1974], Binswanger et. al. [1984].

[69] Bardhan and Rudra [1981].

[70] Even landed households supply attached labour in highly agriculturally developed parts of Haryana. See Bhalla [1976].

[71] Reddy [1985].

I begin the discussion of land-labour interlinkage with tenancy-labour interlinkage in the from of land allotment to tied labourers for the sake of continuity. There are large regional variations in this form of interlinkage. In the Gangetic plains, incidence of land allotment is as high as 89% in Uttar Pradesh, whereas it is almost negligible in West Bengal and at an intermediate level in Bihar and Orissa.[72] Sundari [1981] finds the practice of land allotment to tied labourers quite common in Chingleput district of Tamil Nadu whereas Gough [1983] describes this practice as obsolete as regards Thanjavur district. Similarly, land allotment seems to be virtually absent in Maharashtra and Gujrat.[73] *Sanjhis* in Haryana are also allotted some land,[74] whereas *naukars* are not.

Another kind of land-labour interlinkage, known as *kirsheni* in parts of West Bengal is virtually the same as sharetenancy except that the labourer cultivates the land with *landlord's bullocks* and gets a lower crop share than the usual sharecropper has been found to exist in Punjab as well as West Bengal.[75]

Sharecropping, in spite of the legislation, is observed all over India. However, the landless find it extremely difficult to get land on lease mainly because they face rationing in the credit market as well.[76] Frequently a large farmer *leases in* land from a small farmer. As a consequence of this, tenants rarely act as a pool of reserve labour for the landlord.[77] In fact, sometimes the landlord, who is a smaller landowner, is employed by his tenant on a preferential basis.[78]

This concludes the tentative review of interlinkages between labour and other markets, farm service contracts and collusion in labour markets in India.

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[72] Bardhan and Rudra [1978], Freeman [1977].

[73] Breman [1974], Reddy [1985], Binswanger et. al. [1984].

[74] Bhalla [1976].

[75] Bardhan and Rudra [1981], Rudra [1982], Madan and Madan [1983].

[76] Nair et. al. [1984], Reddy [1985], Leaf [1984], Bhalla [1976], Jodha [1984] and Bardhan and Rudra [1980].

[77] See Bardhan and Rudra [1980], where they found incidence of such linkage in less than 8% of cases in Uttar Pradesh, Bihar and West Bengal.

[78] Jodha [1984].

2.4 Conclusion

In this chapter I consider the village economy to be the basic unit of observation for studying agricultural labour markets and collect empirical material on labour contracts in agricultural labour markets. Primary data from the intensive survey of the village Palanpur in western Uttar Pradesh is combined with secondary data from a number of village surveys.

Palanpur is a village of small and middle farmers. All hired labour in Palanpur labour market is casual labour, hired on a day-to-day basis. The market for agricultural labour is closed and labour recruitment is the duty of the employer, rather than it being the duty of the labourer to search for jobs.

There is a marked seasonality of employment in the labour market of Palanpur, with average employment level in the peak season being more than double the employment level on any slack season day. Average wages, although lower in the slack season, do not show a comparable degree of variation.

Piece rate payments and daily wage payments exist side-by-side in the slack season, but the overwhelming majority of contracts in the peak season are piece rate contracts. Further, there is a standard, "going" daily wage in the slack season and standard piece rates for the peak season task, wheat harvesting. There is no standard daily wage in the peak season and piece rates for slack season tasks display considerable variability.

The income from piece rate payments for field work in the slack season is lower than daily wage incomes in the slack season, even after corrections for variability in individual performance. Yet the duration of contracts is not long enough for the contract to provide any insurance to the labourer. This points towards a *gap* between the reservation wages of labourers and the daily wage level in the slack season. This is, strangely, accompanied by seasonal unemployment.

Secondary data reveals that casual labour is the main form of labour hire in agricultural labour markets and probability of employment for casual labourers sees considerable fluctuation in the course of the year. Piece rate payments and daily wage payments frequently co-exist. As in Palanpur, the relative importance of speed of completion as against the need for exercise of care determines the employer's

decision in favour of piece rate or daily wage contracts. This often results in a major shift in favour of piece rate payments in the peak season.

While there usually is a uniform "going" daily wage in a village at any particular time of the year, labourers with poor reputations (weak or lazy) are involuntarily unemployed in the slack seasons. This observation is in agreement with the hypothesis of coexistence of involuntary unemployment and some element of downward wage rigidity in the slack season.

There are large variations in the incidence and form of interlinkages and labour tying. There is always an element of insurance in the contract of tied labourers. "Fully tied labourers", who pledge their entire labour time to one farmer, usually get meals everyday from him. "Semi-tied labourers" who offer their labor as collateral to get consumption loans (or, alternatively, wage advance) from their employers, are also insured to some extent against income fluctuations. Attached labourers are more commonly observed on large farms.

While tenancy is common in spite of legislations, incidence of tenancy-labour interlinkage is quite low. Events of land allotment to attached labourers, while common in eastern Uttar Pradesh, is almost absent in West Bengal. The tenant rarely commits to supply labour to the landlord as the part of an interlinked deal.

Finally, in Palanpur as in other villages monopolistic or collusive power of employers seems to be limited. In particular, the interests of small farmers and large farmers do not coincide. Occasionally, large farmers, aided by the presence of caste solidarity set wage at a lower level than small farmers in the same village.

Season	Type of Labourers	All Casual Labour		Intra-Palanpur Labour	
		Total Employment	Average Employment	Total Employment	Average Employment
Slack	All	3660.0	10.8	2346.0	6.9
Slack	Adult males	3378.0	9.9	2204.0	6.5
Peak	All	678.5	26.1	671.5	25.8
Peak	Adult males	501.0	19.3	497.0	19.1

Table 2.1: Seasonality in employment in village Palanpur.

Note: Number of days of labour by outsiders in Palanpur has not been included in this table. Then total employment in slack season would rise to 2625.5 and average employment in slack would rise to 7.7 for work done inside Palanpur.

Landsize (in acres)	Labour hired per household in the survey year			
	Cultivators		Owners	
	Slack	Peak	Slack	Peak
0	1.39	0.0	2.6	0.5
below 1	7.68*	0.44	5.2	0.32
1–2.5	3.2	1.46	6.8	1.29
2.5–5	10.4*	2.55	17.1*	4.63
5–10	21.05	6.4	14.38	6.68
10–15	168.5	14.67	77.57	10.71
15 and above	9	14.5	15	42.5

Table 2.2: Table of labour hired in by Palanpur villagers.

Note: Two of the villagers are masons and they subcontracted labour during the survey year. The figures marked by asterisk have an upward bias due to this factor.

Landsize (in acres)	Labour hired per household in the survey year			
	Cultivators		Owners	
	Slack	Peak	Slack	Peak
0	1.39	0.0	2.6	0.5
below 1	7.68*	0.44	5.2	0.32
1–2.5	3.2	1.46	6.8	1.29
2.5–5	10.4*	2.55	17.1*	4.63
5–10	21.05	6.4	14.38	6.68
10–15	168.5	14.67	77.57	10.71
15 and above	9	14.5	15	42.5

Table 2.2: Table of labour hired in by Palanpur villagers.

Note: Two of the villagers are masons and they subcontracted labour during the survey year. The figures marked by asterisk have an upward bias due to this factor.

Serial number	Number of days with creditor					Total number of days
	MLA	MLB	MLC	MLD	Others	
20601			112			171
20608						6
60801			8			75
60901			4			119
60902						4.5
61001			16			48
61002			10		3	159
61003			51		3	129
61004			16		16	16
61301		1.5				85
61302		1.5				46
61702					1	25
70301		5				46
70304						28
80103				16.5		32.5
80104				3		25
80201				3.5		120
80202				2.5		26
80203				.5		11.5

Table 2.3: Credit-labour interlinkage in Palanpur, 1983-84.
(continued overleaf.)

Serial number	Number of days with creditor					Total number of days
	MLA	MLB	MLC	MLD	Others	
80503				13.5		154
80504				12.5		131
80510						15
80804			5			18
81101				1		29
81102						15
81305					2	21
81403				4	1	54.5
81406						33
81901				3		136
81902				2		15

Table 2.3

Note 1: MLA, MLB, MLC, MLD indicate four different money lenders-cum-farmers of Palanpur.

Note 2: Whenever one member of a debtor household supplied any labour to any of its creditors, the labour supply pattern of the rest of the household is given as well and successive households are separated by horizontal lines.

Labourer	Days of wage labour				
	Slack season		Peak season		Tenancy
	with peak employer	total	with slack employers	total	partners
20601	102	156	10	15	0
20903	0	124	0	0	0
20904	0	149	0	0	0
30101	0	51	0	0	2
30801	0	54	0	7	2
30803	0	57	0	11	0
30805	0	92	0	11	0
30901	23	52	8	17	31
30904	0	14	0	2	2
50101	0	31	3	4	0
60901	98	110	7	9	100
61002	2	164	1	7	0
61003	0	114	0	15	0
61201	0	63	0	0	0
61301	0	70	0	15	0
61302	0	31	0	15	0
61501	23	55	7	16	0
71001	24	51	8	10	23
71303	3	31	3	15	0
80103	0	33	0	2	0
80201	25	116	9	17	0

Table 2.4: Tenancy-labour interlinkage and inter-seasonal labour tying in Palanpur.

(Continued overleaf.)

Labourer	Days of wage labour				
	Slack season		Peak season		Tenancy
	with peak employer	total	with slack employers	total	partners
80503	23	142	5	17	25
80504	13	109	6	11	15
80703	10	155	2	17	0
81101	0	29	0	15	1
81202	0	24	0	12	0
81403	0	47	0	6	0
81406	7	22	5	11	0
81701	0	22	0	8	0
81801	7	35	2	12	0
81901	9	69	4	13	3

Table 2.4

Note 1: This table includes only those labourers who worked were in wage employment for at least 30 days in the survey year.

Note 2: In some cases the identity of the employer was unknown, but the number of such cases is negligible.

Note 3: A tenancy partner may be either a landlord or a tenant of the labourer.

Total number of tenancy partners	Number of common partners in credit and tenancy markets					Number of households
	0	1	2	3	7	
0	33					33
1	35	1	0	0	0	36
2	27	6	0	0	0	33
3	16	3	2	0	0	21
4	6	2	1	0	0	9
5	1	1	1	0	0	3
6	2	1	1	0	0	4
8	0	2	0	0	7	4
9	0	0	0	1	0	1
total	120	16	5	1	1	143

Table 2.5: Common partnerships in tenancy and credit markets in Palanpur.

Note: Each entry indicates the number of households which had the specified number of tenancy partners *and* the specified number of tenancy-cum-credit partners.

Wages	Frequency
4.1	1.0
5.0	9.0
6.0	13.0
6.8	10.0
7.0	783.5
7.3	3.0
8.0	59.5
8.4	4.0
8.5	6.0
9.0	427.0
9.3	1.5
9.5	3.0
10.0	16.0
10.8	16.5
11.0	6.0
12.5	20.0
13.5	1.5
14	6.0
16.2	.5

Table 2.6: Frequency Table of daily (nominal) wage rates paid by Palanpur farmers to Palanpur labourers for field work.

Season	Number of Days		Average wage		Coefficient of Variance	
	daily wage	piece rate	daily wage	piece rate	daily wage	piece rate
Slack	1348.0	355.0	7.83	5.92	0.16	0.5
Peak	51.5	625.0	12.07	12.12	0.21	0.28

Table 2.7: Relative importance of daily wages and piece rates.

Note 1: The peak season wages have been adjusted for prices so as to be comparable with slack season wages.

Note 2: Average daily wage is significantly greater than the average piece rate for slack season at 1% level of significance, whereas there is no significant difference between the averages for the peak season.

Activity	Number of Days	
	Daily wages	Piece rates
Field work		
1.Sowing	140.5	0
2. Transplanting	41.5	0
3. Weeding	220.0	96.0
4. Ploughing	89.5	14.0
5. Digging	247.5	152.5
6. Wheat Harvesting	3	620
7. Other Harvesting	82.5	30
8. Threshing and Storage	72.5	3
9. Miscellaneous	435.5	0
Non-field Work		
10. Brick making	0	137
11. Miscellaneous skilled work	113.5	199.5
12. Miscellaneous unskilled work	218	101.5
All Labour	1664.0	1353.5

Table 2.8: Allocation of tasks to daily wage and piece rate systems of payment for intra-Palanpur labour contracts.

Labourer	Number of Days		Percent of Days	
	Slack	Peak	Slack	Peak
20601	156	15	.45	.57
20903*	124	0	.36	0
20904*	149	0	.44	0
30101	51.5	0.0	.15	0
30702	62	0	.18	0
30801*	52	7	.15	.26
30805*	92	11	.27	.42
30803*	57	11	.17	.42
30901	53.5	17.0	.16	.65
50101*	36	4	.11	.15
60901*	99	20	.29	.76
61003	112.5	16	.33	.61
61301	70	15	.21	.57
61302	30.5	15	.09	.57
61501	51	20.5	.15	.78
71001	37.5	22.5	.11	.87
71303*	30.5	15.0	.09	.57
80201	116	16.5	.34	.63
80503*	144	16.5	.42	.63
80504*	119.5	11.0	.35	.42
80703*	156.5	17.5	.46	.67
81202*	24.0	13.0	.07	.5
81406*	22.0	11.0	.06	.42
81701	22.5	15	.07	.57
81101*	38.0	15	.11	.57

Table 2.9: Number of days of wage employment for casual agricultural labourers in Palanpur.

Note 1: Labourer 30101 had been absent from Palanpur during the peak season.

Note 2: The identity code of each cultivators is marked with an asterix.

Wages	Frequency
1.800	4.0
2.100	6.0
2.300	10.5
2.900	6.0
3.000	48.0
3.100	7.0
3.300	8.0
4.400	16.0
5.200	33.0
5.500	14.0
6.100	4.5
6.200	6.5
6.300	48.0
6.500	6.0
6.600	3.0
6.700	7.0
7.500	76.0
7.600	4.0
7.900	4.0
8.000	1.5
8.200	8.0
8.300	3.0
8.400	5.0
8.600	2.0
8.700	1.5
9.100	8.0
9.400	12.0
12.000	3.0
Total	355.5

Table 2.10: Frequency table of slack season, field work "piece rate wages".

Chapter 3

Theories of Rural Labour Markets: A Survey

3.1 Introduction

The last few decades have seen a proliferation of theories aiming at a better understanding of rural labour markets in developing countries: from early subsistence theories where the determination of wages was regarded as largely exogenous to labour market conditions, through the revival of the competitive paradigm to the recent and sophisticated models focusing on incomplete information, uncertainty, or bargaining situations. Over the same period a number of micro studies undertaken in India by social scientists of all disciplines have provided valuable empirical evidence on how rural labour markets actually function in that country. Unfortunately, much of this material has remained insufficiently known to theorists, and its potential in helping to form a judgement about the usefulness of alternative theories is still largely unexploited.

In the previous chapter, a number of important features of the labour market in the village Palanpur (which forms the core data set for the empirical part of this thesis) has been discussed. On the basis of information from several other village studies, it has been shown that in spite of important regional variations, a number of core features are shared by Palanpur and all the other village labour markets. In this chapter I discuss the theories of rural labour markets which attempt to explain *rural*

wages and employment. These theories will be critically evaluated using the empirical facts presented in the previous chapter. Although the empirical information is not quite adequate for the purpose of carrying out rigorous econometric tests of theories, they are helpful in judging the truth of qualitative assumptions and predictions of the theories.

Rural labour markets have been modelled in diverse ways. I shall have to ignore as irrelevant several branches of those theories — important among them being the theories of farm household and the theories of interlinkage and other rural institutions. The economic modelling of farm households started as a response to the empirical debate of an inverse relationship between farm size and average productivity of land. The models tried to determine the optimal labour supply under different assumptions, and wages and employment were both exogenous parameters.[1] The literature on rural institutions and interlinkages, similarly, takes labour market parameters as exogenous. In this literature, focus is mainly on the institution of sharetenancy.[2] Risks and asymmetric information play a key role in this literature. The institutions of usury, interlinkages between tenancy and other markets, etc. have also received attention. It is beyond the scope of this chapter to deal with this vast literature. The more interested reader can consult the following survey articles: Bardhan [1980], Binswanger and Rosenzweig [1984], Singh [1989], Bell [1989] and references therein.[3]

I shall classify the theoretical papers discussed here into two broad parts: models of *casual labour markets*, and models concerning *"labour-tying"*, or, the farmer's decision to appoint labourers on a long-term basis. Each of these broad classes will be further subclassified on the basis of market structures into two parts: competitive and monopolistic. Note that this classification is quite different from the more common system[4] of identifying different strands of theories such as the subsistence wage theory or the efficiency wage theory and elaborating on each. By using this approach, I hope to focus more clearly on the consequences of different theoretical assumptions and

[1] See Sen [1966], Lau, Lin and Yotopoulos [1978] for some perspectives on this questions. See Singh, Squire and Strauss [1986] for a recent review of the subject.

[2] Some starting references on sharetenancy are Cheung [1969], Stiglitz [1974], Newbery and Stiglitz [1976] and Bell and Zusman [1976], Newbery [1976], Mitra [1983].

[3] Also see Basu [1983, [1984a].

[4] Consider Bardhan [1977] and Binswanger and Rosenzweig [1984].

identify the most necessary assumptions more easily.[5]

In Section 3.2 I discuss casual labour markets in agriculture. In Section 3.2.1 markets are assumed to be perfectly competitive. Section 3.2.2 is devoted to monopolistic labour markets. Section 3.3 is devoted to a discussion of theories of labour-tying. As before, Section 3.3.1 and Section 3.3.2 deal with competitive and monopolistic labour markets, respectively. Section 3.4 concludes this chapter.

3.2 Casual Labour Markets

Casual labour is the main form of labour hire in rural labour markets. Several alternative theoretical approaches have been used to justify different stylized facts about casual labour markets. I introduce the alternative approaches here, and discuss their relevance in the context of casual labour.

3.2.1 Perfect competition in casual labour markets

At the outset, let me clarify that by describing a market as perfectly competitive I mean that all buyers and sellers in that economy are infinitesimally small, so that none of them can affect the *prices* by their *individual actions*. Note that this is not necessarily an Arrow-Debreu economy because information gaps may exist or markets may be incomplete. In this market, therefore, the aggregate demand or supply curve of labour, will be derived by aggregating the individual demand or supply curves of each agent, derived on the basis of (constrained or unconstrained) utility maximization of agents. An *equilibrium* will be defined as a situation where *no agent* gains by deviating individually, *ceteris paribus*.

Under this framework, the *theory of subsistence wage* may immediately be translated as a theory which recommends a "flat" or infinitely elastic supply curve of labour. The supply of labour is infinitely elastic at wage $\bar{w}$, which is known as the *subsistence wage*. The level of the subsistence wage

[5]For instance, viewed from this angle, the complicated theory of subsistence wages boils down to a theory of surplus labour, where the wages are infinitely elastic at an institutionally dependent wage.

is determined by forces exogenous to labour market conditions. These forces may be the institutional framework, the biological subsistence requirement, etc. Therefore, the supply curve may be written as follows:

$$\begin{aligned} L^S &= \bar{L} \quad \forall \quad w \geq \underline{w} \\ &= 0 \quad \forall \quad w < \underline{w}, \end{aligned} \tag{3.2.1}$$

$\bar{L}$, of course, is strictly positive.[6]

While most theorists specializing on labour markets consider this a non-theory,[7] and econometric tests have shown that the supply of labour is not infinitely elastic,[8] this theory has been widely used to describe the labour market in the "traditional" or "agricultural" or "rural" sector in models of growth in dual economies,[9] and also in models of sharetenancy.[10] However, apart from the econometric evidence cited above, the *ubiquitous* seasonal fluctuations in real as well as nominal wages (or incomes from piece rate wages) in agricultural labour markets is another empirical pointer against the theory of subsistence wage.

Econometric exercises to disprove the subsistence wage theory have established that even in the traditional, agricultural sector, agents exhibit optimizing behaviour.[11] This naturally leads to the question whether agricultural labour markets are well-approximated by the Walrasian economy — where *markets clear* through fluctuation of prices. Rosenzweig [1978], [1984], in fact, contain strong arguments in its favour. Empirical proof of involuntary seasonal unemployment, cited in Chapter 2 of this thesis, however, did not allow this theory to become a serious contender as a theory of *agricultural* labour markets.[12] In fact, Rosenzweig later re-

[6]This summary of the classical economists viewpoint on labour markets in less-developed economies is due to Lewis [1954].

[7]See McIntosh [1984] and Osmani [1990] for instance.

[8]For references see Paglin [1965], Hopper [1965], Sahota [1968], Krishna [1963], etc.

[9]See Jorgenson [1967].

[10]See Stiglitz [1974], Newbery [1977], Mitra [1983].

[11]See Lal [1988], Rosenzweig [1978], [1984], Bardhan [1979b]

[12]In Harris-Todaro type models of rural-urban dualism, however, it is frequently assumed that in the traditional sector, labour markets clear through perfectly fluctuating wages Harris and Todaro [1971]. See also Ranis and Fei [1961], Corden and Finlay [1975], Basu [1980].

tracted from that viewpoint [13] and dubbed it a *convenient shorthand* for modelling labour market behaviour and this is a very correct description.

Rejection of both the extreme hypotheses: completely rigid wages and completely flexible wages led to the investigation of some intermediate models, where wages are "sticky" — not rigid. Markets were assumed to be imperfect — giving rise to recruitment costs,[14] or utility was assumed to be a function of physical consumption as well as other, non-tangible, factors.[15] But before I move on these theories let me discuss the *efficiency wage theories.*

These theories seek and explore possible reasons why *employers* themselves should want to keep wages at a level at which there is involuntary unemployment and, as such, efficiency wage theories provide a possible rationale for Keynesian unemployment.[16] The literature on efficiency wage has become very voluminous as different reasons were advanced for this peculiar behaviour of employers.[17] The first formal model of efficiency wage, due to Leibenstein [1957], saw it as a connection between a labourer's productivity and his nutrition level. Later economists visualized a "high" wage as a tool employed by the employer to enable him to protect himself against moral hazards or adverse selection. The moral hazard aspect of efficiency wages has been explored in the context of long-term labour tying in agriculture by Eswaran and Kotwal [1985]. I shall return to this later, in section 3.3.2. In the light of the empirical observation that labourers with a reputation for poor performance are faced with a greater risk of unemployment in the casual labour market, there is scope for application of the moral hazard-based model in the context of casual labour as well. But such an exercise has not been carried out yet. Adverse selection is not applicable in the context of agricultural labour because casual agricultural labour appears to be the last resort option of labourers.[18]

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[13] Rosenzweig [1988].

[14] Bardhan [1979a].

[15] Akerlof [1980].

[16] See Solow [1979] and Mookherjee [1986] for different perspectives.

[17] The interested reader may see Yellen [1984] for a concise and lucid introduction. Also see Akerlof and Yellen (eds) [1986], Basu [1984b] and the references therein.

[18] See Drèze and Mukherjee [1989].

In short, under the efficiency wage doctrine, it is assumed that productivity of a labourer is positively linked with his or her income or wage.[19] After Leibenstein [1957] first postulated the existence of the nutrition-productivity relationship, several economists theoretically investigated the consequences of the nutrition-productivity (or wage-productivity) link.[20] It has been shown by Basu [forthcoming], that an essential requirement of most of the above is not only the existence, but also the *recognition* of the wage-productivity relation by the employer.

To write it precisely, the *work* done by a labourer was assumed to be measured in *efficiency units* h, which in turn was assumed to be a function of the labourer's wage (or income) w. Mathematically,

$$h \equiv h(w), \quad w \geq 0. \tag{3.2.2}$$

Insert Figure 3.1: The wage-productivity relationship.

The plot of $h(w)$ against w, or the "efficiency wage curve" is depicted in Figure 3.1. Figure 3.1 shows two alternate forms of the efficiency wage curve, economists have used one form or the other depending on the analytical properties. Leibenstein had postulated the shape depicted in 3.1 (a).

Now suppose the production function of farmers is defined in terms of the number of work units. Then, cost minimization being a necessary condition of profit maximization, any profit maximizing farmer will set wages as w^* such that the cost per unit of work is minimized at w^*. The reader can check that w^* is given by

$$h'(w^*) = \frac{w^*}{h(w^*)}. \tag{3.2.3}$$

Let us assume the supply of labour is given by (3.2.1) above, and the production function ($f(H)$) of an individual farmer is defined in terms of the number of efficiency units (H). Assume that $w^* > \underline{w}$ and also $w^* > \bar{w}$ where $\bar{w}$ is the wage at which there is no involuntary unemployment. Then the optimal wage and optimal labour

[19] For a more general treatment of this idea, as a part of the price theory, see Stiglitz [1987].

[20] Some of them are Mirrlees [1975], Stiglitz [1976], Bliss and Stern [1978a] and [1978b], Rodgers [1975], Mazumdar [1959], Guha [1989], [1990], Dasgupta and Ray [1986], [1987a].

demand l^* of the farmer is given by

$$f'(l^*.h(w^*)) = \frac{w^*}{h(w^*)}. \tag{3.2.4}$$

Under the circumstances, no farmer will want to deviate from the above wage, and this is an equilibrium. Note that no undercutting will be possible in the above model because paying a lower wage to labourers will only lead to a lower profit level for the farmer.

If there are heterogenous workers, such that the "efficiency wage" for the i^{th} worker is given by w_i^*, and the associated *piece rate wage*[21] is z_i^*, then there will emerge in equilibrium, a piece rate wage z^* in the labour market, such that all workers with $z_i^* > z^*$ will be involuntarily unemployed.[22]

As I have presented it, and also in the recent economic literature, efficiency wages are most commonly thought of as an explanation for involuntary unemployment. Historically, however, the efficiency wage theory provided an explanation for *disguised unemployment*. The trade-off between employment and production has been demonstrated very clearly by Stiglitz [1976]. I shall return to it later in Sections 3.3.1 and 3.3.2.

Insert Figure 3.2: The efficiency wage and seasonality.

Note that the *seasonality* of rural labour markets has been ignored in the above discussion on efficiency wages. However, there is a very simple means of incorporating seasonality into the analysis. Assume that the agricultural peak season is characterized by an outward shift in the marginal productivity od labour. Let the wage at which labour supply equals the peak season marginal productivity of labour, $f_p'(H)$, is given by $\bar{w}$ and let $\underline{w}$ be the wage at which the slack season marginal productivity of labour, $f_s'(H)$, equals labour supply. (See Figure 3.2.) If both $\underline{w}$ and $\bar{w}$ exceed w^* then the market behaves in a fully competitive manner. If both $\underline{w}$ and $\bar{w}$ fall short of the efficiency wage w^*, then there will be complete wage rigidity in the

[21] The piece rate wage corresponding to any time-rate wage is defined by the wage per efficiency unit at that wage, for the particular worker.

[22] For details of the analysis, See Dasgupta and Ray [1986].

labour market, in spite of seasonal fluctuations in employment. If $\underline{w} < w^* < \bar{w}$, there will be full employment in the peak season, but the slack season will see involuntary unemployment accompanied by downward rigidity of wages.

This leads to some empirically testable hypotheses:

1. The degree of variation in wages should be greater in "richer" economies, that is, in economies with full employment as compared to poorer economies with high unemployment rates.

2. When piece rates and time rate payments coexist, piece rate payments should exhibit a lower degree of variation as compared to time rates.

3. If it is possible to rank people according to their abilities, the more able worker will get a higher time rate wage,[23] but all workers will get equal piece rates.[24]

Note that the first of these may emerge from straightforward demand-supply analysis as long as there is a flat portion to the supply curve.[25] While it is difficult to verify the other two,[26] there exists more fundamental reason *all* efficiency wage models are likely to appear defective, by definition, as a model of the casual labour market: they attribute the resistance to wage cuts to employers rather than employees. This strongly conflicts with first-hand observation, with villagers' own accounts of who resists wage cuts, and with further informal evidence from similar studies elsewhere. In Palanpur, attempts by employers at wage cutting do occur (though they are not frequent), but are typically resisted by labourers. In informal discussions, farmers as well as labourers clearly identified the resistance to wage cuts in the camp of employees rather than the employers (see above). Rudra [1982a] explicitly asked employers why they did not pay less than the ruling wage rate. The answers clearly indicated that the employers perceived the resistance of labourers as the main problem. In another study of 110 villages carried out in 1979, Bardhan and Rudra

[23] Some of these hypotheses may be completely reversed in the monopsony case, to be discussed later.

[24] In this context, see Bell and Zusman [1976]. The paper argues that more efficient workers will self-select themselves into piece rate jobs, in order to improve their daily earnings.

[25] In this context, it is important to note that econometric analysis of the ICRISAT data produced evidence to the contrary.

[26] Palanpur data shows that there is grater variability in piece rate wages as compared to daily wages in the slack season, but the opposite applies to the peak season.

[1981] report consistent perceptions on the part of employees: "Our labour respondents were specifically asked if they ever offered to work for lower than the ruling wage rate to get work. About 95% of our daily contract labour respondents replied to the negative." A small group articulated the class-consciousness that such action would have led to a lowering of the ruling wage to the detriment of all labourers.

The last sentence points out that *strategic modelling* of rural labourers' behaviour is pertinent. Strategic modelling is a field in which economics has seen a lot of progress in the last ten years — although development economics is yet to catch up fully with it. Strategic approaches have found maximum application in the explanation of the institution of sharecropping, and also in the literature on interlinkage in general. Two approaches contending with each other in this respect are the principal-agent models, and the bargaining theoretic models. Both approaches base their explanation on absence of markets for certain commodities, such as information, insurance or managerial skills. But moral hazards get more importance in the principal-agent approach, whereas adverse selection is more important in the latter.[27]

A recent paper by Osmani [1990] provides a solution to the old problem of coexistence of unemployment and higher then reservation wages in terms of strategic behaviour. In a closed, agricultural economy labourers collude implicitly to maintain wages at a higher-than-reservation level. Under the assumption that all workers are identical (in the sense that they are preferred equally by farmers) each labourer adopts the strategy of "bidding" a wage $w^* > \underline{w}$, the market-clearing wage. If anybody bids a wage $w < w^*$, immediately all others bid the market clearing wage $\underline{w}$ leading to a fall in the general wage level. Clearly, an equilibrium where everyone bids w^* is attainable only if there is a lower bound on the pure rate of time preference δ of workers. In particular, if

$$\delta \geq 1 - P(w^*), \tag{3.2.5}$$

where $P(w^*)$ is the common probability of employment at wage w^*.

If labourers are maximizers of the sum of discounted future pay-offs, then equi-

[27] For more on this see Bell [1989] and Dutta, Ray and Sengupta [1989] and the references in them.

librium wage will be equal to the maximum of w_1^* and w_2^*, where

$$w_1^* \equiv \{w | 1 - \delta = P(w^*)\} \tag{3.2.6}$$

and

$$w_2^* \equiv \underline{w} - P(w_2^*)(\partial P/\partial w_2^*)^{-1} \tag{3.2.7}$$

As already mentioned in Chapter 2, while explicit collusion among employers has been observed to fail in the majority of cases,[28] it is not necessarily the same with collusion among labourers. Secondly, wage uniformity is *very common* and thirdly, there is evidence from West Bengal and Palanpur that workers are conscious that undercutting the wage might start a downward spiral in the wage level itself. This model presents a formalization of the ideas and hence, is very interesting.

It could be made more interesting by a closer examination of the question whether undercutting will truly lead to an execution of the threat. After all, *all* labourers will incur a loss by carrying out the threat, and given the closed nature of the village labour market there is definitely scope for *renegotiation* among labourers once undercutting has occurred. Whether a "renegotiation-proof" equilibrium wage exists in the above model and its level remain open questions.

Let me close this section after discussing the possible consequence of the existence of an element of *social consciousness* in the utility function of agents. Although this idea has been rejected by earlier economists, a number of economists are busy examining the economic role of social institutions and their possible economic roots[29]. An interesting exercise in this kind of economic modelling by Akerlof [1980] is discussed here. He has posited the simplest possible type of utility function, where an individual's utility is affected by his/her consumption, *reputation*, and *beliefs*. Assuming the prevalence of a social custom, an agent who disobeys the custom incurs a loss of utility due to a loss of reputation, and a believer disobeying it suffers an utility loss due to dissatisfaction, say. All agents are utility maximizers.

Now suppose the custom demands that wages be fixed at some $\tilde{w}$, anyone deviating from $\tilde{w}$ will incur an utility loss of R units due to reputation loss. A believer

[28] See Binswanger and Rosenzweig [1984].

[29] Frank [1987], Akerlof [1980], Kuran [1987], Becker [1957].

incurs a further loss of c units for doing something he/she does not believe in. There are two types of agents — labourers and "capitalists" (or, employers). Labourers consume wages, and the consumption of capitalists is assumed to be a/w, a positive amount inversely proportional to wages paid by them.

Let the market clearing wage be equal to $\underline{w} \neq \tilde{w}$ in general. Assume labourers are believers. Therefore, trade will be profitable for labourers at wage $\underline{w} \neq \tilde{w}$ only if

$$\underline{w} \geq \tilde{w} - R - c \tag{3.2.8}$$

Also assume that capitalists are non-believers. They will be willing to trade at $\underline{w} \neq \tilde{w}$ only if

$$\underline{w} \leq \tilde{w}\left(1 + \frac{R\tilde{w}}{a}\right)^{-1}. \tag{3.2.9}$$

Trade will occur at wage $\underline{w}$ only if

$$\tilde{w} - R - c \leq \tilde{w}\left(1 + \frac{R\tilde{w}}{a}\right)^{-1}. \tag{3.2.10}$$

Otherwise, trade will occur at $\tilde{w}$ and either side will be rationed.

While the idea put forward by Akerlof is highly interesting, this paper is an exercise in rationalizing social norms, rather than a serious exercise on the determination of rural wages. The above is a highly simplified presentation of the relevant portion of his model, where he demonstrates how involuntary unemployment may be the outcome of prevalent social norms.[30]

From the above analysis it clearly emerges that perfect competition *can* allow non-Walrasian outcomes, depending upon the assumptions on information structure and the utility functions of agents.

3.2.2 Monopolistic employers in casual labour markets

Just as it is generally accepted that rural labour markets are characterized by involuntary unemployment, it is almost as popularly accepted that rural labour markets

[30] In Chapter 5 of this thesis, I have explored a similar idea where the labourers act on the basis of their "beliefs" and are aided in it by the *seasonality* in agricultural labour markets.

are characterized by *monopsonistic* employers and landlords.[31] This assumption is also popular in the literature on interlinkages in rural labour markets.[32] The labourer will be pushed to the boundary of his consumption set *except* in the presence of imperfect information or incomplete markets.[33] Efficiency wage considerations will also yield involuntary unemployment. In view of the stylized fact that involuntary unemployment and "high" wages coexist in rural labour markets, all the theoretical models discussed in this chapter are some variant of the efficiency wage theory.

The most rigorous treatment to the consequences of the efficiency wage theory in a monopsonistic labour market has been given by Bliss and Stern [1978a]. They pointed out clearly that a monopsonistic employer will pay each labourer his own efficiency wage, so that less efficient labourers will be paid a higher wage but will be more prone to unemployment. To use the notations of the previous section, suppose there are two types of labourers, with efficiency wages w_1^* and w_2^* and associated piece rate wages

$$z_1^* < z_2^* \,. \tag{3.2.11}$$

Then the type 2 labourer will be more prone to unemployment. But *if he is employed*, his wage will be w_2^* which is, in general, greater than w_1^*, and the associated piece rate wage will also be higher for him. This idea was contained in Rodgers [1975] which led to the claim that higher dependency ratio implies higher wages.

Bliss and Stern [1978a] have not discussed possible consequences of seasonality. In a seasonal, monopsonistic labour market one would expect the landlord to employ labour in excess of his slack season requirement. Leibenstein [1957], Mazumdar [1959], Rodgers [1975] have explored this idea, where the landlord maintains a large labour force by rationing the available employment among them,[34] so that all labourers have a non-zero income. According to them, this will lead to disguised

[31] Even in the absence of monopsony, it is sometimes claimed, farmers can collude to extract monopsony profits. See Rao [1987].

[32] The interested reader may see Basu [1983] for an instance of exploitation of landlord's monopoly power. See also Bhaduri [1983].

[33] For a general theoretical treatment in the context of evictions see Datta, Ray and Sengupta[1989].

[34] Recall that in their models it is not "wage" but "income" which determines productivity.

unemployment, i.e. a smaller labour force will raise productivity.[35] More on this follows in the next section on labour tying.

Bardhan has briefly explored the consequences of the existence of *recruitment costs* in the peak season of an agricultural economy in Bardhan [1979a]. The recruitment costs are assumed to be related negatively to the unemployment level in the labour market, and the supply elasticity of an individual labour. Under these assumptions a monopolistic employer will pay wages in excess of the marginal productivity of labour in the slack season, but exploit the labourers' risk-aversion to pay wages lower than the marginal productivity of labour in the peak season. The model also explains wage differences between male and female labourers on the basis of their supply elasticities of labour. Note that the monopoly assumption is crucial in this context. Yet small as well as large farmers incur losses on account of delays, and the empirical literature reveals that the *small farmer* is frequently blamed for raising the village wage level by paying a higher wage. Therefore it is necessary to examine the outcome of this assumption under competition.

Note that while a monopsonistic employer can push each employee to his reservation wage (or maintain him at his efficiency wage) in an *oligopsonistic* labour market this need not be true. There heterogenous labourers may be able to extract "rents" on their abilities. This idea has been developed rigorously by MacIntosh [1984].

MacIntosh's theoretical exercise is a response to the econometric exercises pointing out the existence of heterogenous labourers in rural labour markets, and different wages paid to then.[36] The heterogenous categories defined in that case were adult males, adult females and children. This no doubt addresses the highly neglected area — a theoretical treatment of male-female wage differentials. However, it is now accepted empirically that females are paid lower wages than males even in tasks at which they are better than males and are preferred to male labourers, such as transplanting.[37]

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[35] See also Stiglitz [1976]

[36] Bardhan [1973], [1984], Rosenzweig [1978].

[37] See Rudra [1982a], K. Bardhan [1984].

3.3 Long-term Labour Contracts in Agriculture

Under this sub-heading I shall discuss those theories of labour markets which deal with the question of allocation of labour demand between casual labourers and tied labourers, and/or the determination of their wages. Such theories can be classified broadly into two groups: those based on the implicit contract model and those based on the efficiency wage models. However, as in the earlier case, I shall classify the theories on the basis of the type of market structure, but I shall take them up in the reverse order this time, starting with monopolistic labour markets and discussing competitive labour markets later.

3.3.1 Labour tying in a monopolistic labour market

Let me mention again that while I am dealing with labour markets alone, the idea of monopsonistic labour markets is also very common in the interlinkage literature, where the monopoly power of the landlord-moneylender or landlord-trader in one market extends to another. Indeed they have explored the possible links between credit, tenancy, labour and output markets, or the full range of possible exercise of monopoly power.[38] Labour tying (or, pure credit-labour interlinkage) in a monopolistic labour market has been modelled by Bardhan [1979a], [1983].

Bardhan [1979a] assumes the existence of *high recruitment* costs (r) in the peak season. The cost is a inversely related to the peak season wage rate $\bar{w}$. Given this, a wage-setting monopolistic profit-maximizing employer will set slack season wages at a level higher than the labourers' marginal productivity. Correspondingly, the peak season wage will be at a level lower than the labourers' marginal productivity. Bardhan refers to this as labour tying (explicit or implicit), undertaken with a motive to reduce recruitment costs.

The model combines empirical relevance with simplicity. Indeed, in the peak season there are high costs to possible delays in peak season operations such as transplanting or harvesting. While these delays are confined to losses on the standing crop in some cases, in others the damage may go as far as delay or complete inability

[38] See references cited earlier in this chapter.

to sow the next crop.[39] Large farmers *do* tie labour to insulate themselves against likely losses of this nature.

He has later used implicit contract[40] type of analysis to explain labour tying in a monopsonistic labour market.[41] It is well known that the implicit contract theory exploits a very basic idea of uncertainty theory: for a risk-averse individual the expected utility from an uncertain income is always strictly lower than the utility from the expected income. Then labour tying is optimal whenever (1) there is some fluctuation in the income of the employee, and (2) the employee is less risk-averse than the employer.[42] The employer can extract some surplus by providing insurance to the employer.

There is no doubt that the intrinsic seasonal and climate dependent nature of agricultural production does create an environment of fluctuating wages. Moreover, the greater risk-aversion for labourers as compared to employers is also a very plausible assumption. On the strength of the above Bardhan applied the implicit contract model to explain labour tying. In his formulation the employer is risk-neutral and the market structure is monopsonistic. In equilibrium the attached labourer is pushed back to his reservation utility level, at the cost of *perfectly smoothening* his consumption, thus enabling the farmer to save on wage costs.

He assumed that production took place in two stages: the slack season followed by the peak season. Slack labour demand has been normalized to zero in the model. Peak labour demand is positive, and moreover, subject to uncertainty. The same applies to peak season wages. Let the random variable Θ capture the effect of uncertainty. Let $w(\theta)$ be the peak season wage of a typical labourer. Let the utility of the labourer from earning w_1, w_2 in the slack and the peak seasons respectively be $u(w_1) + \delta u(w_2)$ where $u(w)$ is a strictly concave, monotone increasing, utility function, and $\delta \in (0,1)$ is the pure rate of time preference. The tied labourer's

[39] See Bardhan [1984], Binswanger et. al. [1984], Breman [1974] for empirical confirmation of the above.

[40] I have used this term strictly in the context of an implicit insurance-cum-employment contract between employer and employee.

[41] Bardhan [1983].

[42] For a survey of the implicit contract literature see Azariadis and Stiglitz [1983] or Rosen [1985].

wages are w_t and w^t in the slack season and the peak season respectively.

The farmer was assumed to be a risk-neutral profit maximizer, discounting future income, etc. at the same rate δ.[43] Then a labourer will accept a permanent labour contract at any wage pair (w_t, w^t) subject to the constraint that his expected utility does not fall as a result of entering the contract. Mathematically,

$$u(w_t) + \delta u(w^t) \geq u(0) + \delta E u(w(\theta)). \tag{3.3.1}$$

The farmer's problem is to minimize $w_t + \delta w^t$ subject to (3.3.1). Then the optimal wages of the tied labourer are $w_t = w^t = w^*$ such that

$$(1 + \delta)u(w^*) = Eu(w(\theta)). \tag{3.3.2}$$

The outcome is, consequently, a tied contract. Empirically, it has been observed that tied labourers are provided *some insurance*. Whereas fully attached labourers surely have greater security, semi-attached labourers also have *some* security. Bardhan's model cannot, however, explain the empirical fact that attached labourers are, in general, lower in number than casual labourers. With pure profits from labour tying, tied labourers should be strictly preferred to casual labourers. It may be argued that the uncertainty in labour demand causes the demand for tied labour to be low. But fluctuations in the proportion of hired labour is of the order of twenty-five percent,[44] yet casual labourers constitute about eighty-four percent of the hired labour.[45]

Theoretically, a problem with this formulation is its lack of *incentive compatibility*. Consider the one-period formulation. Surely, in a "good year", when $u(w(\theta)) > Eu(w(\theta))$, the labourer has strong incentive to join the casual labour market. It might be claimed in reply that extra-economic powers of the employers forces the labourers to fulfil their contracts. However, empirically, even in the nineteen-fifties, when permanent labourers frequently had to sign a *naukar-nama*, or a bond pledging to fulfil any loss to the employer due to their absence, in some

[43] In the rest of the chapter, same notations and assumptions on utility functions and time preferences will be used, unless otherwise specified.

[44] Walker and Ryan [1990].

[45] Bardhan and Rudra [1981].

parts of India farmers allowed their tied labourers a fortnight's leave in the harvesting season (peak season) so that they could take the benefit of the high income opportunities available in the peak season. In other parts they were paid a share of the harvested crop over and above their other dues.[46] Even now tied labourers are frequently paid a major part of their income at the end of the contract period. In parts of the Deccan plateau where permanent servants get their entire salary as advance, the contract is *terminated* at the beginning of the peak season.[47] Therefore, the incentive problem should not be ignored. A model which explicitly takes these features into account has been constructed in Chapter 6.

3.3.2 Labour-tying in competitive labour markets

All the competitive models of labour tying are derived from efficiency wage models. It is conjectured that labour tying can be used to improve worker performance.[48] Guha [1989], [1990] has focused attention on the nutrition-providing aspect of wages, whereas Eswaran and Kotwal [1985] have laid stress on the incentive providing aspect of high wages.

One of the conclusions arrived at by Bliss and Stern [1978b] from the discussion on empirical evidence on the efficiency-consumption relation, was that the effect of consumption on efficiency is more likely to be felt in the long-run. Guha has tried to capture this feature by postulating that consumption has a *lagged* effect on efficiency. In that case, there will be a preference for long-term labour contracts in poor economies. Further, if the consumption of casual labourers is related to the size of the unemployed labour force, then disguised unemployment may also exist.

Production takes place in two stages: no labour is needed in the first, the slack, season. In the second stage, the peak season, labour demand is positive. Let the production function (in the second stage) be $f(H)$, where H is the input of *efficiency units* in the peak season. Note that all uncertainty has been removed by assumption. The casual labourer's wages are $\underline{w}$ and $\bar{w}$ in the slack and peak seasons respectively.

[46] See Section B, Chapter VI, Government of India [1960] for a description of attached labour contracts in various parts of India in the nineteen-fifties.

[47] Binswanger et. al. [1984].

[48] See Eswaran and Kotwal [1985] and Guha [1989], [1990].

The effect of nutrition is *both lagged and current.* Moreover, by assumption, a minimum amount of consumption is needed in the current period to bring forth a positive supply of work units.

The common reservation wage of all labourers in the peak season is zero. Let N be the size of the total labour force, and n_c and n_p be respectively the number of casual and permanent labourers hired. Then the slack season income of casual labourers is, by assumption, given by

$$\underline{w} = g(N - n_p) \tag{3.3.3}$$

where $g'(\cdot) < 0$. Therefore, if $h(c_0, c_1)$ describes the relation between previous and current levels of consumptions respectively and the current number of work units supplied by the labourer, then the labour input in the peak season is a function of the consumptions of the labourers, and the numbers of labourers. It is given by

$$H = n_c h(\underline{w}, \bar{w}) + n_p h(w_t, w^t). \tag{3.3.4}$$

The conditions for an interior solution to the farmer's profit maximization are:

$$\frac{w_t + \delta w^t}{h(w_t, w^t)} = \frac{1}{\partial h / \partial w^t},$$

or,

$$\frac{w_t + \delta w^t}{h(w_t, w^t)} = \frac{\bar{w}}{h(g(N - n_p), \bar{w})} \tag{3.3.5}$$

and the piece rate wage (or wage per efficiency unit) paid to permanent labourers is determined solely by the wage-productivity relationship.

Given (3.3.5), for different values of N there may exists different values of n_p and $\bar{w}$ yielding the same number of efficiency units per unit of consumption. However, as long as the supply of work units per unit of consumption does not change, the demand for work units will not change. The demand will, in fact, remain constant at H^* such that

$$f'(H^*) = \frac{w_t + \delta w^t}{h(w_t, w^t)}. \tag{3.3.6}$$

Therefore, although the number of labourers hired will change, the total input of work units, and hence the total output will remain unchanged when the number of labourers in the work force lie in a certain range. Or, in other words, there

will be *disguised unemployment*. When N increases even further, there will be open unemployment, and only permanent labourers will be appointed. On the other hand, for low values of N, $g(N)$ will be so high that it will be optimal to cultivate with *only casual labourers*.

This paper can be seen as a rigorous formulation of Leibenstein's idea that the employer must provide a minimum income to a certain number of labourers throughout the year so that his peak season labour requirement may be met. Unemployment, however, has not been ruled out. It is shown that either kind of unemployment may exist depending on the size of the rural work force and the resources available *outside agriculture* which the labourers can exploit to subsist through the agricultural slack season. Thus it focuses attention clearly on the need for alternative sources of income for the rural people.

Note that the assumptions on the supply side are very arbitrary here. In particular, the possibility that the peak season wages of casual labourers may exceed the peak season wage for tied labourers can not be ruled out. In case $\bar{w}$ does exceed w^t, the model runs into incentive compatibility problems exactly similar to the one described in the previous subsection. Empirically, at the cost of repeating myself, let me state that *no* employer seems to have the wage-productivity relation in mind while deciding whether or not to appoint tied labourers. While maintenance of a minimal labour force may be a consideration in the absence of alternative sources of income, it is irrelevant now in view of availability of alternate sources of income for labourers.

None of the models of labour-tying discussed so far distinguish between casual labourers' duties and tied labourers' duties. Eswaran and Kotwal [1985] have, on the other hand, focused tasks whose monitoring is *impossible or prohibitively expensive*. These tasks are entrusted only to attached labourers. In a two-stage production process, the amount of effort put in by the tied labourer is revealed at the end of the peak season. Hiring and firing of permanent labourers is done only in the beginning of the slack season and a shirker is punished by *eviction*.

Let the expected lifetime utility of a casual labourer be V_C and that of a tied labourer at the beginning of the crop season be V_T. Both tied and casual labourers

have the same utility $u(\underline{w}, \bar{w})$ from an income of $\underline{w}$ and $\bar{w}$ in the slack and peak seasons, respectively. Further, let the disutility from effort applied in the slack season be e. Since shirking in the peak season has been eliminated by assumption, I normalize peak effort level to zero without loss of generality. Then the expected lifetime utility at the beginning of the slack season of a permanent labourer who has *not shirked*, is

$$V_1 = u(w_t, w^t) - e + V_T. \tag{3.3.7}$$

The expected lifetime utility of a permanent labourer who has shirked and has been evicted is

$$V_2 = u_(w_t, w^t) + V_C. \tag{3.3.8}$$

Note that a labourer will not shirk *only if*

$$V_1 \geq V_2, \tag{3.3.9}$$

or,

$$V_T - e \geq V_C. \tag{3.3.10}$$

Therefore the tied labourer's utility level will be strictly higher than that of a casual labourer.[49] and to maintain his utility at that level, the tied labourer will refrain from shirking.

It is difficult to make a general statement about the relative utility levels of tied and casual labourers. In some parts of India tied labourers have a lower status, whereas in others they have a higher status.[50] Supervisory labour, however, is maintained at a higher utility level by the employers.[51]

3.4 Conclusion

In this chapter I have reviewed theoretical models of determination of wage and employment levels in rural labour markets.

[49]See Das and Gangopadhayay [1989] for a proof of existence of similar utility differentials under much weaker assumptions.

[50]See Reddy [1985] and Bhalla [1976].

[51]See Hart [1986], Bhalla [1976] and Sundari [1981] for related empirical material.

Both the extreme hypotheses of wages being determined "traditionally" and of wages being "competitive" (in the sense that markets are complete and spot markets clear through wage fluctuations) stand rejected in view of the empirical facts. Empirical data reveal that casual wages respond to demand and supply conditions *but* involuntary unemployment is common in the slack season. Unemployed labourers are not indifferent between work and leisure.

This has led to a search for theories that explain downward wage rigidity in casual labour markets. Explanations have been provided by postulating (1) a relation between nutrition and productivity (or, the efficiency wage model), (2) strategic behaviour by labourers, (3) social customs regarding wage levels or (4) peak season recruitment costs. Efficiency wage models offer insights in may other directions as well: an important one being the trade-off between distribution and output. Another prediction of the efficiency wage model is worsening asset distribution: because the asset-poor are likely to be more prone to involuntary unemployment in this model.

While the efficiency wage models has many interesting applications its empirical relevance is questionable. The data reveals that the resistance to wage cuts come from *employers* rather than the employees, and the decision to provide meals at work has more to do with shortening the midday break than improving the labourer's productivity.

An altogether different aspect of rural wages and employment, the segmentation of markets — has been explored by MacIntosh [1984]. The answer has been provided in terms of labourers' ability to extract rents on different skills from oligopsonistic employers with different labour requirements.

Besides casual labour, migrant labourers and attached labour are of importance in rural labour markets. Theoretical attention is yet to descend on labour migration between two agricultural labour markets. Attached labour has been explained as a response to seasonality or uncertainty in rural labour markets. An empirically relevant idea in this context is the reduction of peak season recruitment costs by tying labour. Another alternative explanation to labour tying, also relevant empirically, is the provision of implicit contracts to labourers. Such tying, however, is not incentive compatible in the sense that labourers have an incentive to renege on the contract

when the state of nature is "good".

The efficiency wage theory has been applied to explain labour tying as well. In the presence of some alternative source of survival for the labourers, the existence of a lagged effect of nutrition intake on productivity leads to labour tying in a competitive labour market.

A different aspect of labour tying — the non-monitorable nature of the tied labourers' jobs — has been explored by Eswaran and Kotwal [1985]. In a principal-agent type of model they predict that the tied labourer will be at a higher utility level than a casual labourer so that there will exist involuntary unemployment in the market for tied labourers.

This survey, however, reveals that the intrinsic seasonality of traditional agriculture has not received much attention in the context of casual agricultural labour. On the other hand, some of the labour tying models imply that existence of *any* seasonality is sufficient to guarantee labour tying. Yet, in spite of being common, labour tying is by no means *omnipresent* in traditional agriculture. The theoretical models in Chapters 5 and 6 are steps toward fulfilling these lacunae.

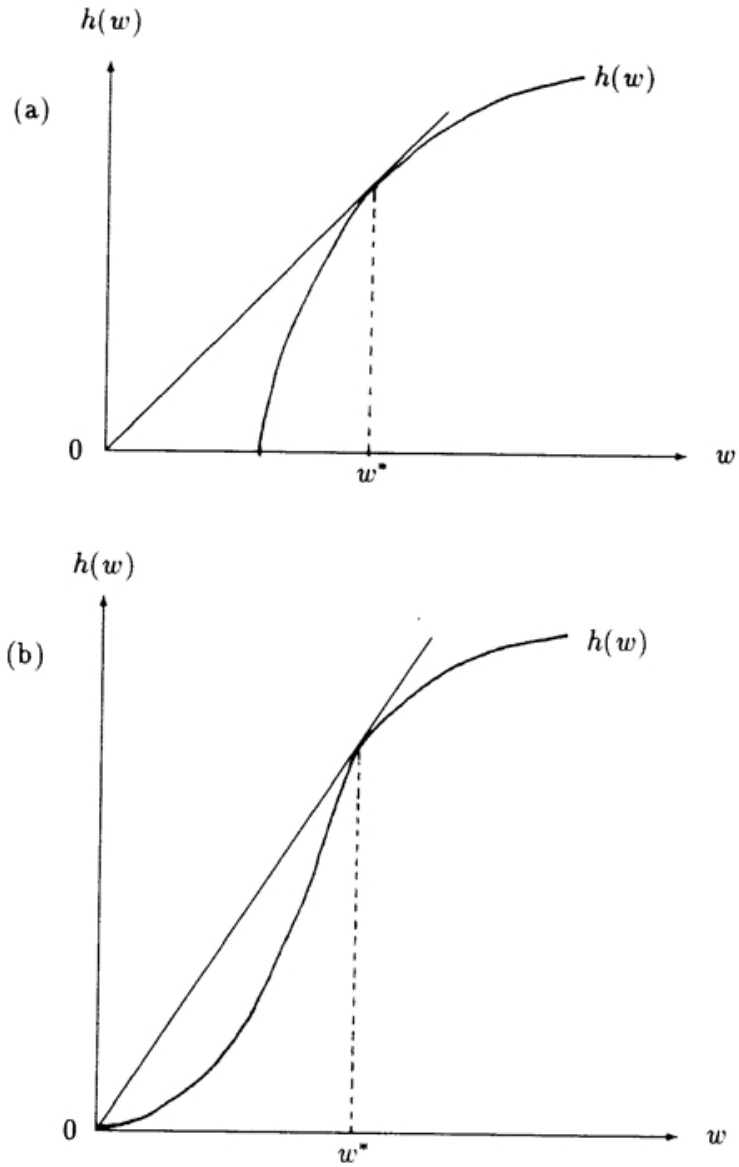

Figure 3.1: The wage-productivity relationship.

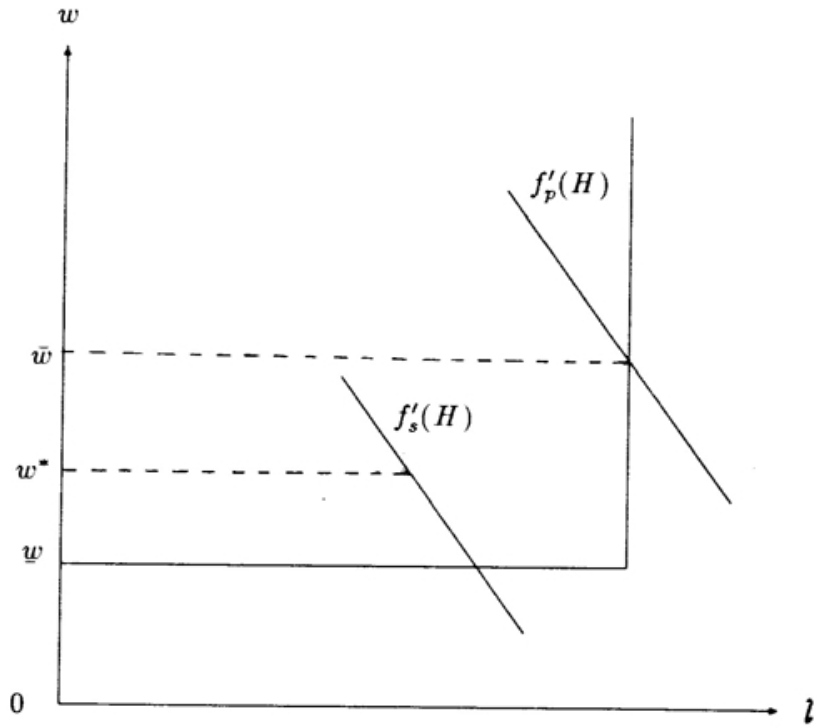

Figure 3.2: The efficiency wage and seasonality.

Chapter 4

Labour Contract in Rural India: a Recapitulation

In Chapter 1 of this thesis I mentioned that the main focus in this thesis is going to be on labour contracts in agricultural labour markets.[1] In view of the seasonality in labour use which is characteristic of traditional agriculture the focus has been further narrowed down to *seasonality and agricultural labour markets.* The two previous chapters, particularly Chapter 2, however, throw up a bewildering profusion of information.

Among them I have chosen to model theoretically:

1. the discrepancy between the "going" wages and reservation wages of labourers in the *slack season*, and

2. the conditions influencing labour tying in agricultural labour markets.

Some general empirical facts regarding village labour markets have been taken as *exogenous data* for the purpose of theoretical modelling. The closed nature of village labour markets, the system of labour recruitment in this market (*bulaana*), and the existence of different systems of payment fall under this category. Most important among these is, however, the absence of explicit collusion among agents and (in the

[1]Note that the word contract is used in the wider sense of the term, to indicate the terms and conditions of hiring labour.

vast majority of the cases) the lack of monopoly power in the hand of either group. This motivated the assumption that the market structure is *competitive*.

Of course, the marked seasonality in employment in rural labour markets has also been taken as exogenous. More importantly, both models make use of the *interdependence* of the slack and peak labour demands of farmers. Thus, whatever the size of the labour force, a part of the population must be unemployed (or withdraw from the labour force) in the slack season. In view of the empirical evidence of the general lack of alternative employment opportunities, the assumption of the existence of involuntary unemployment sounds feasible.

The survey of the theoretical literature on rural labour markets reveals that both the facts presented above have been the subject of considerable theoretical examination, whereas the empirical discussion throws up several interesting questions which have found very limited attention form theorists. In spite of that I have chosen these two characteristics because, I felt, while the importance of seasonality is virtually neglected in the context of the first, it is over-exploited in the context of the second. Further, although certain interesting empirical facts are not the central theme of the theoretical models in this thesis, but they have been at least partially explained by these models. The most important among them is the decay of patron-client relations.[2] The discrepancy between piece rate and daily wage payments and the uniformity of wages in the casual labour market of a village are also partially explained by the model in Chapter 5.

Let us consider casual labour markets first. The co-existence of involuntary unemployment and "high" wages in the casual labour market is essentially confined to the slack season, but few theoretical models of this observed discrepancy even bother to *recognize* the seasonal nature of this phenomenon. The theory of efficiency wages (or, rather, the nutrition-productivity relation) supplies an explanation for involuntary unemployment, but empirical observation of attempts to enforce lower wage payments by farmers makes the relevance of this explanation highly questionable.

On the other hand, the seasonal nature of agricultural production has been exploited heavily by the literature on interlinkage between *credit* and tenancy, labour or

[2] Chapter 6.

crop markets.[3] Perhaps attention was focused strongly on interlinkages because eminent scholars such as Bhaduri [1983], Hayami and Kikuchi [1981] and Bardhan [1984] stressed the importance of interlinked contracts as a response to the peculiarities of production in agricultural labour markets.

Most of the theoretical literature on interlinkages consists of partial equilibrium models of bilateral contracts between two parties. Yet the marked variation in both the incidence of, and the type of, interlinkages displays that there is a need for general equilibrium-type exercises to determine the equilibrium level of incidence of interlinkages in rural markets. The focus being on labour markets in this thesis, I have explored theoretically the equilibrium level of incidence of one form of interlinkage involving labour markets — credit-labour interlinkage or labour-tying — in Chapter 6.

Let me remind the reader that the following exercises are only an illustration of the wide range of possible implications of seasonality in a village labour market. The theme is in no way exhausted by the two theoretical papers presented in Chapters 5 and 6.

[3] Of course, the credit market may be interlinked with more than one market at the same time.

Chapter 5

Wages and Involuntary Unemployment in the Slack Season of a Village Economy

5.1 Introduction

An important feature, characteristic of Indian agriculture, is the downward rigidity of casual labour wages despite the existence of widespread involuntary unemployment. There is a large body of empirical literature that has highlighted this feature, and a number of theoretical models are relevant in the present context, which have been discussed in Chapters 2 and 3 of this thesis.

Briefly, simplistic explanations based on tradition and custom are rejected, for those beg the question of how an "acceptable wage", or the limits to an acceptable wage are determined. Nor is an explanation relying on the notion of minimum subsistence level very illuminating. For one thing, there is sufficient evidence to suggest that the wage exceeds some notion of labourers' *reservation* wage. (See Chapter 2.) Moreover, it is not clear whether minimum subsistence is even a well-defined concept, especially in the context of casual labour.

Bardhan [1979a] has approached the problem in terms of recruitment costs. While it is a highly perceptive model, it suffers from the assumption of a monopsonis-

tic labour market. We do not believe monopsony is the all-pervasive truth regarding Indian rural scenery. Similarly, a caveat applies to nutrition based efficiency wage models (see, eg. Mirrlees [1976], Bliss and Stern [1978a], [1978b], Dasgupta and Ray [1987b]). In casual short-term labour markets, the nutrition-efficiency nexus, which is really a relation operating over time, may fail to be fully internalized.

The purpose here, however, is not to critically evaluate various theoretical developments, but to provide an alternative conceptual approach which appears to be an equally strong contender, especially in the context of casual labour markets. Here the detailed analysis is based on a postulate of *"everyday peasant resistance"*, a concept that has gained currency in the sociological literature (a recent example is the special issue on "Everyday Forms of Peasant Resistance", *Journal of Peasant Studies* **13**, 1986). The recent focus is on

> ... a vast and relatively unexplored middle-ground of peasant politics between passivity and open, collective, defiance ... Under this concept may plausibly be grouped the ordinary weapons of many subordinate groups — ranging all the way from clandestine arson and sabotage, to footdragging, dissimulation, false compliance, pilfering, slander, flight, and so forth. Although varied, such forms of resistance have certain features in common. They require little or no co-ordination or planning ... [and] typically avoid any direct symbolic affront to authority ... Resistance of this kind does not throw up any manifestos, demonstrations and pitched battles that normally compel attention, but vital territory is being won and lost here, too.'[1]

In particular, the notion of "avoidance protest" (Adas [1986]) which is a form of everyday resistance that involves *some cost* to the resistor is explored. It is a form of *social* protest, though it may be carried out on an individual, uncoordinated basis. Here, resistance that takes the form of a *refusal to work for a particular employer* is modelled. Of course, if such a refusal is *too* costly to the potential protester, no such protest will be forthcoming, and this motivates the second major postulate of this analysis: seasonality in agricultural production. I shall argue that it is the *seasonal nature* of agriculture that permits, at one stroke, the existence of widespread involuntary unemployment in the slack, together with credible voicing of protest in

[1] Kerkvliet and Scott [1986].

the peak.

It must be emphasized, at the outset, that *no* collusive or monopolistic elements are present in this model. The objective is to keep faithfully to an idealization of a casual labour market, while generating outcomes which are not "perfectly competitive" in the usual sense of the term.

Briefly, I consider two crop seasons: slack and peak. Labour demand is low in the slack, high (and uncertain) in the peak. There is a large number of farmers (employers) and labourers. In the slack season, a labourer has no option but to accept any wage offer not less than his reservation wage. However, depending on the state of affairs in the peak season, a labourer may decide to refuse to work for the farmers that have been unfair in his opinion, in the sense of paying a "low" wage. (See Section 4.2.2.) The farmers are aware of these possibilities and act accordingly. The objective here is to describe the set of equilibrium slack wages that result.

The analysis has the following broad features:

1. In general, the model predicts a *set* of possible equilibrium wage configurations. This set can be fully characterized. All but one wage configuration in this set involve wage payments that exceed the reservation wage, despite the presence of slack season involuntary unemployment.

2. An increased seasonality in agriculture (defined in a variety of ways) sharpens this phenomenon by expanding the set of equilibrium wage configurations.

3. For each equilibrium, a particular pattern of wage payments is predicted across farmers with different land holdings. This pattern is fully pinned down by the model once it is known how the rates of slack to peak labour demand varies with land size, which is an empirical question.

4. The model predicts sticky money wages, but relatively flexible *real* wages (within some limits). That is, despite the absence of any money illusion, certain changes in the real wage can be created by changes in the price level, while at the same time these changes cannot be effected with a constant price level.

5. The model suggests that output-based contracts, the income components of

which are difficult to accurately estimate, will yield lower income relative to daily wage contracts. An example of such a contract is a piece rate contract.

Some of these implications are present in the detailed village study of Palanpur which will serve as a setting for the theoretical model, and as a partial test for some implications of the theory. In Palanpur casual labour was the only form of labour contract (except, of course, sharecropping). The village labour market was practically closed to outsiders. Monopsonistic or collusive power did not exist among farmers.

In this market, there was a common system for labour recruitment called *"bulaana"*, or literally, "calling". The farmer had to go to the labourer's house to recruit him.[2] This model of offer-refusal fits perfectly into this system. A refusal to work for a particular person is certainly *one* feasible response in this *'bulaana'* framework. Furthermore, such a refusal imposes a natural additional search cost on the employer, particularly in the peak harvesting season where time is of the essence.[3]

More detailed analysis of the data and a later questionnaire survey revealed that *involuntary unemployment* was rife in the slack season in Palanpur. Secondly, analysis of incomes from piece rate payments and time rate payments indicate that *the going slack wage in Palanpur was above the reservation wages for many casual labourers.* For more on this, see Sections 2.6 and 2.7.

Quite apart from this implication, it is of some independent interest that piece rate contracts may yield substantially lower incomes. The model constructed here might throw some light on this finding.

The model is described in detail in the following section, and two special cases are explored in Section 5.2. Section 5.3 contains a discussion of how the set of equilibrium wages varies with the parameters of the system, and also a few possible extensions of the basic model. Section 5.5 concludes the chapter. Formal proofs of the results are relegated to the appendix.

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[2]These features are not unique of Palanpur. For references see Drèze and Mukherjee [1989].

[3]The reader may ask for evidence showing refusals do take place. Unfortunately, the surveyors recorded only those employment contracts that finally materialized. However, they noted that farmers often had difficulties in finding labourers in the peak season.

5.2 A Theoretical Model

5.2.1 Overview

This section introduces a model of a village economy in which labourers may get wages higher than their reservation wages in the agricultural slack season in spite of the existence of involuntary unemployment. As we shall see, the *seasonal* nature of agricultural production will be crucial to the argument.

Consider a village economy where agriculture is the only activity. Crop production takes place in two stages: sowing, weeding, etc. in the *slack season* and harvesting in the *peak season*. The level of activity during the slack is indicative of, but does not fully determine the extent of labour requirements in the peak. Here *Nature* plays a crucial role, and a random parameter Θ captures the effect of uncertainty on peak labour demand (see Section 5.2.3 for details). The *distribution* of Θ is commonly known, but its *value* is realized only in the peak season. Let the cumulative distribution function of Θ be known by $\Pi(\theta)$, and the density function of Θ be $\pi(\theta)$.

No labourer or farmer in the village has the power to affect the total labour demand or supply by their individual actions. Formally, in the model, both labourers and farmers are supposed to be uncountably infinite in number so that their contribution to the labour demand or supply is *infinitesimal* as compared to the aggregate.

The farmer in the model is free to choose the slack season wage he pays, but the peak season wage is fixed at $w_p > 0$ by assumption. The labourers remember the terms of each wage payment by each farmer. All wages, costs and utilities are measured in units of the same homogeneous crop.

The farmers must go to labourers with job offers for recruitment. Assume that there is widespread unemployment in the slack season, so that every labourer accepts a job offer as long as the wage is not less than his reservation wage. However, in the peak season, the labour market is tighter and, *provided that a refusal is not too costly*, a labourer may refuse to accept a job offer from a farmer who, in his opinion, has been "unfair" in the slack season. (See Section 5.2.2 for a further elaboration.) It is the possibility of these potentially costly refusals that guides an employer's choice

of wage levels in the slack season.

5.2.2 The Labourers:

Each labourer supplies one unit of slack season labour inelastically, provided the wage is not less than his reservation wage, which is normalized to zero.[4] The total labour supply in the peak season is denoted by L.

A labourer's total utility is assumed to be a function of

1) his expected wage earnings, and

2) certain beliefs, and actions taken on the basis of these beliefs.

We shall now elaborate on the latter set of factors.

A labourer believes that a farmer is *"unfair"* if he pays a wage lower than the labourer's *"notional fair wage"* in the slack season to *any* labourer. The labourer would like to refuse offers of employment from these unfair farmers in the following peak season and this action would bring him additional utility.

Of course, there are costs involved in making these refusals. In general, the labourer's decision to refuse or accept peak season offers will depend on the following two factors: (1) the tightness of the labour market in the peak season, and (2) the percentage of labour demand coming from farmers who, in *his* view, have been fair.

Let us be more specific. Each labourer is indexed by a number $m \in [0,1]$ (call him labourer m). Labourer m is characterized by his *notional fair wage* w_m. Denote by $Z(w_m)$ the cumulative distribution of the notional fair wage across labourers. In all other respects the labourers are identical. In general the notion of a fair wage is allowed to vary across individuals.[5] Certainly, the case where all labourers have the *same* fair wage can be allowed as a special case.

The refusal decision of the labourer (in the peak) is captured as follows: there is a function $R(P, n_m)$, common to all labourers, which gives the probability that the labourer will refuse an *unfair* farmer, as a function of the *employment rate* in the peak (P), and the percentage of labour demand coming from the fair farmers (n_m).

[4] Assume that all labourers have the same reservation wage, so that all wages are being expressed as deviations from the common reservation wage.

[5] See Kerkvliet [1986] for similar variance among Philippino villagers in the concept of 'injustice'.

Therefore, the probability p_m that labourer m will refuse an offer from an unfair farmer in the peak is given by

$$p_m = R(P, n_m) \tag{5.2.1}$$

where n_m denotes the fraction of peak season demand from farmers who paid a wage of at least w_m in the slack season.

Make the following assumptions on R:

(R.1) R is a continuous function, increasing in P.
(R.2) $R(P, n_m)$ is nondecreasing in n_m.
(R.3) $R(P, 0) = 0$ for all $P \in [0, 1]$.

Assumption (R.1) implies that if the probability of peak season employment increases, then so does the probability that the labourer will refuse an unfair farmer. Assumption (R.2) says that the labourer finds it easier to refuse an unfair farmer, if the strength of fair farmers is higher. The last assumption says that if *all* farmers are unfair in the eyes of the labourer, he does not find it worthwhile to engage in protest, for the costs are simply too high. In life, people who have high standards often fail to meet them, and this need not be an exception. Note that (R.3) simplifies the analysis, but is not really required in the sense that the main ideas of the chapter are completely robust to the relaxation of (R.3).

While these behavioural postulates may seem somewhat arbitrary, there are strong grounds for recommending their use:

1. It is a natural way of capturing a form of avoidance protest discussed in the introduction. It is being postulated here that each labourer *does* have some social norms, and will indeed choose his actions to uphold such norms, provided that such actions are not too costly. In the specific context of this model, the seasonality postulate is crucial. A refusal to work, so costly in the slack season, may not be such a daunting prospect in the peak. It is well-known that such social beliefs, and obedience to such beliefs can have strategic value (see, eg. Frank [1987]). For economic models in the same spirit, see, eg. Akerlof [1980] and Kuran [1987].

2. While the above justification is sufficient (to my mind), one might also regard our postulate as a convenient shorthand for modelling a repeated relationship. Even if labourers do not receive any direct utility from refusing peak season offers, they recognize the importance of such refusals in maintaining the level of the slack season wages. While such a repeated game formulation is attractive,[6] it is eschewed here to focus more directly on the characteristics of the short period equilibrium. One simple way of doing this is to "truncate" the dynamic model by postulating the existence of a "credible refusal" by the labourer provided, of course, that such a refusal is not overwhelmingly costly to him.[7] This is precisely what is done here.

5.2.3 The Farmers:

A farmer is characterized in this model by a number $k \in [0, \infty)$ which represents his level of operational land size *and* farm capital.[8] For brevity, k will be referred to as the farmer's *landholding* or simply *land.* A farmer with land k will be referred to as farmer k. Denote by $\eta(k)$ the cumulative distribution of k. So that the *total* amount of land in the village is

$$\int_0^\infty k \, d\eta(k) < \infty.$$

Consider farmer k. I denote his *labour requirements* in the *slack season* by $\alpha(k)$ and in the *peak season* by $\theta\beta(k)$ respectively, where $\alpha(\cdot)$ and $\beta(\cdot)$ are positive valued functions. Assume that Nature does not affect slack season labour requirement, and affects peak season labour requirement in a multiplicative way. This is only a simplifying assumption. A somewhat more heroic simplification is the inelasticity of labour demand with respect to prices. It should be mentioned that the main results go through if the wage elasticity of labour demand is bounded above, which is a

[6] For a study of the role of punishments in supporting non-myopic equilibrium outcomes in repeated games, see eg. Green and Porter [1984], Abreu [1988].

[7] Similar "truncations" have been exploited, for example, in the literature on international debt repayments. See for example, Eaton and Gersowitz [1980].

[8] By farm capital I mean the implements, machinery, money and labour that the farmer has at his disposal, without hiring or borrowing.

plausible assumption.

Denote by B the integral $\int_0^\infty \beta(k)\, d\eta(k)$.[9] Then if the support of Θ is given by $[\underline{\theta}, \overline{\theta}]$, $\overline{\theta}B$ denotes the maximum conceivable demand for labour. Assume (to avoid complications[10]) that even this magnitude is less than or equal to the available labour supply L, so that

$$\theta B \leq L \text{ for all } \theta \in [\underline{\theta}, \overline{\theta}]. \tag{5.2.2}$$

In the peak season, the *farmer* carries out the search for labour. There are costs to be incurred if he is faced with refusals. These costs are a function of the number of refusals (r) and the farmer's peak season demand for labour (l): call this function $h(r, l)$.

This cost function may assume a variety of forms, depending on the kind of cost that is to be emphasized. Suppose, for instance, that the farmer loses an amount $c > 0$ each time there is a refusal. This "search cost" may be viewed as arising from delaying an operation in which *time* is of the essence. In this context, see, for instance, Binswanger et. al., [1984] which says "... The large yield or quality reductions caused by *delays* in agricultural operations such as sowing, weeding, and harvesting appear to result in competitive pressures on the labour demand side that makes collusion [to fix wages] unsuccessful."[11]

In that case, we may take

$$h(r, l) = c.r \text{ for all } l > 0.$$

Of equal importance in this context is the *loss of output* involved if the number of refusals reach a certain threshold fraction of the farmer's peak season labour demand. Let this fraction be λ. In its simplest form, this type of cost is captured by the function:

$$\begin{aligned} h(r, l) &= H.r \quad \text{if } r \geq \lambda l \\ &= 0 \quad \text{otherwise,} \end{aligned}$$

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[9] Assume that $\beta(k)$ is a bounded-valued function so that this integral is finite.

[10] The only complications relate to modelling of the peak season labour allocations when there is full employment. A model with peak season wage flexibility can easily accommodate this feature.

[11] Note also how the differential recruitment costs make it difficult for the farmers to collude.

where Hr is the output loss, taken to be proportional to the number of refusals.

It is convenient and natural to assume that h satisfies a "constant returns to scale" assumption: that is, $h(\alpha r, \alpha l) = \alpha h(r,l)$ for all $\alpha > 0$. This assumption is satisfied in both the examples above. I also impose the obvious restrictions that $h(0,l) = 0$ and $h(r,l)$ is nondecreasing in r.

Every farmer is aware that the probability of refusal in the peak season is a function of the state of Nature, and the slack season wage paid by himself and others. Assume that no farmer can identify any labourer as being of any particular type, and must therefore assign the same probability of refusal to every labourer that he offers a peak season job to. In the sequel, this probability function will be taken to be the same as the one that is *actually* generated by the behaviour of labourers (Section 5.2.2). For now, assume that each farmer takes the following function as given:

$$p = p(w, \theta, \mathbf{w}). \tag{5.2.3}$$

The value p is the probability that a *peak* season employment offer made by a farmer will be refused by a labourer, *given* that farmer's *slack* season wage offer w, the state of Nature θ, and the entire wage schedule $\mathbf{w}$ in the slack season.

With the assumption of a continuum of farmers, it is immaterial whether one considers the *entire* wage schedule $\mathbf{w}$, or the schedule of wages paid by all *other* farmers. In other words, an individual farmer cannot affect, by his actions, the probability of refusals faced by other farmers.

Assume that each farmer is risk-neutral. Then, noting that the number of refusals, with probability one, is given by pL if L is the peak season labour requirement,[12] the objective of farmer k may be written mathematically as:

$$\min_{\{w:w\geq 0\}} E[\alpha(k)w + \theta\beta(k)w_p + h(p\theta\beta(k), \theta\beta(k))] \tag{5.2.4}$$

Using the constant returns to scale assumption on h, and removing additive terms

[12]This simplification, that pL is the number of refusals with probability one, and not the *expected* number, arises from the supposition that each labourer supplies an infinitesimal amount of labour (relative to labour demand). In the linear examples considered in the following sections, this makes no difference.

that do not influence the farmer's wage decision, this problem is easily seen to be equivalent to

$$\min_{\{w:w\geq 0\}} E[\rho(k)w + \theta c(p(w,\theta,\mathbf{w}))] \tag{5.2.5}$$

where $\rho(k) \equiv \alpha(k)/\beta(k)$.

Let us name this modified cost function of the farmer $C(w,k,\mathbf{w})$.

Note that the conceptual premise embedded in this cost function is that the employer faces potential acceptance or rejection from broad sections of the society, and the identity of the particular workers he is employing are of little consequence in this regard.

5.2.4 Equilibrium

Now it is possible to define an equilibrium for the village economy. First, suppose that a wage schedule $\mathbf{w} = (w(k))$ is given, and consider a particular value of θ. For labourer m, with fair wage w_m, define

$$n(w_m,\mathbf{w}) \equiv \frac{\int_{\{k:w(k)\geq w_m\}} \beta(k)\, d\eta(k)}{B}. \tag{5.2.6}$$

This is equal to n_m, or, the proportion of the peak season labour requirement arising from farmers who are fair in the eyes of labourer m, under the wage schedule $\mathbf{w}$.

Next, observe that the state-dependent employment rate P_θ, is simply

$$P_\theta = \frac{\theta B}{L}. \tag{5.2.7}$$

Recalling (5.2.1) and using (5.2.6) and (5.2.7), it is possible to characterize labourer m's probability of refusal as

$$p_m = R\left(\frac{\theta B}{L}, n(w_m,\mathbf{w})\right) \tag{5.2.8}$$

One can now quickly use (5.2.8) to obtain an *aggregate* "probability of refusal" function, with domain $(w,\theta,\mathbf{w})$. This is

$$p^*(w,\theta,\mathbf{w}) = \int_{w_m>w} R\left(\tfrac{\theta B}{L}, n(w_m,\mathbf{w})\right) dZ(w_m). \tag{5.2.9}$$

The function $p^*(w, \theta, \mathbf{w})$ gives us the overall probability that a farmer who offered w in the slack (when the overall schedule was $\mathbf{w}$) will be refused by a labourer in the peak. Observe that, *ceteris paribus*, $p^*(w, \theta, \mathbf{w})$ is non-decreasing in w.

Now we define an *equilibrium*. This is a wage schedule $\mathbf{w}$ such that for every farmer k,

1. $w(k)$ solves the problem (5.2.5), with
2. $p(w, \theta, \mathbf{w}) = p^*(w, \theta, \mathbf{w})$.

I should point out that Condition 2 of an equilibrium does not necessarily mean that each farmer knows the notional fair wage of each labourer, or even the distribution function $Z(\cdot)$. Of course, the model is perfectly compatible with either of these two informational scenarios. But the model is equally compatible with an informational situation where the farmers *only* anticipate a particular probability (of refusal) function. This is equal to the true one as an equilibrium condition, but the "convergence" of the two to each other is left unmodelled here.

The equilibrium notion takes as exogenous the "fair wage beliefs" of labourers. This is a drawback of the model. A more complete picture would endogenize this, requiring that the distribution of the fair wages must correspond, in some sense, to the set of possible *equilibrium* wages that can arise out of that distribution. This extension is not pursued here.[13]

The reader will easily verify the truth of the following, using (R.3):

Observation: The wage schedule given by $w(k) = 0$ (that is, wage equal to the reservation wage) for all k is always an equilibrium.

The reason is simple. In this situation, using (R.3), the labourers for whom zero is less than their notional fair wage will not be able to refuse any farmer, because for them *all* farmers are unfair. Of course, the labourers who feel that zero is a fair wage will not want to refuse any farmer.[14]

[13] For a model where the notional fair wage is determined endogenously on the basis of the agents' utilities, see Akerlof [1980].

[14] This Observation may not hold if (R.3) is dropped. But our main interest is not in the existence of a reservation wage equilibrium, but in equilibria involving higher wages.

Thus, there is always scope for the whole system to "break down" to what one might call the *trivial equilibrium*. Our main interest is in characterizing *nontrivial* equilibria in which $w(k) > 0$ for at least a positive measure of farmers. This is the task of the next section. However, before moving on, I state a result which may be derived from this general framework.

Proposition 1 *In any equilibrium, if for some* k_1, k_2

$$\rho(k_1) = \frac{\alpha(k_1)}{\beta(k_1)} > \frac{\alpha(k_2)}{\beta(k_2)} = \rho(k_2),$$

then

$$w(k_1) \leq w(k_2).$$

Proof: See Appendix.

This is an intuitive result. For those farmers whose slack season labour requirements are relatively larger, a given probability of refusal function is somewhat easier to tolerate. This is because their peak season labour demands are (relatively) low, and to this extent there is a greater incentive to save on slack season costs.

Insert Table 5.1.

A plot of Palanpur data on operational land holding versus ratio of slack and peak season labour hire, shows an inverse-U shaped pattern. See Table 5.1. One may interpret it like this. The small farms need very little hired labour, and especially in the slack season, most of their labour requirements are met from within the family. The middle farms have somewhat less pressure on land (from within the family) both because of larger land size and social taboos.[15] They are usually not rich enough to purchase machinery replacing labour on a large scale (such as tractors) and do not always have enough work for a full time farm servant. The large farmers are very likely to have farm servants or modern machinery to take care of a substantial part of their slack season labour requirements. This brings about the difference in slack season labour requirements.

[15] Some such taboos are that women must not work on farms, *brahmins* must not touch the plough, etc.

In the peak season there is not such a vast difference in labour requirement per area. There is wide evidence that even small farmers need hired labour in the peak season. Further, the effect of any labour saving technology is diffused more evenly over all landowning groups.[16]

Suppose that we accept this empirical description. Then Proposition 1 yields the following testable description: the large farmers and the small farmers will *never* pay lower wages than the middle farmers.

In the absence of mechanization, large farmer would have higher $\rho(k)$ than small farmers. That big farmers sometimes pay lower wages than small farmers is usually explained in terms of extra-economic power. Here we give an economic reason for such a phenomenon. The following quotation from Kandasamy [1964] shows that phenomena in agreement with Proposition 1 have indeed been observed in the Indian agricultural sector.

> In the peak season the labourers had a better bargaining power ... The "larger" group of farmers had a complaint that "small" group farmers, because of the small size of their lands, did not mind paying higher wages for one or two days and thereby inflated the labour market ...

Of course, it should be noted that all the inequalities of Proposition 1 are "weak", and in no way are incompatible with a uniform wage schedule across farmers. Indeed, a *uniform*, nontrivial, wage equilibrium can always be shown to exist in our model, *whenever* there exists a nontrivial equilibrium with wages bounded away from the reservation wage. A direct examination of the wage data in the case of Palanpur and many other villages[17] supports this uniformity very strongly indeed.

[16] Peak season labour may be replaced mostly by mechanical threshers or harvesters. In Palanpur the services of a thresher are hired out more freely than that of a tractor or a pumpset and there are no mechanical harvesters.

[17] See Drèze and Mukherjee [1989], and the references cited therein, for instance, Bardhan and Rudra [1981].

5.3 A Full Characterization of Equilibria in Some Specific Cases

My goal in this section is to fully describe the set of *uniform* equilibrium wage schedules in two simplified versions of the model. By this I mean equilibrium wage schedules where two farmers of the same type pay the same wage in equilibrium. While I have not been able to eliminate the possibility of "non-uniform" equilibria, these would appear to be of technical interest at best. There is overwhelmingly strong evidence, as mentioned above, for wage uniformity in the literature on village labour markets, at least among similar employers.

In the first case (Section 5.3.1), all the farmers will be assumed to have the same size of land holding k. In the second case (Section 5.3.2), I shall consider farmers with two different land sizes. The analysis reported in Section 5.3.2 also goes through for any finite number of different land holdings. In this section, some additional assumptions are made on Z, the cumulative distribution function of the labourers' characteristics. I also postulate a specific type of refusal function $R(\cdot)$ in Section 5.3.2. In both the cases, a complete picture of the uniform equilibrium set is obtained.

It is shown in Section 5.4, that this set is particularly amenable to "comparative statics" analysis with respect to the parameters of the model.

5.3.1 Identical Farmers

Assume that every farmer in the village holds an identical amount of land, k. By a uniform wage equilibrium we will now equivalently mean an *equilibrium wage* w^*. My purpose is to describe the set of w^*s that can be achieved as an equilibrium.

Define, for each θ ,

$$\bar{R}(P_\theta) \equiv R\left(\frac{\theta B}{L}, 1\right) \tag{5.3.1}$$

I shall first state the main result, then develop its proof in the discussion to follow.

Proposition 2 *The set of possible equilibrium wages is precisely the set of all* $w^* \geq 0$

such that

$$\min_{w\in[0,w^*]} \rho(k)w + \int_{\underline{\theta}}^{\overline{\theta}} \theta c\left(\bar{R}(P_\theta)\{Z(w^*) - Z(w)\}\right) d\Pi(\theta) = \rho(k)w^* \tag{5.3.2}$$

The argument underlying Proposition 2 is very intuitive. Suppose all farmers are paying the same wage w^*. This will be an equilibrium wage if for each farmer, w^* is an optimal wage when rest of the farmers in the village are paying w^*. To write it formally, the notations are changed a little: $p(w,\theta,\mathbf{w})$ may now be rewritten as $p(w,\theta,w^*)$ and $C(w,k,\mathbf{w})$ may be rewritten as $C(w,k,w^*)$. (The sense is quite obvious.) The condition for w^* to be an equilibrium wage is

$$w^* = \arg\min_{\{w:w\geq 0\}} C(w,k,w^*). \tag{5.3.3}$$

Let us first derive the exact form of the function $p(w,\theta,w^*)$. This is the proportion of labourers refusing a farmer who has paid any $w \in [0,\infty]$, given $\Theta = \theta$, is equal to the proportion of labourers for whom

1. w is notionally unfair, and
2. who can punish the offending farmer given that all others pay the same wage, w^*.

Note that labourers may be divided into two groups — those who consider w^* to be unfair, and those who consider w^* to be a fair wage. Their relative strengths in the population are $(1 - Z(w^*))$, and $Z(w^*)$ respectively. For each labourer in the former group, *all farmers are unfair*, and so, using (R.3) we infer that they cannot punish any farmer. For the labourers in the latter group, *practically all farmers are fair* because one farmer's labour requirement is negligible compared to the whole (so that $n(w^*,\mathbf{w}) = 1$). Thus using (5.3.1) and (5.2.9) we have

$$\begin{aligned} p(w,\theta,w^*) &= \bar{R}(P_\theta)(Z(w^*) - Z(w)) && \text{if } w \leq w^* \\ &= 0 && \text{otherwise.} \end{aligned} \tag{5.3.4}$$

Note that no farmer will wish to deviate individually to a wage above w^*, because in that case he will only be increasing slack season wage cost without lowering the peak season refusal probability. The equilibrium condition may then be rewritten using (5.2.5), (5.3.3) and (5.3.4) as:

$$w^* = \arg\min_{[0,w^*]} \rho(k)w + \int_{\underline{\theta}}^{\overline{\theta}} \theta c\,(\bar{R}(P_\theta)\{Z(w^*) - Z(w)\})\,d\Pi(\theta). \qquad (5.3.5)$$

We are now done, for it is easy to see that condition (5.5) is equivalent to the statement of Proposition 2.

Let us specialize to the case where the farmer's cost $h(r,l)$ equals cr for some constant $c > 0$. In this case, define

$$\tilde{e} \equiv \int_{\underline{\theta}}^{\overline{\theta}} \theta \bar{R}(P_\theta) d\Pi(\theta) \qquad (5.3.6)$$

One can now use Proposition 2 to easily obtain the following corollary:

Corollary 1 *In the case where $h(r,l) = cr$ for some $c > 0$, define*

$$f(w) = \frac{\rho(k)}{c\tilde{e}} w - Z(w)$$

and

$$\hat{f}(w) = min_{x\in[0,w]} f(x).$$

Then the set of possible equilibrium wages is precisely the set $\{w^* \geq 0 : f(w^*) = \hat{f}(w^*)\}$.

Insert Figure 5.1: The set of equilibrium wages when $h(r,l) = cr$.

This corollary is easily deduced by simply substituting the specific functional form of $h(r,l)$ in Proposition 2, so a detailed discussion is not included. Figure 5.1 depicts the same result diagrammatically.

This corollary can be written in the following explicit form when $Z(\cdot)$ has a continuous density function (denote the density by $\zeta(\cdot)$). Define $\underline{w}_1 \equiv \inf\{w > 0 : \rho(k)w - c\tilde{e}Z(w) \leq 0\}$,[18] and recursively,

$$\bar{w}_i \equiv inf\{w \geq \underline{w}_i : \rho(k) - c\tilde{e}\zeta(w) > 0\} \qquad (5.3.7)$$

[18] In case the set within brackets is empty, define $\underline{w}_1 = 0$.

$$\underline{w}_{i+1} \equiv inf\{w > \bar{w}_i : \rho(k)w - c\bar{e}Z(w) \leq \rho(k)\bar{w}_i - c\bar{e}Z(\bar{w}_i)\} \tag{5.3.8}$$

as long as the bracketed set in (5.3.8) is nonempty. Stop at the first index n for which this set is empty.

Then the set of equilibrium wages is the set

$$\{0\} \bigcup_{i=1}^{i=n} (\underline{w}_i, \bar{w}_i)^{19}$$

Insert Figure 5.2: Different equilibrium sets for a general distribution function of notional fair wages and $h(r,l) = cr$.

This alternative characterization can be easily deduced by using Corollary 1 and Figure 5.2, and the formal proof is omitted.

Here, I specifically write out two equilibrium sets. In one case $\zeta(w)$ is decreasing throughout (see Figure 5.3) and there are always a smaller number of labourers associated with higher fair wages. It turns out that in this situation, the set of equilibrium wages is always *an interval* and all equilibria are uniform equilibria. To state the result precisely, define

$$\overline{w} \equiv sup\{w \geq 0 : \rho(k) - c\bar{e}\zeta(w) \leq 0\}.^{20}$$

Then $[0, \overline{w}]$ is the set of equilibrium wages, illustrated in Figure 5.2 above.

Insert Figure 5.3: An equilibrium set for decreasing density of notional fair wages, and $h(r,l) = cr$.

Consider next perhaps the most plausible form of density function; namely the inverse U-shaped density function. In this case, the equilibrium set of wages generally *breaks up into two disjoint pieces.*

Let us rule out the case where the trivial equilibrium is the only equilibrium, that is, assume that there exists some $w > 0$ such that $\rho(k)w - c\bar{e}Z(w) \leq 0$.

[19] The reader may check that the number of disjoint intervals in the equilibrium set is at most equal to the number of modes of $Z(\cdot)$ plus one.

[20] When the set within the brackets is empty, define $\overline{w} = 0$.

Define

$$\underline{w} \equiv \underline{w}_1 \text{ and } \bar{w} = \bar{w}_1.$$

Then the set of equilibrium uniform equilibrium wages is $\{0\} \cup (\underline{w}, \bar{w})$.

The significant point in this case is that, apart from the trivial equilibrium, *the set of equilibrium wages is generally bounded away from the reservation wage.* See Figure 5.4.1. That is, wages close to but exceeding the reservation wage are generally not supportable as equilibria. This is not counterintuitive, given that there is some bunching of the density of labourers around some central positive value of the notional fair wage.

Insert Figure 5.4.1: A typical non-trivial equilibrium set when the density of notional wages is inverse U-shaped, and $h(r,l) = cr$.

Insert Figure 5.4.2: The equilibrium set is a uniform equilibrium set.

Of course, there are exceptions to this general rule. As already stated, if $\rho(k)w > c\tilde{e}Z(w)$ for all $w > 0$, then the reservation wage is the only equilibrium wage. On the other hand, if $\rho(k)w < c\tilde{e}Z(w)$ for all $w \in (0, \overline{w}]$, then the set of equilibrium wages reduces to the interval $[0, \overline{w}]$. (See Figure 5.4.2.)

5.3.2 Two Types of Farmers

When farmers are heterogeneous, the argument is somewhat more complicated. However, a careful analysis of the case where there are only two types will extend to a situation where there are an arbitrary (finite) number of types. Accordingly, in this section, a detailed description of the "two-farmer" model is provided. Of course, the feature that *each farmer is negligible* is retained by postulating that there are a large number of farmers of each type.

The landholdings will be denoted by k_1 and k_2. Assume, without loss of generality, that $\rho(k_1) < \rho(k_2)$. (The case of equality leads to exactly the same results as in Section 5.3.1.) Denote by w^* (respectively $w^{*'}$) the equilibrium wages paid by farmers k_1 (respectively farmers k_2). Then it follows from Proposition 1, that

$$w^* \geq w^{*'}. \tag{5.3.9}$$

Let $n \in (0,1)$ be the fraction of total peak season labour requirement coming from farmers k_1. Using the same approach as in Section 5.3.1, define

$$\hat{R}(P_\theta) \equiv R\left(\frac{\theta B}{L}, n\right), \tag{5.3.10}$$

and,

$$\hat{e} \equiv \int_{\underline{\theta}}^{\overline{\theta}} \hat{R}(P_\theta) d\Pi(\theta). \tag{5.3.11}$$

Then $\tilde{e}$ defined in the previous subsection exceeds $\hat{e}$.

I shall follow Section 5.3.1 by stating the main characterization result first, a detailed proof of which is given in the Appendix. The remaining discussion in this section will be used to provide some intuition for this result. Unlike Section 5.3.1, however, an additional assumption on the distribution of notional fair wages is needed, as the technical analysis is of a higher order of difficulty. Specifically, it is assumed that

$Z(\cdot)$ has a continuous density $\zeta(\cdot)$ with support $[0,\infty)$ which is either inverse U-shaped or decreasing throughout.

This assumption does not appear to rule out many relevant cases. It is also assumed that recruitment costs are linear.

As in Section 5.3.1, functions of the form $\rho(k)w - ceZ(w)$ will turn out to be important. Figure 5.5 below is a drawing of the "highest" of these functions; namely, $\rho(k_2)w - c\hat{e}Z(w)$:

Insert Figure 5.5: The function $\rho(k_2)w - c\hat{e}Z(w)$.

Purely for expositional ease, and to ensure there exist some non-trivial equilibria I shall also assume that this function displays a negative value for some part of its domain, as in Figure 5. Define, for any (k,e),

$$\begin{aligned} \underline{w}(k,e) &\equiv inf\{w > 0 : \rho(k)w - ceZ(w) \leq 0\}, \\ \bar{w}(k,e) &\equiv sup\{w \geq 0 : \rho(k) - ce\zeta(w) \leq 0\}. \end{aligned} \tag{5.3.12}$$

Note that these correspond exactly to $\underline{w}$ and $\overline{w}$ as defined in Section 5.1.[21] Now we can state

Proposition 3 *For a monotone increasing, unimodal distribution of notional fair wages $Z(\cdot)$, and two types of farmers with land k_1 and k_2 and labour requirement ratios $\rho(k_1) < \rho(k_2)$, there are two plausible types of equilibria; one, where $w^* = w^{*'}$, and the other where $w^* > w^{*'}$.*

(i) If $w^* = w^{*'}$, then the uniform equilibrium set is given by $\{0\} \cup (w_1, w_2)$, where

$$\begin{aligned} w_1 &= \underline{w}(k_2, \tilde{e}) \\ w_2 &= \overline{w}(k_2, \tilde{e}) \end{aligned} \tag{5.3.13}$$

(ii) If $w^* > w^{*'}$, then

$$\begin{aligned} &w^* \in [w_3, w_4]; \\ &w^{*'} \in [w_3, min\{w_2, w_4\}]; \end{aligned} \tag{5.3.14}$$

describe the equilibrium sets for w^* and $w^{*'}$ respectively. Here

$$w_3 = \overline{w}(k_2, \hat{e}) \tag{5.3.15}$$

$$w_4 = \overline{w}(k_1, \hat{e}). \tag{5.3.16}$$

Some intuition for this result follows:

Insert Figure 5.6.1: The equilibrium set for two types of farmers when both pay the same wage in equilibrium and $h(r,l) = cr$.

First consider the case $w^* = w^{*'}$. Here, just as in Section 5.3.1, all farmers in the village pay the same wage in equilibrium. Hence, any farmer deviating unilaterally from w^* will face the same probability of refusal as in Section 5.3.1. The function $p(w, \theta, \mathbf{w})$ will be the same as the function $p(w, \theta, w^*)$ in Section 5.3.1 and the modified cost function of an individual farmer will also be the same as $C(w, k, w^*)$ defined in Section 5.3.1.

[21] If either of the sets within parentheses is an empty set, define the corresponding value of w to be 0.

Figure 5.6.1 illustrates diagrammatically a typical equilibrium predicted by the above proposition when both types of farmers pay equal wages. The reader can see that the equilibrium set is the intersection of the equilibrium wage sets of farmers k_1 and farmers k_2, each defined in the absence of the other type.

It has already been discussed in Section 5.2.4 why in general the optimal wage of farmers with higher relative labour requirement in the slack is lower. For exactly the same reason, the equilibrium wage set when there are only type k_2 farmers is a subset of the corresponding set for type k_1 farmers.

Insert Figure 5.6.2: An equilibrium with two types of farmers and $h(r,l) = cr$.

In the more complicated case where $w^* > w^{*'}$ let us begin by deriving the refusal probability function for an individual farmer paying any $w \geq 0$, when all other farmers pay w^* or $w^{*'}$ depending on their land holdings. The labourers may be divided into three groups.

1) Those who feel that w^* is not a fair wage. For such labourers, *all* farmers are unfair and therefore, by assumption (R.3), they will be unable to punish a deviant.

2) Those with notional fair wages higher than $w^{*'}$ but lower than w^*. For each of these labourers, $n_m = n$. Given the type of refusal function postulated here, they can punish the unfair farmers only if θ, or peak season labour demand, is sufficiently high.

3) The remainder who feel that even $w^{*'}$ is a fair wage. Although they are the most lenient while deciding which farmer is unfair, they are the ones who can refuse offers most easily, since for them cent percent of equilibrium labour demand arises from fair farmers.

Let us denote the refusal probability by $p(w,\theta,w^*,w^{*'})$. Clearly,

$$\begin{aligned}
&\text{if } w > w^*, && p(w,\theta,w^*,w^{*'}) = && 0 \text{ for all } \theta, \\
&\text{if } w^* > w \geq w^{*'}, && p(w,\theta,w^*,w^{*'}) = && (Z(w^*) - Z(w))\hat{R}(P_\theta) \\
&\text{if } w^{*'} > w > 0, && p(w,\theta,w^*,w^{*'}) = && (Z(w^*) - Z(w^{*'})\hat{R}(P_\theta) \\
& && && +(Z(w^{*'}) - Z(w))\bar{R}(P_\theta).
\end{aligned} \tag{5.3.17}$$

The modified expected cost function may similarly be denoted by $C(w,k,w^*,w^{*'})$

and it is

$$\begin{aligned} C(w,k,w^*,w^{*'}) &= \rho(k)w && \text{if } w \geq w^* \\ &= \rho(k)w + c\hat{e}(Z(w^*) - Z(w)) && \text{if } w^* \geq w \geq w^{*'} \\ &= \rho(k)w \quad + c\hat{e}(Z(w^*) - Z(w^{*'})) & & \\ &\qquad\quad + c\tilde{e}(Z(w^{*'}) - Z(w)) && \text{if } w^{*'} \geq w \geq 0. \end{aligned} \tag{5.3.18}$$

In Figure 5.6.2, I have depicted an equilibrium with two types of farmers paying unequal wages. The cost function of farmers k_2, $C(w,k_2,w^*,w^{*'})$, decreases as w approaches $w^{*'}$, and increases thereafter. In fact, this function achieves its minimum at $w^{*'}$. Therefore, farmers k_2 have no incentive to deviate from $w^{*'}$.

Note that the cost function of farmers k_1, is decreasing in the range $[w^{*'}, w_4]$, and $C(w,k_1,w^*,w^{*'})$ is minimized at $w^{*'}$ in the interval $[0,w^{*'}]$. Therefore, farmers k_1 have no incentive to deviate from w^*. Note that $w^* > w^{*'}$. So, all the necessary conditions are satisfied and both farmers are in equilibrium, paying different wages.

A point of interest is that the farmers' equilibrium sets shrink due to the presence of the other type. The common lower limit for the farmers' equilibrium sets is not only strictly positive, but also higher than the lowest nontrivial wage payable by either type in isolation. The upper limit of the equilibrium set of farmers k_1 is lower than it would have been in isolation. The same will apply to farmer k_2 as well if $\bar{w}(k_2,\tilde{e}) > \bar{w}(k_1,\hat{e})$.

The reader can check that there are no two points in the range below the equilibrium wage where the costs are equal. Therefore, the equilibria depicted here are uniform equilibria.

5.4 How Changes Affect Equilibrium Wages

In this section, we shall conduct a number of exercises to demonstrate the wide range of implications of the model. For most of these exercises, it suffices to consider the one farmer case studied in Section 5.3.1. However, there are some questions of separate interest that concern the interaction between farmers of different types, and for those we shall turn to the model of Section 5.3.2. Although only uniform wage equilibria are considered here, they will be referred to simply as equilibria for brevity.

5.4.1 Seasonality

I have already remarked that the seasonal nature of agricultural production is crucial to this exercise. There are a number of ways to capture an "increase" in seasonality. Two of them are considered here. First, suppose that there is a change in *production technology* so that for all farmers, $\rho(k)$, or the ratio of slack labour demand to peak labour demand *falls* in the one-farmer-type model.

Using Proposition 2, it is easy to establish that :

If the slack to peak labour ratio falls, then the set of equilibrium wages expands. In particular, the highest equilibrium wage increases.

Insert Figure 5.7: Changes in equilibrium sets as the labour requirement ratio falls from ρ to ρ'.

Figure 5.7 illustrates this result for two special cases. Here is a quick proof. (Similar arguments may be constructed for the observations to follow).

Suppose that ρ falls to ρ'. Let w^* be an equilibrium wage under ρ. It remains to show that it is an equilibrium under ρ'. Suppose not. Then, by Proposition 2, there exists a $w' < w^*$ such that

$$\rho' w' + \int_{\underline{\theta}}^{\overline{\theta}} \theta c(\bar{R}(P_\theta)\{Z(w^*) - Z(w')\}) d\Pi(\theta) < \rho' w^* \tag{5.4.1}$$

Because w^* is an equilibrium under ρ, we know that

$$\rho w' + \int_{\underline{\theta}}^{\overline{\theta}} \theta c(\bar{R}(P_\theta)\{Z(w^*) - Z(w')\}) d\Pi(\theta) > \rho w^*. \tag{5.4.2}$$

Combining (5.4.1) and (5.4.2), it follows that

$$(\rho' - \rho)(w' - w^*) < 0. \tag{5.4.3}$$

But this contradicts the twin supposition that $\rho' < \rho$ and $w' < w^*$.

A *second* way of capturing changes in seasonality is to alter the *distribution* of the random variable Θ. This, in turn, admits of two alternative interpretations. First, it may be said there is an increase in seasonality if the stochastic distribution of θ

shifts "to the right", in the sense of first order stochastic dominance. Under this interpretation, it is easy to use Proposition 2 together with the assumptions on the refusal cost $h(\cdot)$ and the refusal probability $R(\cdot)$ and arguments similar to those used above, to show that an increase in seasonality must *expand* the set of equilibrium wages.

Alternatively, one might consider mean preserving spreads of Θ. Under this somewhat less plausible interpretation, an increase in peak season *uncertainty* would be akin to an increase in seasonality. The results here are correspondingly somewhat qualified. The reader can verify, for instance, the following:

If the peak season costs (incurred by a farmer) are a convex function of the number of refusals, and if the refusal probability is convex in the employment rate, then an increase in peak season uncertainty does expand the equilibrium wage set (raising, in particular, the highest equilibrium wage).

increase

5.4.2 Labour Supply

Somewhat related to the issue of seasonality is the total labour supply to the village. If the *supply of casual labour* were to increase *ceteris paribus*, this would decrease the significance of the seasonal component of agriculture.

However, an increased labour supply affects the outcome via a route entirely different from that of seasonality. By reducing the probability of refusal in the peak season, an augmented labour supply makes it more difficult to sustain non-reservation equilibrium wages. Proposition 2 can be used to formally establish that

An increase in labour supply contracts the set of equilibrium wages.

5.4.3 Real wage Flexibility; Money wage Rigidity

This model displays an interesting feature of money wage rigidity coupled with real wage flexibility, despite the complete absence of money illusion. The reason is at once simple and general.

Let the functional forms of the refusal costs and the refusal probabilities be

fixed. Then the distributions $\Pi(\cdot)$ and $Z(\cdot)$ together with the functions $\rho(\cdot)$ and $c(\cdot)$ and other things (such as the informational scenario) describe the economic *"environment"*, E. An equilibrium wage has any meaning only in context to this environment. A crucial part of this environment has so far been kept implicit. It is the unit of measurement, or the *price* of the homogeneous crop.

Let us represent the money wage by ξ. The corresponding real wage is $w = \xi/p$, where p is the price of the crop. Let $W(E)$ be the set of all possible money wage equilibria ξ, associated with an environment E. Recall that a nontrivial equilibrium set is an union of *intervals*. Therefore, for small changes in the environment, the intersection of the old and new money wage equilibrium sets will be non-empty. In case the former equilibrium money wage ξ^* had been lying in that intersection, it will remain unchanged. *However*, the economic environment having undergone a change in the meanwhile, ξ^* now represents a *different* equilibrium.

An individual farmer chooses the money wages in the context of the existing prices, etc. (This distinction was not necessary before.) Observe that once the economy settles on a real wage w, it is not possible to move to another w' by means of unilateral *money* wage changes by individual farmers. That is, the choice of the corresponding money wage ξ is analogous to a Nash equilibrium.

However, consider the same real wage w', but this time brought about by an exogenous change in the price level, that is, $w' = \xi/p'$ for some new p'. In this case, the economy will display w' as the new equilibrium real wage. What could not be effected via changes in the money wage can be effected by a change in the price level, because the latter can mimic a *coordinated* 'deviation' by *all* farmers to a new self-sustaining wage equilibrium.

The model, therefore, predicts that real wage changes are more likely to be brought about by a change in the price level rather than changes in the money wage. There has been a substantial literature in the Indian context which refers to the relatively low rise in agricultural wages as compared to agricultural output and incomes.[22] In Palanpur also, the slack money wage is always slow to rise. It remained unchanged from *kharif* of 1984 to *rabi* of 1987. In the meanwhile, the price

[22]See, for example, Bardhan [1977].

of wheat had increased by about 40%. Such sticky money wages are common in other parts of India as well. For other examples, see Rudra [1982a].

To summarize: the formulation put forward here leads naturally to a situation where a change in the real wage can be brought about by parametric changes, but not by changes in the money wage which remains 'sticky'. To repeat, this occurs in spite of the absence of money illusion.

5.4.4 Piece rate Contracts

In the formal analysis of Section 5.3, it was assumed that *all* labourers observed the wage payments made by farmers in the slack season. After all, it is only after this is known that a judgement on the fairness of a particular farmer is possible. However, this assumption is difficult to maintain if a piece rate contract is offered during the slack season. While the piece rate itself is observable, it may not be possible to precisely infer the implied *income* component from this information. The reason is that the task under contract may be of uncertain difficulty. Consequently, a low observed income accruing to a labourer may be due to: (1) a difficult task (the farmer has been unfair), or (2) poor application by the labourer himself (the farmer may not have been unfair). It follows that *other* labourers are faced with an additional degree of uncertainty in deciding whether the farmer has been fair or not.

The simplest way of capturing this feature within our model is to introduce an additional exogenous probability $h \in (0,1)$, with the following interpretation. If a farmer pays a wage w in the slack season, and if labourer m considers w to be notionally unfair ($w_m > w$), then h represents the probability that labourer m will actually refuse such a farmer, conditional on his being *able* to do so. That is, h is the probability with which a labourer m will judge the farmer to have been unfair. In the model put forward above, $h = 1$. Using this interpretation, it may be shown that:

If a fixed fraction of slack season labour demand is on piece rate contracts, then the equilibrium income under a piece rate contract will be less than daily wage income in equilibrium.

Therefore, this model is suggestive of the fact that if piece rate contracts are

offered side by side with daily wage contacts, the equilibrium income under the former will be lower.

As mentioned earlier, in the majority of cases, income from piece rates is lower than the income from daily wages in Palanpur. One might ask, then, why do we not observe all slack season contracts in the form of piece rates. The answer is simple: all slack season jobs do not have a fully observable output on which to condition the piece rate!

I am not suggesting that this explanation is the *only* reason why piece rate contracts yield a lower daily income. This is only one of a number of alternative explanations. One common explanation, for instance, is that piece rate contracts permit the labourer to consume more leisure. So daily income falls, but the *utility* level of the labourer remains unchanged. Recall, however, that this explanation is of doubtful validity in situations of widespread unemployment (see Chapter 2).

5.4.5 Collusive Behaviour

Suppose that farmers, instead of unilaterally choosing a wage, can pursue joint action in the following sense. A fixed fraction α can form coalitions and jointly decide on the wage. When $\alpha = 0$, this reduces to the model described here. When $\alpha = 1$, we are looking at the case of a single, monopsonistic employer.

It is easy to incorporate this into our model. Consider the homogeneous farmers model of Section 5.3.1, and redefine the notion of equilibrium. A wage w^* is now an equilibrium if *no* group of farmers of size α or less can benefit by *jointly* deviating from w^*. This extension leads to the following comparative statics result.

If $W(\alpha)$ denotes the set of equilibrium wages when coalitions of size α can form, then $W(\alpha) \supseteq W(\alpha')$ whenever $\alpha \leq \alpha'$. Moreover, $W(1) = \{0\}$, so that only the trivial equilibrium is an outcome under perfect farmer collusion.

This result may be in apparent contradiction to Bardhan's [1979a] result on the behaviour of monopsonistic farmers in the presence of recruitment costs. In his model, however, recruitment costs are independent of the farmer's actions, whereas in this model, they are very much related. That is why the two results are so different.

5.4.6 Observations on Two Types of Farmers

I should mention at the outset that all the observations made in Sections 5.4.1 to 5.4.5 are valid in the two-farmer-type case studied in Section 5.3.2. They are, however, more transparent in the one farmer type model of Section 5.3.1. This subsection is restricted to remarks that explicitly concern the interaction between farmers with different land holdings, and paying distinct equilibrium wages. In particular, the effect of a change in the relative strengths of farmers will be discussed. The effect of a change in the labour requirement ratio will also be discussed because the resultant changes in this case will be slightly different from the type of changes discussed in Section 5.4.1.

Let there be two types of farmers — farmers 1 and farmers 2 — with labour requirement ratios ρ_1, ρ_2 respectively, such that $\rho_1 < \rho_2$. Let the relative strengths of the farmers, that is, the proportion of peak season offers from farmers 1 (equal to n) change significantly. An increase in n will induce an upward shift in the equilibrium sets. The common lower bound of the equilibrium sets will rise. So will the upper bound of the equilibrium set of farmers 1, and the upper bound to the equilibrium set of farmers 2 may rise as well. These changes are caused by a shift in the refusal probability function, because refusal decisions are easier to take now.

Consider next the effects of a change *ceteris paribus*, in the labour requirement ratios. This discussion gives an idea of how the equilibrium sets will change with changes in $\Pi(\theta)$, L, or other parameters. Assume that ρ_1 always remains less than ρ_2.

Suppose ρ_1 decreases (increases). The upper bound to the equilibrium set of farmers 1 will rise (fall). The same effect may be obtained on the equilibrium set of farmers 2. The lower bound will not change.

In case ρ_2 decreases (increases), the common lower bound of the equilibrium sets will rise (fall). The upper bound to the equilibrium set of farmers of type 1 will not be affected. The upper bound to the equilibrium set of type 2 farmers may rise (fall).

5.5 Conclusions

To conclude, the main results are summarized.

A village economy is remodelled, and equilibrium slack season wages in the presence of involuntary unemployment are examined. This model draws its inspiration from sociological notions of "everyday peasant resistance", applied to a specific form: refusal to work. In particular, labourers can react to low wage payments in slack by engaging in protest during the relatively tight peak season. However, a refusal to work is not an automatic response, and this decision is conditional on economic factors.

I obtain, in general, a continuum of equilibrium wage configurations. The set of configurations is completely characterized in some specific models. It turns out that all these configurations, barring one, involve wages that exceed the reservation wage, despite the presence of involuntary unemployment.

A number of qualitative observations follow. (1) With heterogeneous farmers, equilibrium wage differentials, if any, can be characterized in terms of slack-to-peak labour demand ratios. (2) Increased seasonality enhances the possibility of wage payments above reservation levels, showing that the seasonal nature of agriculture is crucial to our exercise. (3) Increased labour supply on the other hand, reduces this possibility. (4) The model predicts sticky nominal wages and relatively flexible real wages in the presence of parametric changes, despite the absence of money illusion. (5) The model suggests that piece rate incomes will be significantly lower than daily wage incomes, in equilibrium.

These and other observations are examined with respect to available empirical observations, in particular, the intensive survey carried out for the village Palanpur.

In Palanpur there is a marked seasonality in employment and we have reason to believe that the slack season wage is greater than the reservation wages for some labourers, at least. In Palanpur, as well as in parts of West Bengal the wages have remained unchanged for over a year[23] in spite of price changes in the meanwhile. Significantly lower income for piece rate wages as against daily wages has also been observed in the slack season in Palanpur.

[23]The reader can refer to Rudra [1982a], Drèze and Mukherjee [1989] for instances.

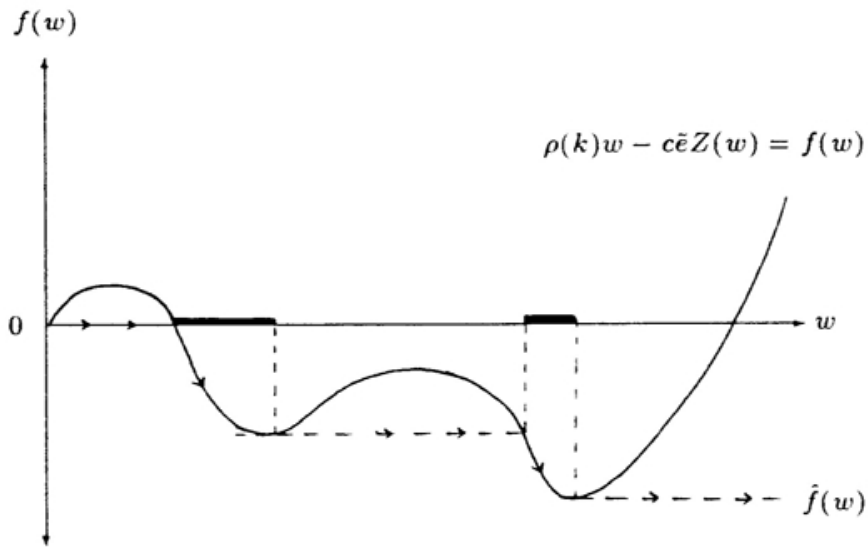


Figure 5.1: The set of equilibrium wages when $h(r,l) = cr$ for all l. Note: Thick lines indicate the equilibrium set.

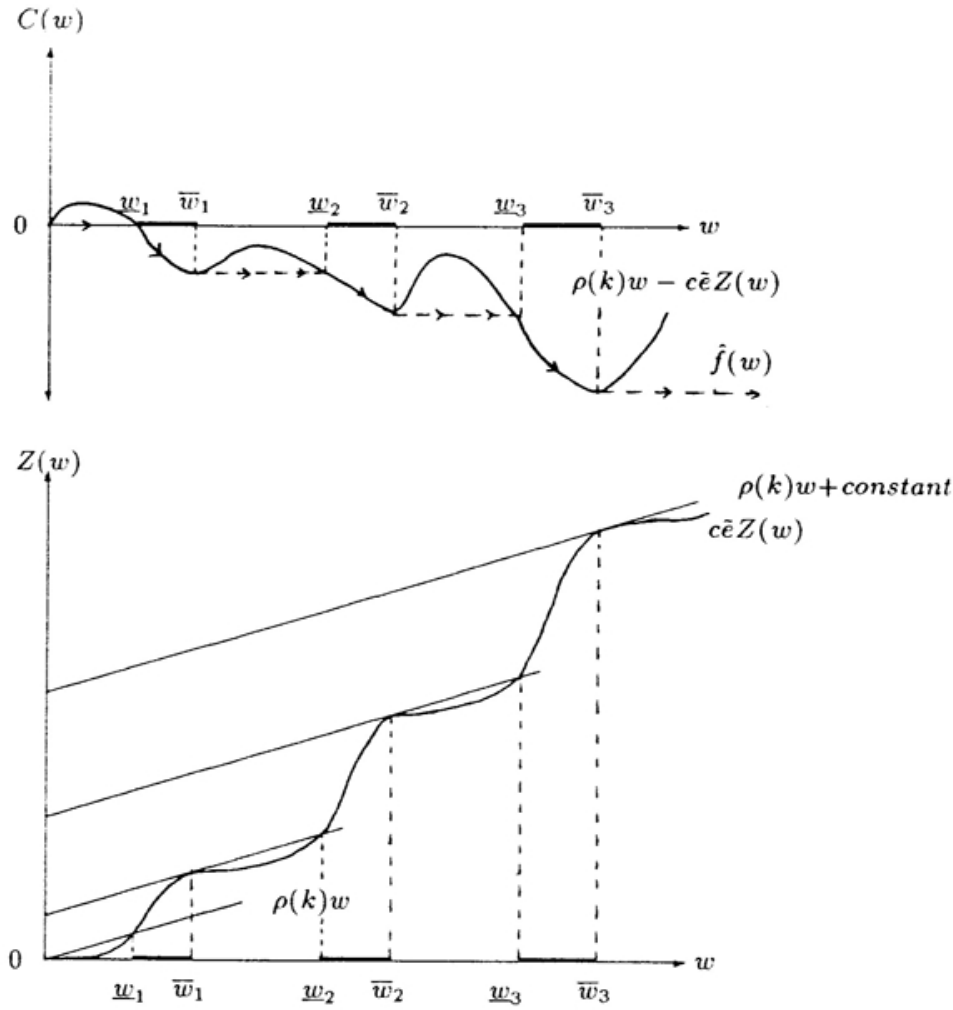


Figure 5.2: The equilibrium set for a general distribution of notional fair wages and $h(r,l) = cr$.
Note: The thick lines indicate the equilibrium set.

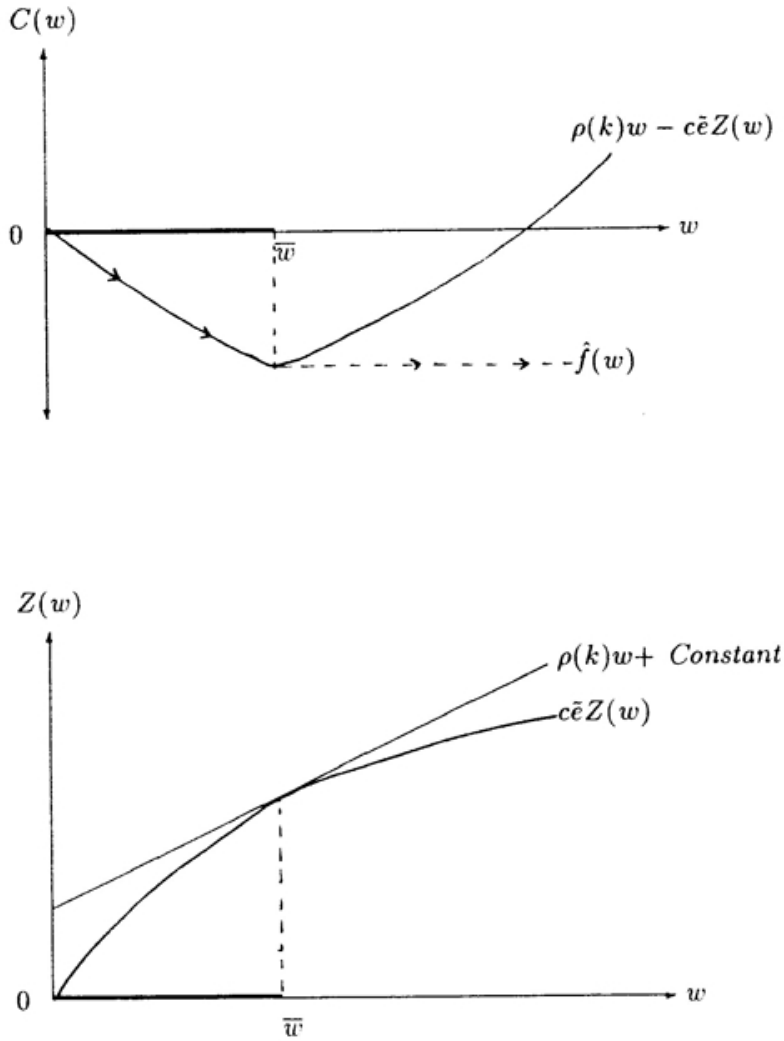


Figure 5.3: An equilibrium set for decreasing density of notional fair wages and $h(r, l) = cr$.
Note: Thick lines indicate the equilibrium set.

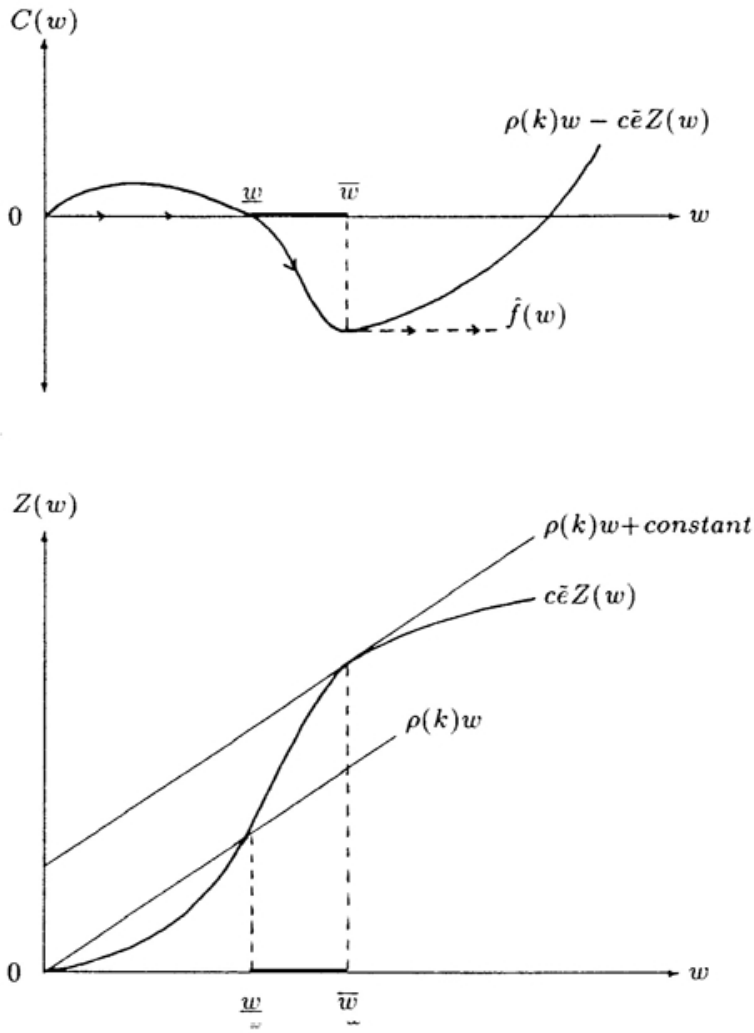


Figure 5.4.1: A typical non-trivial equilibrium set for inverse U shaped density of notional fair wages, and $h(r,l) = cr$. Note: Thick lines indicate the equilibrium set.

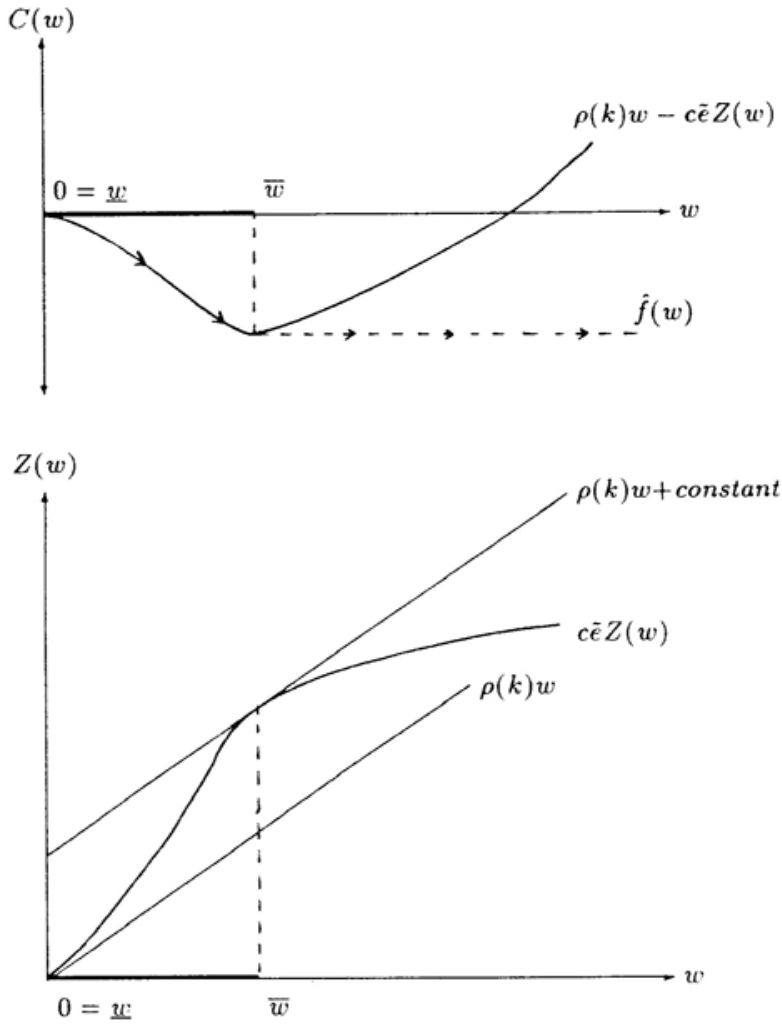


Figure 5.4.2: The equilibrium set is a uniform equilibrium set. Note: Thick lines indicate the equilibrium set.

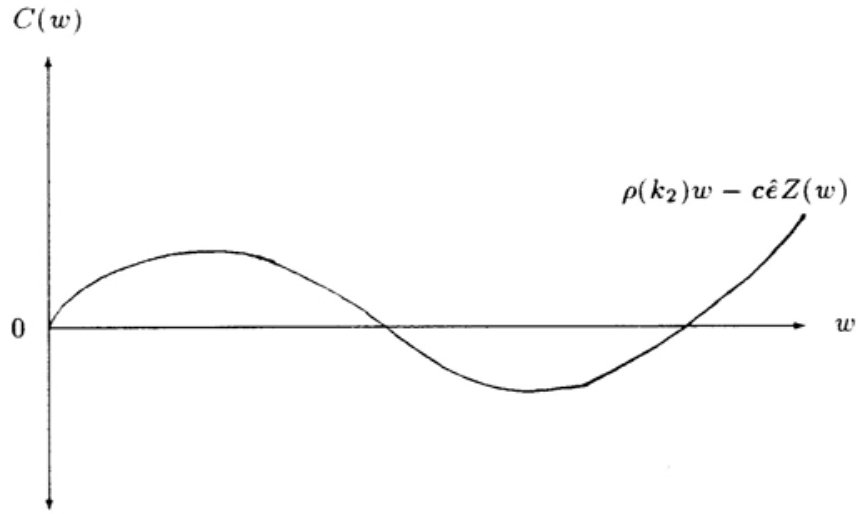


Figure 5.5: The function $\rho(k_2)w - c\hat{e}Z(w)$.

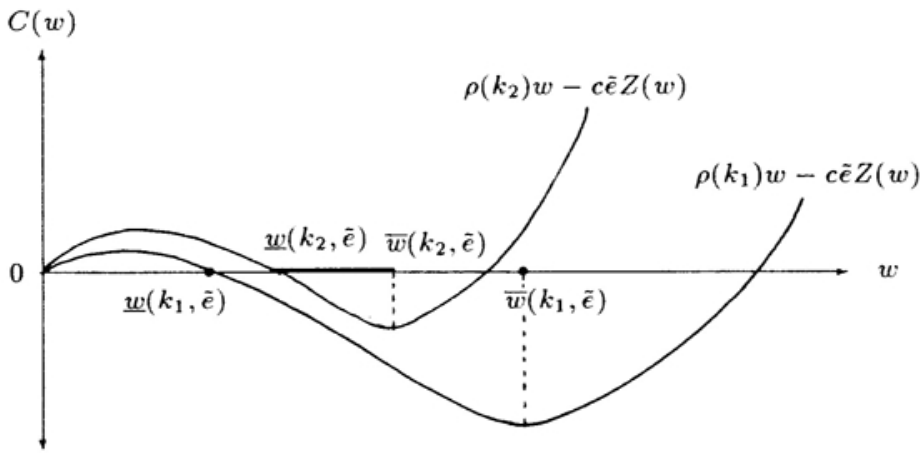


Figure 5.6.1: The equilibrium set for two types of farmers when both pay the same wage, and $h(r, l) = cr$.
Note: Thick lines indicate the equilibrium set.

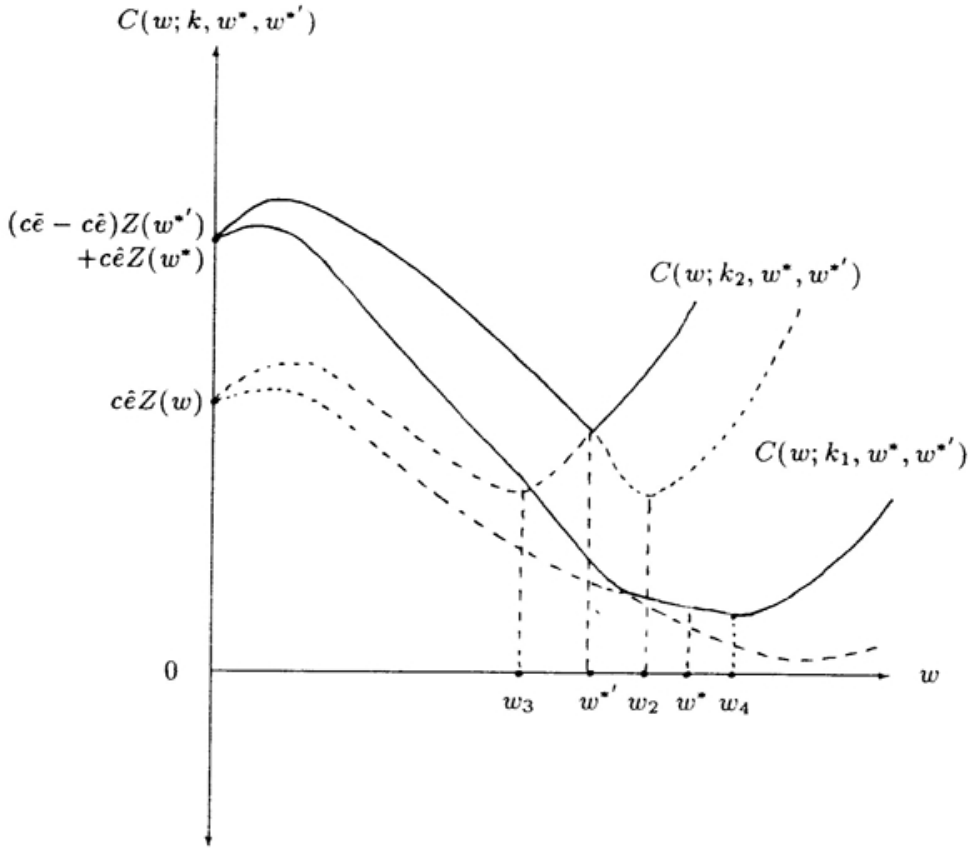
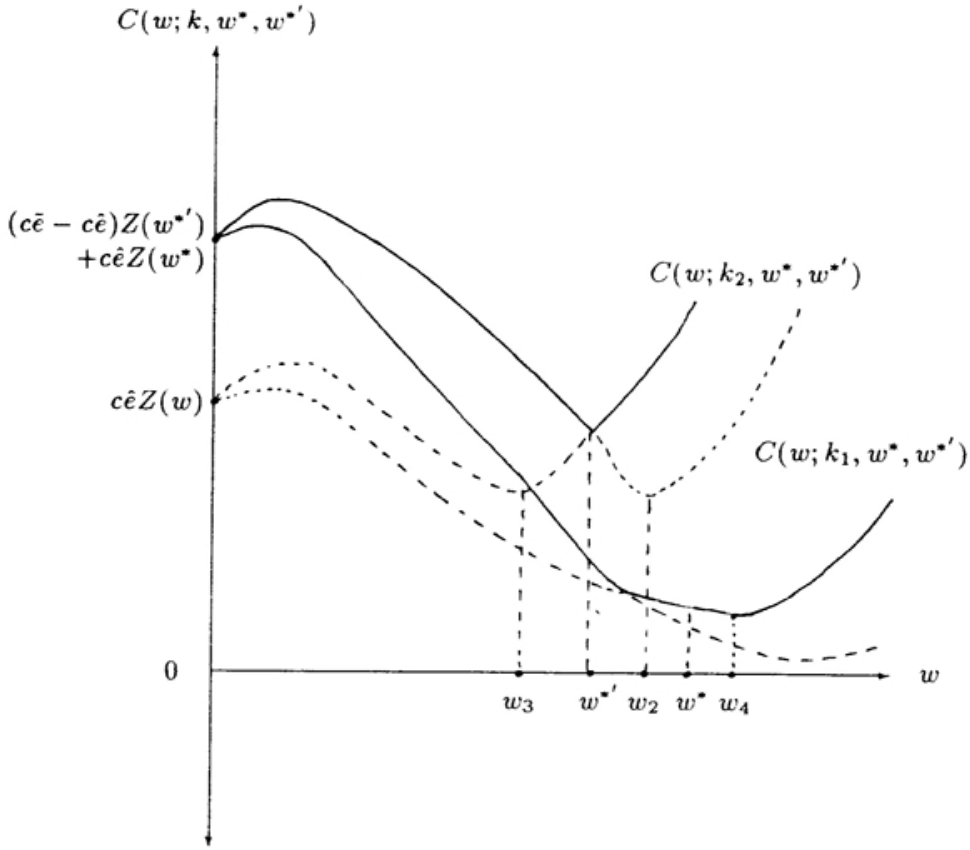


Figure 5.6.2: An equilibrium with two types of farmers, and $h(r, l) = cr$.
Note: The solid lines represent the cost functions.



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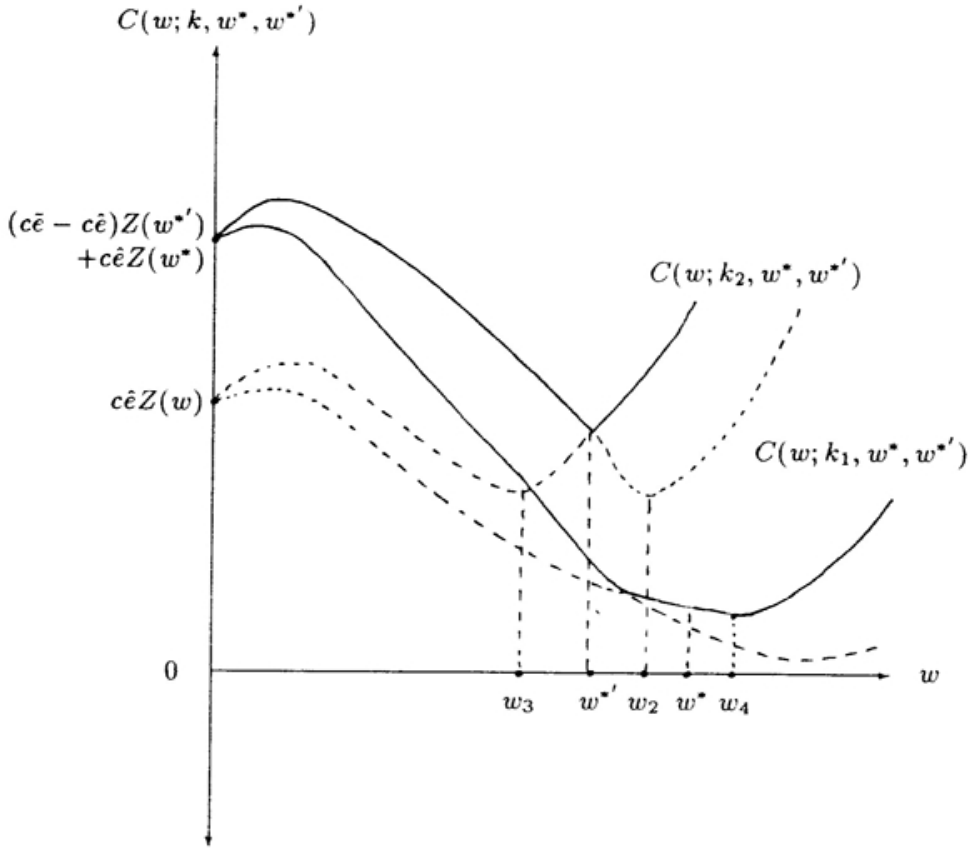

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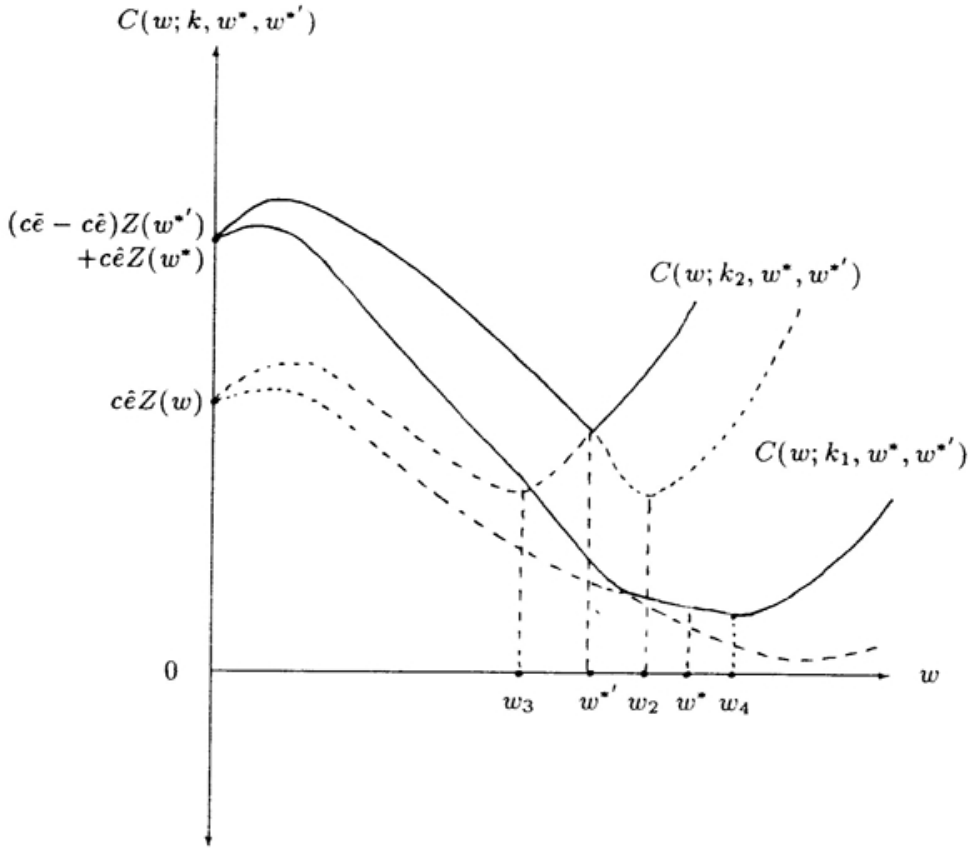

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Note: The solid lines represent the cost functions.

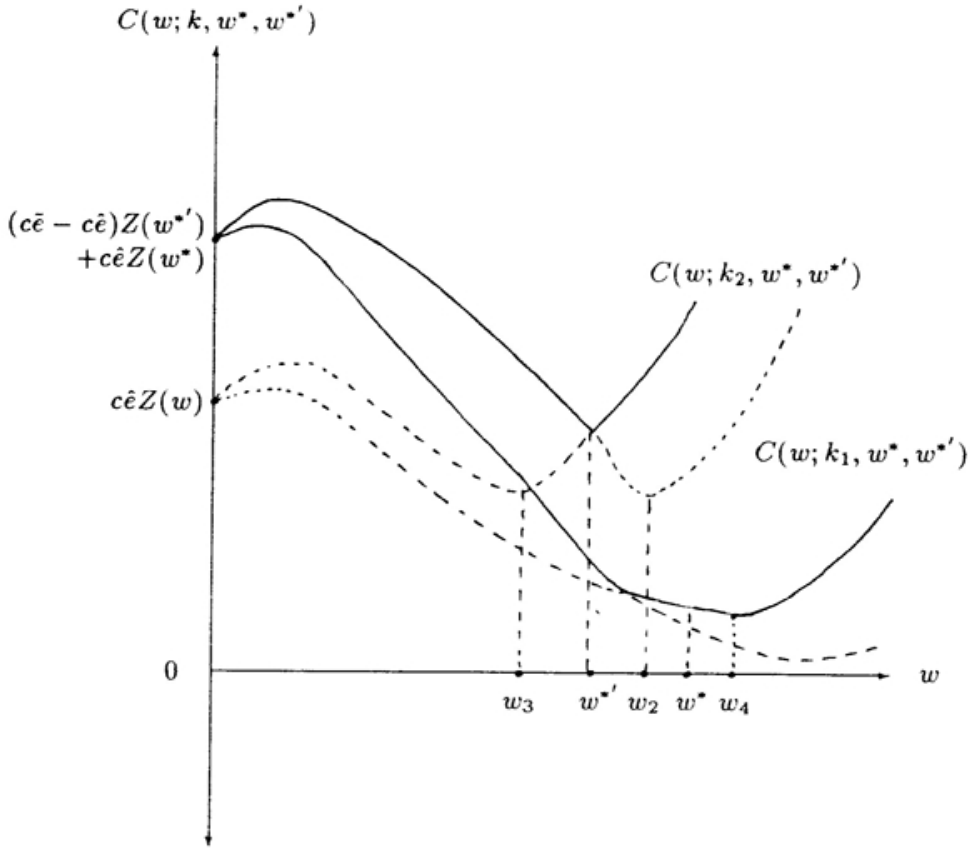

Figure 5.6.2: An equilibrium with two types of farmers, and $h(r, l) = cr$.
Note: The solid lines represent the cost functions.

work suggests that the activity level (measured by the number of labourers used daily) will be lower in the slack season than in the peak season. Indeed this has adequate empirical confirmation[7] and justifies the terminology "slack" and "peak"!

It will be assumed that slack and peak labour are applied in fixed proportions $\alpha : 1$ (where $\alpha < 1$), and this composite unit of labour will be termed (one unit of) *effective labour*. Output is taken as a function of effective labour,[8]

$$Y = F(n),$$

where $F(\cdot)$ is a twice continuously differentiable, increasing, strictly concave function such that $F'(0) \to \infty$ and $F'(n) \to 0$ as $n \to \infty$.

All farmers discount profits at the end of each slack or peak season by a discount factor $\delta \in (0, 1)$, and are taken to be risk-neutral expected profit maximizers. Assume there are uncountably infinite such farmers in the economy and that the labour used by each of these farmers is infinitesimally small with respect to the aggregate. I will label a farmer using the index $i \in [0, 1]$. All variables relating to that individual will be suffixed by i. The suffix i will be omitted in general because all farmers are identical, but it will sometimes be convenient to use it.

Denote by C the discounted cost of using one unit of effective labour for a year. I emphasize right away that C will be endogenized in the sequel. Each farmer's objective is:

$$\max \ \delta F(n) - n.C.$$

The cost of a unit of labour will depend on the type of labour used as input and the wages to each of these types. Accordingly, I now describe the types of labour contract used in this economy.

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[7] See, for instance, the agricultural crop calendars given in Reddy [1985] and Breman [1974]. See also Bharadwaj [1974] and Chapter 2 of this thesis.

[8] At this stage of the exercise it is assumed that all other inputs are fixed and available equally to all farmers. Relaxation to permit heterogeneity among farmers is a straightforward exercise. The model also permits an extension to other variable inputs such as supervisory labour, which are ignored here for ease of exposition.

6.2.2 Types of labour contract

There are *two types* of labour contracts in this economy: the *casual* labour contract and the *tied* labour contract. There can be two sub-types of tied labour contracts: fully tied and semi-tied, to be defined presently.

The casual contract is characterized by spot market hire. The labourer's relation with the employer ends as soon as the work is done. The tied labourer is assumed to be hired for *at least a year*, on a contract that is potentially renewable and is *always* hired at the outset of the slack season. I take it that no tied jobs are ever offered in the interim period. The employer engages the services of the semi-tied labourers for only the peak season, whereas he engages the service of the fully tied labourer for the entire year. We shall see that, there is, in principle, scope for both types of labour tying.

I wish to reiterate that "tied labour" in this context refers to a type of long-term attachment that has no special (supervisory) tasks associated with it. Tied labor here is fully substitutable by casual labour so far as *tasks* are concerned. Tied labour that is used for supervision requires a different analysis, some indications of which are provided in a later section.

The tied contract spells out terms of payment $(\underline{w}, \tilde{w})$ to fully tied labourers and $(\underline{x}, \tilde{x})$ to semi-tied labourers. The tied labourer may remain with the same employer for his entire "lifetime" which has been assumed to be infinitely long for the sake of convenience. On the other hand, a tied labourer and employer are both free to terminate the contract at the end of any year. The rate of quit due to *exogenous factors* (that is, not including voluntary termination) for both types have been assumed to be equal to $q \in (0, 1)$.

However, *voluntary* quits may also take place. Such quits will be called *non-fulfillment* of contract. In contrast to the standard analysis of tied agricultural labour contracts, I assume that the employer has no non-economic power to ensure fulfillment of contracts.[9] The farmer always makes the payments to the labourer for the relevant season at the *end* of that season. Thus, if there is any deviation from

[9]The possibility of contractual non-fulfillment on the farmer's side has also been ruled out by assumption.

a contract during a season, the employer does not have to pay the labourer for that season. But this, coupled with possible contract termination, is assumed to be *all* that the employers have as punishment devices. A contract which ensures fulfillment by the means of adequate economic incentives will be called an *incentive compatible contract*. Such contracts will not have any voluntary quits.

For the discussion to proceed further it is necessary to describe the characteristics of labourers.

6.2.3 The Labourers

I assume that a typical labourer is risk-averse (or more precisely, since this analysis is going to abstract from uncertainty, averse to fluctuations in income). They receive utility from income and leisure and discount future utilities after each peak or slack season.

Fluctuation-aversion is captured, as usual, by postulating a utility function of labour that is strictly concave in income earned. Workers possess one unit of leisure that is supplied indivisibly to the labour market. The utility function of income w conditional on labour supply is given by $u(w)$; $u(w)$ is defined over the nonnegative part of the real line, it is strictly concave and twice continuously differentiable, with $u(0) = 0$, $u'(\cdot) > 0$ and $u''(\cdot) < 0$. It is also assumed that $\lim_{w \to 0} u'(w) = \infty$ and $\lim_{w \to \infty} u'(w) = 0$. Labourers enjoy a fixed utility u_0 from uninterrupted leisure for a season. Therefore, to work during any season as a casual labourer, the worker must be paid at least a wage w_0, where $u(w_0) \equiv u_0$.

So for any wage at least equal to w_0, the labourers supply one unit of labour inelastically. Each labourer's supply of labour is infinitesimally small with respect to the whole. The total volume of labour supply forthcoming from the economy for any $w \geq w_0$ is L_0. Thus the aggregate supply curve of labour may be written as follows:

$$\begin{aligned} L(w) &= L_0 \quad \text{for all } w \geq w_0 \\ &= 0 \quad \text{otherwise.} \end{aligned} \tag{6.2.1}$$

6.2.4 Availability of different jobs and lifetime utilities

Consider the start of any slack season. Three types of contracts are available to a presently unemployed labourer:

1) employment as a fully tied labourer at wages (w_*, w^*). Such contracts are available with probability p_1,

2) employment as a semi-tied labourer at wages (x_*, x^*). Such contracts are available with probability p_2,

3) remaining in the spot market with probability $(1 - p_1 - p_2)$. This last option means that the worker will receive the utility of a casual labourer over slack and peak seasons (given full casual wage flexibility). If casual wages are given by $(\underline{w}, \bar{w})$, this utility is $u(\underline{w}) + \delta u(\bar{w})$.

While these wages and probabilities are treated as exogenous at the moment, later they will be derived endogenously on the basis of the agents' behaviour given the parameters described in Sections 6.2.1 and 6.2.3.

Let V_* denote the lifetime utilities of such a labourer facing these probabilistic options. Let W_* denote his lifetime utility conditional on being offered a fully tied labour contract, and let X_* denote his lifetime utility conditional on being offered a semi-tied labour contract. Assume, without loss of generality, that $u_* \equiv u(w_*) + \delta u(w^*)$ and $u_x \equiv u(\underline{w} + x_*) + \delta u(x^*)$ are not less than $\underline{u} \equiv u(\underline{w}) + \delta u(\bar{w})$, otherwise tied labour contracts will not ever be taken up.[10] Then any offer of employment as a tied labourer of either type is always accepted. It is also assumed that no labourer can switch jobs, that is, only an unemployed labourer will get a job offer.[11] Then it is easy to see that the three lifetime utilities are related in the following way:

$$V_* = p_1 W_* + p_2 X_* + (1 - p_1 - p_2)(\underline{u} + \delta^2 V_*). \tag{6.2.2}$$

$$W_* = u_* + \delta^2(qV_* + (1 - q)W_*), \tag{6.2.3}$$

[10] An equivalent assumption is, of course, $W_* \geq V_*$ and $X_* \geq V_*$. There is no loss of generality. If some tied contract offers a lower utility than casual labour, this can be exactly simulated by setting employment probability equal for that category equal to zero.

[11] The model can be easily modified to accommodate this feature, but it is by-passed to get on with the exposition.

and

$$X_* = u_x + \delta^2(qV_* + (1-q)X_*). \tag{6.2.4}$$

Equations (6.2.2) to (6.2.4) are largely self-explanatory, but an additional word of explanation is offered here. The equations presume that no worker wishes to *voluntarily* quit his job between the slack and peak seasons. This presumption will be borne out in equilibrium, therefore no generality is lost by using this expository simplification.

Let $\mathbf{z}$ be the vector of variables $(\underline{w}, \bar{w}; w_*, w^*; x_*, x^*; p_1, p_2, q)$ facing the agents in the economy. Given (6.2.2) to (6.2.4), it is possible to write the closed-form solutions to V_*, W_* and X_* as $V_*(\mathbf{z})$, $W_*(\mathbf{z})$ and $X_*(\mathbf{z})$ respectively. In particular,

$$V_* = \frac{p_1 u_* + p_2 u_x + (1-p)(1-\delta^2(1-q))\underline{u}}{(1-\delta^2(1-q))(1-\delta^2(1-p)) - \delta^2 pq}, \tag{6.2.5}$$

where $p = p_1 + p_2$.

6.2.5 The farmer's choice of contract

An individual employer takes as *given* the economy-wide prevalence of wages in different contracts, as well as the employment probabilities and the quit rates. That is, he takes $\mathbf{z} \equiv (\underline{w}, \bar{w}; w_*, w^*; x_*, x^*; p_1, p_2, q)$ as given. The employer's task is to hire labourers using a contract (or contracts) most advantageous to him.

The reader will already see what is to be the basic component of the equilibrium notion. It is that each employer's choice of contract, given $\mathbf{z}$, must be "aggregated" across employers to give rise to $\mathbf{z}$ itself! To work toward this, it is necessary to describe first the behaviour of employers as a response to the *going* vector $\mathbf{z}$.

Consider an individual employer in a regime where the going vector is $\mathbf{z}$. Recall that each farmer is infinitesimally small with respect to the aggregate, so his choices will not affect the going vector. Suppose he is considering the offer of a fully tied contract to currently unemployed labourers in the slack season. Denote by $(\underline{w}, \tilde{w})$ his offer, and by $\underline{W}$ the expected lifetime utility of a labourer who accepts that offer.

A closed-form expression for $\underline{W}$ is easy to find. Assuming for the moment that no labourer will willingly deviate from contractual terms (this will indeed be true in

the sequel), and writing $\underset{\sim}{u} \equiv u(\underset{\sim}{w}) + \delta u(\tilde{w})$,

$$\underset{\sim}{W} = \underset{\sim}{u} + \delta^2 q V_* + \delta^2(1-q)\underset{\sim}{W}. \tag{6.2.6}$$

That is, the labourer enjoys the contract for the current year (obtaining utility $\underset{\sim}{u}$), and in the next year, will continue the contract with probability $(1-q)$, obtaining $\underset{\sim}{W}$, or discontinues with probability q, obtaining V_*. These latter terms are suitably discounted. Note that the worker's lifetime utility upon quitting is V_*, depending upon the *going* wages (w_*, w^*) and (x_*, x^*) rather than those offered by the individual farmer under consideration. The chance of being re-employed by the same farmer controlling an insignificant proportion of the market is zero.

For the contract to prevail (and indeed, this will justify (6.2.6)), it must be, first, *acceptable* to the worker, and second, *incentive compatible*, so that its fulfillment is ensured. The *acceptability constraint*

$$\underset{\sim}{W} \geq V_* \tag{6.2.7}$$

requires no explanation. Consider the incentive constraint.

In principle, the worker may deviate from a tied contract in two ways. First, after having accepted the contract he may choose to work as a casual labourer elsewhere during the slack season.[12] [13] Second, after having accepted the contract *and* having fulfilled it for the slack season, he may accept a peak-season casual job. In either case, the employer terminates the contract, with no payment for the season in which the deviation occurred, and the worker is returned to the casual labour market. We take it that the worker returns "unscarred", and can obtain any type of contract thereafter in the same way as any other labourer.

Given this description, it is obvious that the first of the two incentive constraints is *implied by* the acceptability constraint, and there is no need to examine this any further. "Peak season incentive compatibility" is, however, different. It requires that the tied labourer should not want to quit at the onset of the peak season, after

[12] This option does not have to be considered, of course, for semi-tied contracts.

[13] He may enjoy leisure, too, but since slack season casual wages always compensate exactly for leisure utility, this option is subsumed under the above deviation.

having received $\underline{w}$ in exchange for his labour in the slack season. Formally,

$$u(\underline{w}) + \delta u(\bar{w}) + \delta^2(1-q)\underline{W} + \delta^2 q V_* \geq u(\underline{w}) + \delta u(\bar{w}) + \delta^2 V_*$$

or,

$$u(\bar{w}) + \delta(1-q)\underline{W} \geq u(\bar{w}) + \delta(1-q)V_*. \tag{6.2.8}$$

A contract $(\underline{w}, \bar{w})$ satisfying (6.2.7) and (6.2.8) will be called an *incentive compatible contract* for the fully tied labourer.

In what follows, I take it that the employer must *always* respect the incentive-compatibility constraint whenever he offers a tied contract. Of course, this is not an assumption at all if the peak season casual labour market is active! But this constraint is imposed *even if* the going size of the casual labour market is zero. This is because the equilibrium concept should be "robust" to the presence of "small" activity in the casual market. An equilibrium not satisfying this constraint would be destroyed by a tiny perturbation of the model.[14]

Similarly I define an incentive compatible contract for the semi-tied labourer. The acceptability condition is

$$\underline{X} \geq V_*, \tag{6.2.9}$$

and the incentive compatibility condition, after some manipulation, reads as

$$u(\tilde{x}) + \delta(1-q)\underline{X} \geq u(\bar{w}) + \delta(1-q)V_*. \tag{6.2.10}$$

The employer's objective may now be described: find the cost-minimizing incentive compatible contracts of each type — $(\underline{w}(\mathbf{z}), \bar{w}(\mathbf{z}))$ and $(\underline{x}(\mathbf{z}), \tilde{x}(\mathbf{z}))$,[15] and then settle on the mix of contracts in the following way. Observe that the choice of casual workers in the peak season versus semi-tied labour tying depends on which is lower: $\delta\bar{w}$ or $\underline{x}(\mathbf{z}) + \delta\tilde{x}(\mathbf{z})$. Similarly, the choice of casual workers in slack and peak seasons combined versus fully tied contracts depends on the lower of the three unit costs:

[14] This robustness criterion is similar to the notion of perfection widely used in game theory. See eg. Selten [1975].

[15] Notice that the incentive constraints are strictly concave, given the strict concavity of the utility function. Therefore, the minimization problem described above will have a unique solution making it legitimate to write the cost-minimizing choice of the farmer as a function of z.

$\underline{w} + \delta\bar{w}$, $\underline{w}(\mathbf{z}) + \delta\tilde{w}(\mathbf{z})$ and $\underline{w} + \underline{x}(\mathbf{z}) + \delta\tilde{x}(\mathbf{z})$. So the unit cost of effective labour, $C(\mathbf{z})$ is given by

$$\begin{aligned} C(\mathbf{z}) \equiv \quad & \alpha \min\{\underline{w}(\mathbf{z}) + \delta\tilde{w}(\mathbf{z}), \underline{w} + \underline{x}(\mathbf{z}) + \delta\tilde{x}(\mathbf{z}), \underline{w} + \delta\bar{w}\} \\ & + (1-\alpha)\min\{\underline{x}(\mathbf{z}) + \delta\tilde{x}(\mathbf{z}), \delta\bar{w}\}. \end{aligned} \tag{6.2.11}$$

This is the unit cost which the farmer will use to choose the number of effective units of labour that he hires.

6.2.6 Equilibrium

Denote by T_1 and T_2 the economy-wide *quantities* of labour tied under fully tied and semi-tied contracts, and by L and $\bar{L}$ the amount of casual labour hired in the slack and the peak seasons respectively. Let $\mathcal{L}$ denote the vector $(T_1, T_2, L, \bar{L})$.

An equilibrium is a vector $(\mathbf{z}, \mathcal{L})$ such that the following are satisfied: first,

$$p_j = \frac{qT_j}{L_0 - (1-q)(T_1 + T_2)}, \qquad j = 1, 2. \tag{6.2.12}$$

This condition simply says that the perceived probability of gaining employment in any category of tied labour must equal the total number of vacancies in that category divided by the total number of job-seekers.

Next,

$$(\underline{w}(\mathbf{z}), \tilde{w}(\mathbf{z})) = (w_*, w^*) \tag{6.2.13}$$

and

$$(\underline{x}(\mathbf{z}), \tilde{x}(\mathbf{z})) = (x_*, x^*) \tag{6.2.14}$$

are conditions that simply state that the going contractual offers are "self-fulfilling", that is an individual farmer reacting to these offers will choose the same offers himself. I reiterate that the definition of a "self-fulfilling" contract *includes* the incentive-compatibility constraint whether or not the casual labour market is active in the peak season. This is because the equilibrium should be robust to small variations in casual market activity (recall the discussion following (6.2.8)).

Finally, we have the macroeconomic balance conditions:

$$L \leq L_0 - T_1 - T_2, \quad \underline{w} \geq w_0, \quad (L_0 - (T_1 + T_2) - L)(\underline{w} - w_0) = 0; \tag{6.2.15}$$

and

$$\bar{L} \leq L_0 - (T_1 + T_2), \quad \bar{w} \geq w_0, \quad (L_0 - (T_1 + T_2) - \bar{L})(\bar{w} - w_0) = 0. \qquad (6.2.16)$$

These conditions state that the spot wages in slack and peak adjust so that there is no excess demand for effective labour when the discounted cost of effective labour is evaluated at the equilibrium $\mathbf{z}$. It also ensures that workers either do not wish to or are not able to displace another by undercutting contractual terms.

Obviously, given (6.2.15) and (6.2.16), labourers will not be *willing* to undercut the casual wages. The labourers will not be *able* to undercut the wages for tied labour even if they want to, because the incentive compatibility of contracts ((6.2.13) and (6.2.14) ensure that the contractual wages are the "lowest-possible" incentive compatible wages) will be violated.

6.3 Equilibrium Labour Tying and Casual Labour

A basic characteristic of the model is that it yields, in a natural way, the *co-existence* of tied and casual labour under a minimal set of assumptions. In particular, the casual labour market is never wiped out entirely. Unlike the standard models, *this is true in spite of the absence of uncertainty in labour demand and*[16] *irrespective of the degree of seasonality.*

I have already noted in the introduction that the standard model of agricultural labour tying must fundamentally rely on uncertain variations in labour demand to explain *any* casual labour at all. I argued that such models greatly overestimate, *a priori*, the incidence of labour tying. The results here are more "primitive": because of the incentive constraint, there must always be casual labour market activity in equilibrium, otherwise (given the high re-employment probabilities as a tied labour) it will be impossible to meet that constraint at all! To be sure, the presence of uncertainty will only augment this result. I now turn to a more detailed analysis of these and other features.

Define a *trivial* contract for a fully tied labourer as involving wages $(\underline{w}, \bar{w})$, and a trivial contract for a semi-tied labourer as involving payments $(0, \bar{w})$. The interest

[16] See Bardhan [1983] for the standard formulation.

lies, of course, in equilibria featuring tied contracts that do *not* involve these trivial payments. Accordingly, I make the convention that all trivial contracts are lumped under the heading of casual labour. Whenever I refer to a tied contract I will be referring to *non-trivial* tying.

It will be useful to start with a simple preliminary observation:

Fact: If a non-trivial fully tied contract (respectively semi-tied) is offered in equilibrium, then $w^* < \bar{w}$ *(respectively* $x^* < \bar{w}$*).*

The fact above is intuitively obvious. First of all note that if in an economy $\underline{w} = \bar{w}$, or the wages exhibit no seasonality, then the only possible contracts are the trivial contracts. Therefore, consider only $\underline{w} \neq \bar{w}$. Slack labour demand being strictly less than the peak level of labour demand, we will have $\underline{w} < \bar{w}$. Labour tying is designed to provide insurance to the worker against fluctuations. The way in which this happens is that the slack season payment is raised above the casual level and the opposite occurs for peak season payments. However, full insurance will not, in general, occur, as we shall soon see.

Armed with this fact, I now turn to the main analysis. The first task is to provide a complete characterization of the parameters that will yield non-trivial labour tying within this model. That is, I provide a condition that is *both* necessary *and* sufficient for *some* positive level of labour tying in equilibrium. This is done in

Proposition 1 *There is labour tying in equilibrium (equivalently,* $T_1 + T_2 > 0$*) if and only if*

$$\delta^2(1-q)u'(w_0) > u'(\max\{w_0, F'(L_0) - \alpha w_0/\delta\}). \tag{6.3.1}$$

I first interpret the proposition, relegating a formal proof to the appendix. Imagine a variant of the economy modelled here, with labour tying ruled out by assumption, so that only casual labour contracts are observed. Call this the *benchmark economy*. What would be the equilibrium casual wage in the benchmark economy? Given that slack labour demand is linked to peak demand by a fixed proportion less than unity, it must be the case that slack labour demand is less than L_0, so

that *the slack casual wage always equals the reservation wage* w_0, in the benchmark economy.[17]

The peak casual wage might be w_0 or greater, depending on the technology and other parameters. A little manipulation will reveal that the exact formula for the peak casual wage in the benchmark economy is given by the expression within round brackets on the RHS of (6.3.1). So (6.3.1) translates into:

$$\delta^2(1-q)u'(\text{benchmark slack wage}) > u'(\text{benchmark peak wage}).$$

That is, not only must there exist seasonality in the benchmark economy, but there must exist *sufficient* seasonality (in the sense of (6.3.1)); for (6.3.1) *implies* that the benchmark peak wage must exceed the benchmark slack wage, but the converse is *not* true. Put another way, there is no reason to expect that the economy will exhibit labour tying *whenever* there are seasonal fluctuations, even if all workers are risk-averse and all employers are risk-neutral. (This would be a prediction of the implicit contract theories, as presented for rural labour markets by Bardhan [1983].)

The reason for this is the presence of the incentive constraint. The incentive constraint requires the employer who offers a tied contract to offer a premium to the worker under such a contract, otherwise the worker will default. This is costly for the employer. On the other hand, a standard insurance argument implies that there are gains to be made by the employer whenever he offers tied contracts in the presence of seasonality. Proposition 1 provides a precise statement of when the gains balance the losses. Note, moreover, that while Proposition 1 describes the *equilibria* of the economy, its conditions are stated *entirely* in terms of the parameters of the model, and no endogenous variables are present, which is as it should be.

So labour tying may or may not be observed. But what about the casual labour market? Is it perhaps possible that an extremely high level of seasonality or risk-aversion is capable of eliminating this market altogether? The answer is no, and it is stated as

Proposition 2 *In any equilibrium, the casual labour market is always active.*

[17] In fact, this will turn out to be true of all equilibria in the original economy as well.

Proof: Suppose not. By the Inada conditions on $F(\cdot)$, some positive employment takes place in equilibrium. So if the casual labour market is inactive, it must be that $T_1 + T_2 > 0$. By Proposition 1, (6.3.1) must hold. This in turn implies that $p_1 + p_2 = 1$, that is, there is no involuntary unemployment because, by (6.3.1), $F'(L_0) > w_0$.

Let W_* and X_* be given by the equilibrium. If both $T_1 > 0$ and $T_2 > 0$, pick the contract type which gives (weakly) lower lifetime utility to the worker. Without loss of generality, let $X_* \leq W_*$. (Otherwise, simply pick the contract type i for which $T_i > 0$.) Now observe that by (6.2.2) and using $p_1 + p_2 = 1$,

$$V_* = p_1 W_* + p_2 X_* \geq X_* \tag{6.3.2}$$

in both the cases above. Using (6.3.2) in the incentive constraint (6.2.11), and recalling the condition (6.2.14) of the equilibrium,

$$\begin{aligned} u(x^*) + \delta(1-q)X_* &\geq u(\bar{w}) + \delta(1-q)V_* \\ &\geq u(\bar{w}) + \delta(1-q)X_* \end{aligned}$$

so that $u(x^*) \geq u(\bar{w})$. But this contradicts the Fact. ∎

Proposition 2 reveals how the incentive constraint is fundamental to our analysis. If there were no casual labour in equilibrium, then one can use the complete characterization of Proposition 1 to argue that there cannot be any unemployment either (voluntary or involuntary). Recall that the worker is of infinitesimal size and the vacancy pool induced by quits is of the same measure as the number of job-seekers. This means that if a worker is expelled from a tied contract, he will find another tied contract with probability one. So the tied contract of the type that gives lower utility to the worker cannot be viable. For by the Fact, there is always an incentive for the worker not to fulfil the contract in the peak season, and expulsion carries no punishment value! This contradiction establishes the proposition.

6.4 Equilibrium: A Full Description

In Section 6.3 I have described the parametric configurations that can give rise to labour tying in an economy. In this section I shall completely characterize an equilib-

rium according to the definition given in Section 6.2.6. This characterization throws up some interesting properties of the equilibrium such as partial employee insurance and indifference of employers between the two types of labour tying. However, it is not necessary to characterize the equilibrium fully in order to derive these properties. I characterize the equilibrium principally in order to carry out comparative statics analysis with respect to the parameters of the models; and given the regional and temporal variations observed in patterns of labour-tying, such exercises are well in demand.

Before describing the equilibrium, it will be convenient to return to the benchmark economy introduced earlier. Let me denote by $(w_0, \bar{w}_0)$ the vector of casual wages in that economy. Recalling the discussion following Proposition 1, the reader will see that $w_0 = w_0$ and $\bar{w}_0 = w^0$ where

$$w^0 \equiv \max\{w_0, F'(L_0) - \alpha w_0/\delta\}.$$

Now I can state

Proposition 3 *There exists an equilibrium, which is unique upto a possible indeterminacy in the division of tied labourers between fully tied and semi-tied categories.*

(i) If condition (6.3.1) fails to hold, the equilibrium is simply the equilibrium of the benchmark economy, with only casual labour hired at the wages $(w_0, \bar{w}_0)$ of the benchmark economy.

(ii) If condition (6.3.1) does hold, the equilibrium is characterized by co-existence of tied and casual labour. The equilibrium casual wages $(\underline{w}, \bar{w})$ must equal the benchmark casual wages $(w_0, \bar{w}_0)$. The equilibrium tied *wages are characterized completely by the following conditions:*

$$\begin{aligned} \textit{employer indifference} \quad w_* + \delta w^* &= w_0 + \delta w^0 \\ x_* + \delta x^* &= \delta \bar{w}_0; \end{aligned} \tag{6.4.1}$$

$$\begin{aligned} \textit{partial employee insurance} \quad \delta^2(1-q)u'(w_*) &= u'(w^*) \\ \delta^2(1-q)u'(w_0 + x_*) &= u'(x^*); \end{aligned} \tag{6.4.2}$$

$$\textit{probability of tied employment} \quad p^* = 1 - \frac{u(w^0) - u(w^*)}{\delta(1-q)\{u(w_*) - u(w_0)\}} \in (0,1); \tag{6.4.3}$$

$$\textit{prevalence of tied labour} \quad \frac{T}{L_0} = \frac{p^*}{q + (1-q)p^*}. \tag{6.4.4}$$

The division of tied labour between fully tied and semi-tied categories is given by any non-negative pair (T_1, T_2) *satisfying*

$$\begin{aligned} \textit{indeterminacy} \quad T_1 + T_2 &= T \\ T_1 &\leq \alpha L_0, \end{aligned} \tag{6.4.5}$$

and the probabilities of employment corresponding to any particular division are given by

$$p_i = \frac{qT_i}{L_0 - (1-q)T}, \quad i = 1, 2. \tag{6.4.6}$$

Proposition 3 provides a complete description of the equilibria of the economy. It is stated in two parts. The first says little more than Proposition 1, adding that the equilibrium is simply the equilibrium of the benchmark economy. This is hardly surprising, for the latter equilibrium is simply the one that obtains when tied labour is ruled out by assumption.

The second part characterizes equilibrium with tied labour, when condition (6.3.1) *does* hold. There are several conditions involved. The first, which I call "employer indifference", states that the discounted wage bill for tied labourers and casual labourers must exactly be the same. Of course, tied labourers receive an extra amount in the slack and a lesser amount in the peak (relative to casual labour), so all this means that in *utility* terms, tied labour must be strictly better off relative to their casual counterparts.

The reason for employer indifference comes from Proposition 2 and the supposition that tied and casual labour perform the same tasks (in this model). Because (by Proposition 2) there must always be casual labour in equilibrium, employers *must* be indifferent between the hiring of either type of labour whenever there is coexistence. However, this indifference cannot be resolved in an arbitrary way (see below). Only a *particular* percentage of tied labour is consistent with equilibrium. Employer indifference would, however, break down if *supervisory* tied labour was included as well. Cost considerations are only secondary in hiring supervisory labour and hence,

the discounted sum of wages of a unit of supervisory labour may well exceed that of a casual labour. Indeed, the supervisory work is non-monitorable by nature,[18] and would require payment of a premium *over and above* the premium required to ensure contractual fulfillment.

With employer indifference already explained, it is easy to explain why casual wages in the presence of labour tying equals those in the benchmark economy. To begin with, note that the cost per unit of effective labour must remain invariant at $w_0 + \delta w^0$, otherwise there will either be excess demand, or excess supply of effective labour. Next, observe that there will *always* be some unemployment in the slack season casual labour market because of the nature of the technology. Therefore, equilibrium slack season casual wage cannot be different from w_0. It follows straightaway that the peak season casual wage equals w^0.

The next condition, called partial employee insurance, describes how tied wages are determined. These are stated in terms of the first-order conditions of the optimization problem determining the tied contract. Observe that *irrespective* of the degree of concavity of the utility function, a tied labourer never receives complete insurance. This is due to the incentive constraint. In the absence of the incentive constraint complete insurance *is* optimal. In its presence, however, complete insurance would mean equalization of slack tied wage to peak tied wage. This, together with the necessity to provide the "incentive premium" in the peak season, would lead to a sub-optimal situation.[19] On the other hand, there is a cost-saving aspect of insurance, and (6.4.2) dictates the exact amount of insurance provided in the optimum.

The next two conditions (6.4.3) and (6.4.4) yield the percentage of tied labour in the economy. One might ask: if employers are absolutely indifferent between tied and casual labour, how is it that this percentage is *exactly* determined within the model? The answer is based on the observation that this percentage determines the reservation utility of a labourer conditional on quitting (or being expelled from) a tied

[18] See Eswaran and Kotwal [1985].

[19] See the Appendix for an example where in spite of a strictly concave utility function for labourers, it is impossible to find an incentive compatible and profitable contract giving full insurance to the employers, even for arbitrarily high levels of seasonality.

contract. If there is "too much" tied labour, then the probability of re-employment as a tied labourer is "high". Consequently, to meet the incentive constraint and deter tied employees from defaulting on their peak season obligations, tied peak wages must be very attractive. In addition, if the employer must provide insurance, the tied wage bill becomes too high and the employers *strictly* prefer to hire casual labour. This contradicts the supposition that there is tied labour to start with!

If there is "too little" tied labour, exactly the opposite argument holds. The low reservation utilities of tied labour enables the farmers to offer tied contracts involving low wage bills, enabling them to make strictly positive "savings" (with respect to casual labourers' wage bills) from labour tying. This leads to high levels of labour tying, which, in turn, induces high probabilities of re-employment as tied labour. Then the argument in the previous paragraph applies, and equilibrium labour-tying cannot rise above a certain critical level.

Finally, (6.4.5) states how the total number of tied labourers is divided between the two types. Recall that (6.3.1) implies that aggregate demand for effective labour is L_0 and the aggregate demand for slack season labour is, therefore, αL_0. Therefore, the maximum number of tied labourers of type 1 cannot exceed αL_0.[20] No such restriction applies for semi-tied labourers because the farmer does not need to compensate the semi-tied labourer for his leisure in the slack season, and by (6.3.1), labour demand is equal to L_0 in the peak season. Apart from this restriction and the obvious restriction that the number of tied labourers is non-negative, the total demand for tied labour may be allocated in any way in equilibrium. Thus there is an indeterminacy in the equilibrium allocation of tied labour between the two types. Consequently, there is also an indeterminacy in the equilibrium probability of becoming a tied labourer of a particular type, though not of being a tied labourer in general. However, the employment probabilities p_1 and p_2 in a particular equilibrium must be those generated by T_1 and T_2, otherwise, the definition of equilibrium is violated; (6.4.6) ensures such a violation does not occur.

Let us, as an illustration, view the prediction of this model assuming a very simple form of utility function for labourers: $u(w) = \sqrt{w}, w \geq 0$. Recalling that the

[20] No farmer will compensate a labourer for his time if the farmer does not need to use it.

equilibrium spot market wages are equal to those in the benchmark economy, in the following examples I shall not distinguish between the two and simply refer to *the* spot market wages.

Example 6.1: Consider the following parametric configuration. Let the spot market wages be $w_0 = 1.75$ and $w^0 = 12.0$. Assuming a high rate of interest on loans, put $\delta = 0.7$.[21] For a quit rate as low as $q = 0.3$, there will be *no* labour tying in the economy characterized by the above parameters, because

$$\delta^2(1-q) = .343$$

and

$$\frac{u'(w^0)}{u'(w_0)} = \frac{\sqrt{w_0}}{\sqrt{w^0}} = .382 < \delta^2(1-q).$$

Example 6.2: An increased seasonality in the spot wages, however, will lead to a positive level of labour tying. Keeping all other parameters unchanged let the value of the peak season spot wage $w^0 = 16$. Then

$$\frac{u'(w^0)}{u'(w_0)} = .331 < \delta^2(1-q).$$

Choose wages $w_* = 1.86$, $w^* = 15.843$, $x_* = 0.11$ and $x^* = 15.843$. See that

$$w_0 + \delta w^0 = 12.95 = w_* + \delta w^* = w_0 + x_* + \delta x^*.$$

Further,

$$\frac{\sqrt{1.86}}{\sqrt{15.843}} = .343 = \delta^2(1-q).$$

Therefore the pair of wages (1.86, 15.843) satisfy conditions (6.4.1) and (6.4.2) of equilibrium. Therefore they can be used the derive the equilibrium value of the re-employment probability p^* and hence the equilibrium proportion of tied labourers, say t^*, in the economy. Accordingly,

$$p^* = 1 - \frac{u(16) - u(15.843)}{.7 \times (1 - 0.3) \times [u(1.86) - u(1.75)]} = .142$$

[21] These wages are close to respectively the expected slack season and peak season casual wages in the Palanpur labour market. Any consumption loan of wheat, taken in the slack season, requires the borrower to return 150% of the amount in the peak season. Most cash loans carry a monthly rate of interest of 5%.

and

$$t^* = \frac{p^*}{q + (1-q)p^*} = 0.061.$$

Example 6.3: On the other hand, if the quit rate in Example 6.1 is lowered to $q = 0.2$[22] keeping the values of the other parameters unchanged, condition (6.3.1) is satisfied.

The reader can check that values of tied wages equal to $w_* = 1.83$ and $w^* = 11.886$ will satisfy conditions (6.4.1) and (6.4.2) of an equilibrium. The equilibrium percentage of tied labourers under this parametric configuration will be $t^* = .187$.

Example 6.4: Consider one final example with a high rate of involuntary quits. As before, let $\delta = 0.7$. Choose $q = 0.5$. Labour tying will be observed in the presence of these parametric values will be observed only if the ratio between spot market incomes in the slack season and the peak season is at least 1:17. Accordingly, let $w_0 = 1.75$ and $w^0 = 32.0$. Then the equilibrium proportion of tied labourers is only 0.044. Associated values of w_* and w^* are respectively 1.91 and 31.771.

Therefore, if high levels of labour tying are to be observed together with high quit rates then the level of seasonality in that economy must be very high indeed.[23]

6.5 The Characteristics of an Economy and Labour Tying

In this section I investigate how changes in the parameters of the model affect the proportion of tied labourers and the wages of tied labourers in the economy modelled above. I also discuss some extensions to the basic model. I will discuss all comparative statics results under the connection that in what follows, the necessary and sufficient condition for labour tying (embodied by (6.3.1) continues to hold. Otherwise, the reader will note that there is no labour tying and consequently the comparative

[22]See Table 7, Bardhan and Rudra [1981]. Although the majority of labourers said they preferred the length of a contract to be a year, the quit had actually materialized in only 22% of the cases, making 0.2 a plausible value of the quit rate.

[23]In this context recall Breman [1974]. According to him both quit rates and proportion of tied labourers were high in south Gujrat.

statics become trivial. We should note, however, that the relation (6.3.1) is not itself verifiable in a straightforward manner because it involves measurement of the degree of curvature of the utility function and the pure rate of time preference. However, the risk perception and the rate of discount of labourers *does* seriously influence their decision to accept a labour-tying contract and attempts toward experimental assessment of agents' risk-behaviour are not unknown.[24]

6.5.1 Changes in seasonality

Changes in seasonality can occur in different ways. First consider the effects of a change in the *size of the labour force* (L_0) or a change in the technology parameter of seasonality in labour demand (α). A fall in either of the two parameters will have the effect of increasing the spot market wage for the peak season ($\bar{w}_0$). I should note, however, that the changes come about for quite different reasons. While a fall in L_0 represents a decease in the supply of labour, a fall in α represents a technological change augmenting the peak season labour demand in relation to the slack season labour demand.[25]

An increased seasonality brought about by either of these two routes will have identical effects on the endogenous variables. The *proportion of tied labourers* will typically increase with a fall in the labour supply or the technology parameter. The intuition is as follows: an enhanced seasonality typically allows the employers greater scope for manipulation of tied labourers' wages, thus temporarily increasing the profitability of tying labour. However, the market being competitive, pure profits will induce more farmers to attach labour, until the profits are completely eroded. The equilibrium level of labour tying, however, will be higher.

However, the proportion of tied labourers increases with an increase in the spot market wage $\bar{w}$ only if absolute risk aversion is high enough to ensure that

$$\frac{-u''(w^*)}{u'(w^*)} + \delta\frac{-u''(w_*)}{u'(w_*)} > p\frac{-u''(w^*)}{u'(w^*) - u'(\bar{w})}.$$

The effect of an increased tightness in peak season labour market will lead to an

[24] Bidinger, Nag and Babu [1980] is a relevant example.

[25] Consider, for instance, the introduction of tractors or pump-sets. These machinery will replace slack season labour but increase the labour demand in the peak season through a larger yield.

increase in both the slack season and peak season wages of the tied labourers. That is, the *total income* of tied labourers will increase. This result, is, of course, immediate from the condition of "employer indifference" in the previous section, and the fact that we are investigating the effects of an increase in the peak casual wage, $\bar{w}_0$. A question of interest is whether there is a trade-off between income ad insurance. A crude measure of insurance (I) may be taken as the relative gap between the peak season and the slack season wages of the tied labourers with respect to their slack season wages. Mathematically,

$$I \equiv \frac{w^* - w_*}{w_*}.$$

If I decreases with respect to some variable then we can say that an increase in the variable leads to better insurance for tied labourers.

By totally differentiating (6.4.2) it may be shown easily that

$$\frac{dI}{dw^*} < 0 \text{ only if } \frac{-u''(w_*)}{u'(w_*)} \Big/ \frac{-u''(w^*)}{u'(w^*)} < \frac{w^*}{w_*}. \tag{6.5.1}$$

This condition is, of course, satisfied if the utility function exhibits increasing absolute risk aversion. But it is also satisfied for simple forms of utility functions with constant or diminishing risk aversion. The reader can verify that (6.5.1) will hold with equality for $u(w) = w^\beta, \beta \in (0,1), w \geq 0$ but will be true for $u(w) = 1 - e^{-w}, w \geq 0$.

6.5.2 Quit rates and patron-client relations

Most of the empirical literature discussed in Chapter 2 states that the duration of a labour tying contract is one crop season or a year, at the end of which attached labourers may quit. Yet it is also mentioned in the literature that traditionally the *actual* duration of contracts was not quite so short.[26] It would be of interest to investigate the consequence of this increased quit rate on the endogenous variables.

An increase in the quit rate q leads to a fall in the proportion of tied labourers, and to an increase in the income fluctuation of tied labourers.

The first result is, however, conditional on a "high" rate of absolute risk aversion.

[26] Some relevant references are: Gough [1983], Reddy [1985], Breman [1974], Hopper [1957].

Mathematically, if

$$\delta \frac{-u''(w_*)}{u'(w_*)} + \frac{-u''(w^*)}{u'(w^*)} > \frac{\delta pq}{(1-p)(q+p(1-q))} \frac{u'(w_*)}{(u(w_*) - u(w_0))},$$

then the proportion of tied labourers in the labour force increases with a fall in the quit rate (q).

The effect of an increased quit rate on the income of tied labourers is ambiguous. The *fluctuations* in tied labourers' wages, however, increases with an increase in the quit rate. An increased quit rate has the effect of increasing the peak wage of tied labourers and decreasing their slack wage. Therefore, the relative gap between slack and peak wages increase, or labourers get a lower level of insurance from tied labour contracts.

Note that this is an explanation for the erosion of patron-client relations. While labourers are keen to avail of alternative job opportunities, the employers do not find it worth their while to tie as many labourers as they used to or to absorb all the risks of the tied labourers. This is precisely what is meant by break-down of patron-client relations. Gough's observations (Gough, [1983]) are of particular interest in this context. In the pair of villages surveyed by her in 1952 and 1976, she finds that the terms of an attached labour contract provided much greater insurance to tied labourers in 1952 as compared to 1976. The proportion of tied labourers among agricultural labourers fell from a level close to 80% to a level close to 25% in the aforementioned period.

Also relevant in the context is Breman's observation in south Gujrat: a increasing quit rate among attached labourers accompanied by the breakdown of patron-client relations. The numberical examples in Section 6.4 suggest that in such a case, the seasonality in wages must be extremely high, or employment probabilities in the slack season must be abysmally low.

6.5.3 An extension: monopolistic employer

The model presented here may be very easily extended to the case of a single, monopolistic employer. It can be shown that labour tying will remain at an intermediate level in equilibrium although the monopolistic employer will be able to make pure

profits from labour tying. Attached labourers will be worse off under a monopolistic equilibrium as compared to a competitive equilibrium. An indication of the proof is offered below.

Assume that the characteristics of the labourers remain unchanged and so does the technology. Only instead of there being a continuum of farmers now there is only *one* farmer who controls the entire labour demand. He is identical to our earlier farmers in being a risk neutral discounted profit maximizer, and having the same rate of discount δ as the labourers.

If the equilibrium concept is left unchanged (that is, robust to small changes, as before) then both Propositions 1 and 2 will hold good. That is, non-trivial labour tying will be possible only if (6.3.1) is true, and the casual labour market will always be active in the peak season. There will, however, be a difference in the actual description of equilibrium. Although indeterminacy will remain because both types of labour tying will be "equivalent" in a sense, the condition of employer indifference will break down. The monopolistic farmer will be able to make *pure profits* from labour tying in equilibrium.

I give a partial description of the equilibrium below taking the spot wages $(\underline{w}, \bar{w})$ as exogenous. Then the monopolist's profit maximizing choice of tied wages (w_*, w^*) and probability of re-absorption p is given by the first order conditions:

$$u'(w^*) = \delta^2(1-p)(1-q)u'(w_*), \tag{6.5.2}$$

$$\underline{w} + \delta\bar{w} - (w_* + \delta w^*) = \frac{p}{1-p}\frac{u(w_*) - u(\underline{w})}{u'(w_*)}, \tag{6.5.3}$$

$$\delta(1-p)(1-q)u(w_*) + u(w^*) = \delta(1-p)(1-q)u(\underline{w}) + u(\bar{w}). \tag{6.5.4}$$

From the above description it can be inferred that the attached labourers will be worse off in the monopolistic equilibrium as compared to the competitive equilibrium. Condition (6.5.3) states that their incomes will be lower than the incomes of casual labourers. Condition (6.5.2) states that the gap between their slack and peak wages will also be higher in the monopolistic equilibrium as compared to the competitive equilibrium. However, tied labourers will continue to be strictly better off than the casual labourers in terms of utilities. Otherwise the contract will always fail to be incentive compatible.

Note that the level of labour tying in the monopolistic equilibrium will be lower than the level of labour tying in the competitive equilibrium, because the monopolistic farmer will not allow labour tying to rise to a level that will wipe out all pure profits. Theoretically this is not a surprising result because it is the exact analogue of the standard result for a monopolistic firm. There is, however, a loose belief that high levels of labour tying go hand-in-hand with monopsony. This result contradicts that. Again the driving force is provided by the condition of incentive compatibility, which implies that high levels of labour tying lead to higher wages for tied labourers.

6.5.4 An extension: supervisory labour

Although it is well-known that tied labourers are frequently engaged for the purpose of performing special tasks,[27] this feature has not received adequate attention in the main analysis above. Below I provide a partial treatment of the subject, hoping to throw light thereby on some interesting features of labour tying, namely:

1. The supervisors will be paid a higher wage than ordinary tied labourers.
2. Propositions 1 and 2 will continue to hold for (non-supervisory) semi-tied labourers.
3. Supervisory labour tying will be observed only on large farms.

Although the exact form of the above-mentioned special task may vary from supervision of casual labour, to looking after machinery or animals, these special tasks have one thing in common: they are not easily monitorable (or, alternatively, there is not enough household labour to monitor their activities). For the sake of convenience, all such tasks will be assumed to be *completely non-monitorable*, and any such task will be referred to as "supervision". I assume that non-monitorable tasks are confined to the slack season.

Accordingly, a unit of effective labour will now represent α units of supervisory labour or attached labour in the slack season in combination with one unit of casual labour in the peak season. Following Eswaran and Kotwal [1985], I assume

[27] See Section 2.3.6 above.

that supervisory tasks may be entrusted only to attached labourers. Then all fully attached labourers are engaged in supervision during the slack season. As before, "replacement tying" may very well exist in the economy. Tied labourers who do not perform any special tasks will be referred to as semi-tied labourers in this subsection.

Assume that a *shirker* can be identified in the beginning of the peak season and is evicted immediately.[28] Note that a shirker can enjoy complete leisure in the slack season and thereby enjoy an additional utility of u_0. Then the farmer is faced with a fresh incentive constraint for fully tied labourers:

$$u(\underline{w}) + u_0 + \delta u(\bar{w}) + \delta^2(1-q)V_{\cdot} \leq u(\underline{w}) + \delta u(\bar{w}) + \delta^2(1-q)\underline{W}$$

or, equivalently

$$u(\bar{w}) + \delta(1-q)V_{\cdot} + \frac{u_0}{\delta} \leq u(\underline{w}) + \delta(1-q)\underline{W}\,. \tag{6.5.5}$$

Note that (6.5.5) is strictly more stringent than (6.2.8). Therefore, other assumptions, remaining unchanged, the utility level ($\underline{u}$) for fully tied labourers must be greater than the utility level ($\underline{u}_x$) for semi-tied labourers. Also observe that cost-saving is still the primary objective in a farmer's decision to hire semi-tied labourers and, as such, Proposition 1 will continue to hold. In other words, without a non-trivial level of seasonality in the labour market, no semi-tied labourers will be there in the economy. Further, the incentive condition for the type 2 labourers will also continue to be relevant which implies that Proposition 2 will also be true. This in turn proves that fully tied labourers will be strictly more expensive than casual labourers.

Proposition 1 will not be relevant, however, in the decision to hire fully tied labourers, because, by assumption, they perform essential services. If it is assumed that the marginal productivity of effective labour is increasing in landsize, and the distribution of labour endowment of households is more egalitarian than the distribution of their land endowment, then it can be shown that *farm size* is directly related to the number of fully tied labourers.

[28] For a discussion of contracts with eviction see Datta, Ray and Sengupta [1989] and the references in it.

In order to incorporate the land distribution, assume that each farm has a land endowment of k, k taking any finite, positive value. The production function is then

$$Y = F(n; k)$$

where $F(\cdot)$ is a twice continuously differentiable and increasing function of both the number of units of effective labour (n) and the land size (k). It is strictly concave in n such that $\forall k$, $F'(0; k) \to \infty$ and $F'(n; k) \to 0$ as $n \to \infty$.

Assume that each farm/farmer has an endowment of H units of household labour and its cost to the farmer is equal to the reservation wage w_0 in both the slack and the peak season. Moreover, all farmers strictly prefer to use household labour for supervision. Then there exists a $\bar{k}$ such that farms with $k \leq \bar{k}$, will *never* appoint fully attached labourers. This threshold size of landholdings is given by

$$\delta F'(H/\alpha, \bar{k}) = (\alpha + \delta)w_0. \tag{6.5.6}$$

Note that farmers with land endowment $k \geq \bar{k}$ may or may not require fully attached labourers depending on the level at which the peak season spot wage settles. However, $(\alpha+\delta)w_0$ being the lowest possible cost for one unit of effective labour, the demand for supervisory labour from smaller farms will never exceed their household labour endowment, H.

6.6 Conclusion

In this chapter I have examined the equilibrium level of labour tying in an agricultural economy. In this economy the co-existence of seasonality coupled with relatively higher risk-aversion among labourers facilitates the existence of implicit contracts. I examine only those equilibria which are incentive compatible in the sense that in equilibrium no tied labourer should voluntarily quit his post as a tied labourer.

Some properties of an incentive compatible, competitive equilibrium follow. (1) Labour tying occurs if and only if the labour market exhibits a non-trivial amount of seasonality, defined as the gap between the slack season and the peak season wage. (2) In spite of the absence of uncertainty, the casual labour market is *never* wiped out altogether. (3) Tied labourers get only *partial insurance* in equilibrium. (4) The

utility level of a tied labourer strictly exceed the utility level of a casual labourer. However, undercutting is made impossible by the existence of the incentive constraint. (5) The yearly wage bill to the employer is equal for both tied and casual labourers.

In this model any parametric change enhancing seasonality will increase the proportion of tied labourers subject to an assumption of high risk aversion. If the peak season wage increases, then the tied labourers' income will increase and the degree of fluctuation in their wages will also decrease. A fall in the rate of exogenous quits from the post of tied labourers will lead to a higher level of labour tying, again, if risk aversion if sufficiently high, but will surely lead to greater income stability for tied labourers. This provides a theoretical explanation for the breakdown of patron-client relations.

An extension of the above model to include non-monitorable tasks (supervision) preserves all these properties of the equilibrium for semi-tied (replacement) labourers. The wage bill of the supervisory labour will be higher than that of the casual labourer. The remaining properties will be preserved in equilibrium. This extension also justifies the empirical fact that supervisory labourers are found only on large farms. Another extension to the case of one single monopolistic employer also leaves unchanged properties (1) to (4) of the equilibrium. The monopolistic employer, however, can make pure profits.

Chapter 7

Conclusion

This dissertation combines a theoretical and empirical survey of the literature on rural labour markets in India. In analyzing the effects of seasonality on labour markets, it also contributes to that literature.

In the empirical part of the thesis, the village has been identified as the basic unit of observation. All the evidence has been drawn from village studies. Primary evidence from the 1983-84 survey of Palanpur village in western Uttar Pradesh has been considered together with secondary evidence from a number of other studies on Indian villages in the post-independence period.

It is evident that agriculture being the primary activity, village labour markets see considerable fluctuation in employment over the course of the year. Level of fluctuations in wages are not of a corresponding degree. Detailed analysis of the primary data set confirms the presence of *involuntary* unemployment in the casual labour market. The data also indicates that the daily casual wage in the slack season is *higher* than the reservation wages of labourers in spite of the presence of unemployment.

Labour tying and interlinkages between the labour market and credit or tenancy markets is virtually absent in Palanpur. In general, casual labour is the most important form of hired labour and the incidence of interlinkages and labour tying as well as the terms of the contracts show marked regional variations. Although the attached labourers usually get some insurance from the contract, patron-client relations appear to have vanished.

Some qualitative features emerging from this analysis are the isolation of village labour markets; the participation of small farmers as employers in the labour market; the absence of explicitly collusive behaviour among labourers or farmers (with the exception of political party-led actions) and the co-existence of several types of labour contracts (such as daily wage contracts and piece rate contracts).

The existing theories of labour markets, particularly those that acknowledge the existence of seasonality in rural labour markets focus on monopsony, interlinkage, and labour tying. In an alternative model of a *competitive labour market* with seasonality I have examined a similar phenomenon.

My first model studies unemployment in rural labour markets. The model draws its inspiration from sociological notions of *"everyday peasant resistance"* applied to a specific form: refusal to work. In particular, labourers can react to low wage payments in slack by engaging in protests in the peak. However, the refusal to work is not an automatic response, and this decision is explicitly modelled. The decision depends, in particular, on the probability of unemployment in the slack season, and on the labourer's *beliefs*.

The model predicts, in general, a *continuum* of equilibrium wage configurations. The set of configurations is completely characterized in some specific models. It turns out that *all* these configurations, barring one, involve wage payments above the reservation wage, despite the presence of involuntary unemployment.

A number of qualitative observations follow: (1) with heterogeneous farmers, equilibrium wage differentials, if any, can be characterized in terms of slack-to-peak labour demand ratios. (2) Increased seasonality enhances the possibility of wage payments above reservation levels showing that the seasonal nature of agriculture is crucial to the exercise. (3) The model predicts sticky nominal wages and relatively flexible real wages, despite the absence of money illusion. (4) The model suggests that piece rate incomes will be significantly lower than daily wage incomes, in equilibrium.

In a second model, I turn to the analysis of labour tying. I argue that the existing literature based in implicit contract theory is deficient in a basic way. It predicts too much labour tying. Indeed, were it not for the uncertainty in labour demand, *all* labour would be tied in such models. My analysis seeks to provide a model that

avoids these properties in the macroeconomic equilibrium.

The model focuses on an incentive problem inextricably associated with any implicit contract: the possibility of non-fulfillment of the contract from the labourer's side, whenever attractive alternative employment is available. Equilibrium level of labour tying and wages in the above model is fully characterized.

Two results follow immediately. A *discrete* minimum level of seasonality in the labour market, (in the sense of the gap between the spot wages) is *necessary and sufficient* for the existence of labour tying. And even in the presence of the required level of seasonality, the casual labour market will never be wiped out altogether. The latter is a consequence of the constraint and I analyze this issue in detail in Chapter 6.

Some other properties of the equilibrium are: the tied labourer *never* gets full insurance from the contract. His peak season wage will be higher than his slack season wage. The competitive employer will be indifferent between tied and casual labourer in terms of costs, if both perform the same tasks. The tied labourers will be strictly better off than the casual labourers. An increased level of seasonality manifested in the form of a tighter peak season labour market will lead to an increase in the tied labourer's income accompanied by a fall in his relative income fluctuations. Labour tying will also increase with increased tightness.

The above model also provides an explanation for the decay of patron-client relationship in terms of an increased probability of contract termination due to exogenous factors.

Finally, it has been shown that in the presence of non-monitorable tasks, to be performed exclusively by tied labourers, labour tying will be observed only in large farms. Tied labourers who perform such tasks will be at a higher level of utility as compared to tied labourers who perform "casual" tasks.

Most of the predictions of the theoretical models in Chapters 5 and 6 are in broad agreement with the empirical facts about rural labour markets.

Appendix to Chapter 2

The Palanpur Village Survey Data

The Palanpur village survey of 1983-84 was undertaken as a part of a project funded by the United Kingdom Overseas Development Agency. The broad objective of the survey was to estimate household incomes of the village, and assess changes in the standard of living since the previous surveys. Prof. Jean Drèze coordinated the survey with the help of Mr. S. S. Tyagi of the Agro-Economic Research Centre, Delhi and Mr. N. K. Sharma of the Indian Statistical Institute. The investigators lived in the village during the survey year and in addition to the filling the schedules, Drèze also maintained a diary in which he recorded any event or observation of interest.

Insert Table A.1: The list of data collection schedules for Palanpur Village Survey, 1983-84.

The surveyors took the household (that is, the "farm management unit") as the unit of observation. A census of all households was made and information was collected on land holdings, cropping patterns, cultivation practices, wage labour transactions, credit transactions, land leasing activities and on other transactions and assets of each household. Information was collected at the household level for most of the above parameters, but individual level information was available on some of the characteristics of the agents and, in particular, on labour and credit transactions of the agents. Table A.1 gives the complete list of schedules. Most of the data used by me came from the wage labour schedule: PVS-W. The rest of the data I used was scattered in Schedules PVS-A, PVS-B, PVS-C, PVS-P and PVS-H. Figures A.1 and A.2 are copies of the PVS-W and PVS-H schedules respectively.

Insert Figure A.1: The PVS-W schedule, or the wage labour schedule.

Insert Figure A.2: The PVS-H schedule, or the cultivation schedule.

The data on labourers' personal characteristics, credit and land was available to me in ASCII files. The data had also been "cleaned" of likely errors. I only extracted the necessary information. Similarly, the wage data had also been computerized and cross-checked, but some more work was necessary before the data was usable.

Since the survey was motivated at assessing household incomes, the surveyors did not focus on any intra-household transactions that might have taken place. Similarly, unpaid labour in the household did not receive much importance. Also unimportant was the time of the year when the transaction took place. Further scanning of PVS-W and PVS-H schedules did not yield useable information on days spent on self-employment, etc. Therefore I have used only wage labour data for my thesis.[1] However, I had a complete census of the wage labour transactions that took place in Palanpur in the survey year, which started on November 6, 1983 and ended in October 1984. The year was so chosen as to span the *rabi* crop season of 1983-84 and the *kharif* crop season of 1984.

My first task was to try and identify the approximate periods when the task had been performed. Drèze and I identified the approximate dates of the beginning and end of all agricultural operations. Using this with the activity codes of each transaction and the interview dates, it was possible to place most agricultural contracts in the *rabi* season or the *kharif* season. Next, assuming that during the hectic wheat harvesting season *no other* activity took place, unless explicitly mentioned, it was possible to place each data record either in the peak season (the wheat harvesting season) or the slack season (the rest of the year), which was important for my work.

At this point let me state the nature of approximation used in Figure 1.1. I have simply assumed that the work was uniformly distributed over the time interval obtained in the above method. However, since the points on the graph are distributed close together, this error is not very serious. Nevertheless the diagram should be used only to get an idea of the kind of fluctuations that arise during an agricultural year in a region where the principal crops are wheat and sugarcane.

The next task was to obtain nominal incomes from the complicated wage codes.

[1]This has surely added a downward bias on the employment figures, but the existence of seasonal, involuntary unemployment can be confirmed by the surveyors' direct observation and responses to the discussion questionnaire.

The cost of a meal was taken to be Re. 1, the established exchange rate between money and meals for all wage transactions during the survey year. When other perquisites such as *bidis*[2] were given, the value of those perquisites had been recorded. Sometimes (usually because of caste or religious taboos) labourers were given grains instead of meals. The most widely prevalent form of kind wage payment was the payment of harvest shares during the wheat harvesting season. When kind payment was in units other than wheat, the exact value had been inserted in the data file. Although labourers were usually paid in bundles of wheat, their earnings were reported either in kilograms of wheat or in bundles of wheat. The weight of a bundle of wheat was taken as the ratio between the average number of kilograms of wheat earned by a labourer and the average number of bundles harvested by a labourer.[3] The price of a kilogram of wheat was taken as Rs. 1.80 in the slack season and Rs. 1.35 in the peak season, on the basis of record of village wheat prices kept by the surveyors. These are only approximate estimates because the wheat prices fluctuate over the entire year. However, grain payments were uncommon during the slack season, and the duration of the peak season being very short, this factor does not seriously distort any estimates.

To make the slack season and peak season incomes comparable to each other the peak season data were multiplied by the ratio between the arithmetic averages of the Consumer Price Index numbers for Agricultural Labourers (CPIAL) for the slack months and the peak months in 1983-84. The ambiguity about the time of transaction, mentioned above, prevented better estimation.

Recall that in Chapter 2 of the thesis I have made extensive use of the data on piece rate contracts. First of all, I used the remarks in the data file and the schedules and coded the piece rate and the number of "pieces" or units of work done under each transaction by each agent. The total reward to each agent from each transaction and the number of days of work done was already available in the data file. If the piece rate for a particular contract was not available, it was approximated by the average piece rate for the particular task. "Piece rate wages", intended to capture

[2]A kind of small, indigenous cigarettes.

[3]This calculation needs an assumption, however, that the coefficient of variation of the distribution of harvesting capacity is not high.

the variation only in the piece rates but not those in the speeds of individuals was calculated from the above data by multiplying the rate associated to each transaction by the average speed associated with the task.

Even after the completion of the above exercises, wages or the number of days remained unknown for some contracts. All records with unknown wages were wheat harvesting contracts. The number of bundles harvested was put down as 4, which is the integer closest to the average number of bundles harvested by a labourer in a day. The unknown days, fortunately, were related to piece rate jobs. The number of days were inserted for those tasks on the basis of the individual's working speed on that task.

Of course, besides all this, the schedules were repeatedly scanned at various stages and entries made or corrected. However, Drèze and others working on the Palanpur project had done a tremendous amount of work before the data came to me and I am very grateful to them for it.

The Discussion Questionnaire

In December 1986 and January 1987 I conducted extensive discussions with both labourers and farmers of Palanpur about various aspects of labour contracts. I shall attempt to give here a summary of the relevant points of those most instructive discussions.

In general, the farmers seemed to be more conscious of the issues involved in an action or a decision as compared to labourers. But astute observations came from both groups.

Almost all our respondents, in particular, all farmers, acknowledged that the same daily wage applies to all labourers. The main reasons proffered by farmers was that labourers would protest. Several farmers and labourers simply said this was the village rule and some of them connected this to ethics. However, they also generally acknowledged that productivity differences existed and mattered even when they were supervised. Some farmers said the wage equality not matter because the farmers could choose the better labourers anyway.

The discussion made clear that money wage cuts for daily wages were extremely

rare. Several respondents said it 'never happened', but this was undoubtedly an exaggeration and we also heard reliable stories of how, occasionally a labourer in desperate need of a job had accepted a wage cut during the slack season. Employers squarely attributed the resistance to wage cuts to labourers; some of them explained that labourers are reluctant to accept wage cuts because they fear that the wage standard will fall for the whole season. A few labourers gave the same answer when asked why do wages not fall in the slack season. In reply to the question of why they do not accept a wage cut to obtain work during the slack, they were fairly unanimous that undercutting would not necessarily bring forth extra employment.

Money wage increases do, of course, happen from time to time. They were attributed to two possible factors. Some respondents related wage increases to price increases. More commonly, we were told that the money wage increases when the demand is labour high as compared to supply. Most farmers, however, were referring to the higher wheat harvesting wages when they spoke of this. We were also told that wages increase when labourers, in groups, ask for a raise.

The existence of explicit collusion or concerted action on the part of either labourers or employers was unanimously dismissed. One respondent squarely asserted that 'in our place there are no meetings and such nonsense' (*'hamare yahan meeting-feeting naheen hota'*). A few labourers connected their inability to take joint action to their weak bargaining power. A labourer asserted that labourers do take the decision to ask for wage increases, jointly. The farmers connected their own inability to collude to the time bound nature of agricultural operations, with high losses connected to delays.

When labourers are unemployed, they do not search for work in other villages. They only work in nearby villages if they are 'called', which is rare. They felt that at times of excess supply, *skilled or willing workers* tend to get more work than others in the village. However, labourers who were willing to accept poorly paid assignments could also get more work.[4]

Similarly, employers reported that they only rarely hired labourers from outside the village; at times of excess demand, they usually preferred to work harder them-

[4]Note that there is a contradiction between this, and the earlier statement that undercutting rarely brings forth additional employment.

selves or to delay their farm operations. The reasons offered for such behaviour was not clear.

The determination of piece rate contracts was described essentially in terms of bargaining between employer(s) and labourer(s). Employers (especially those belonging to farming castes) saw the control of work quality as the major problem of piece rate work. They typically resorted to this type of contract when they were too busy to supervise, or when they wanted the job completed in a short time. The majority of the labourers, however, preferred working on piece rates, because there was no supervision. The possibility of increasing ones daily earnings added to the attraction.

The incidence of piece rate contracts was decreasing in Palanpur according to the labourers. They attributed the reason to the absence of big farmers in Palanpur. The farmers' responses were ambiguous. A large number said the incidence of piece rate contracts were decreasing because the labourers had become inefficient. But two farmers connected the fall in the incidence of piece rate contracts to increasing mechanization of agriculture or changing cropping patterns, with sugarcane replacing millets to a large extent.

Schedule	Information contained
PVS-A	Household identification schedule: caste, household structure and major income source
PVS-B	Plot schedule: details regarding owned and leased land
PVS-C	Household member schedule: age, sex, education level, occupation, etc. of individuals
PVS-D	Crop schedule: cropping patterns
PVS-E	Inventory schedule: inventories and assets
PVS-H	Cultivation schedule: details of cultivation practices and inputs
PVS-P	Debt-credit schedule
PVS-T	Foodgrains and crop transactions schedule
PVS-W	Wage labour schedule: names of employer, employee, terms of employment, number of days, total earnings and remarks
PVS-Z	Livestock schedule: number and value of livestock

Table A.1: The list of data collection schedules for Palanpur Village Survey, 1983-84.

PALANPUR VILLAGE STUDY

Date: 23 / 4 / 1[illegible]

PVS - W WAGE LABOUR SCHEDULE - Worksheet

Household No. 223

Period 18-4 to 22-4

Respondent [illegible]

Investigator [illegible]

Sale or ~~Pur-~~ chase	Individual's Code	Employer's Code	Activity	No.of days	Total wages			Remarks
					Total (Rs.)	Kind	Shares etc.	
S	[illegible]	[illegible] (1)	[illegible] (GF)	3	-	18 3U	-	

Figure A.1: The PVS-W schedule, or the wage labour schedule.

PALANPUR VILLAGE STUDY

Date 22 / 5 [illegible]

PVS - H CULTIVATION SCHEDULE - Worksheet

Household No. 813

Respondent Hari Chand

Period 3-5 to [illegible]

Investigator [illegible]

Date	Plot No.	Crop	Activity	Labour input			Other inputs				Remarks
				Type	Nb. Hrs.	Reward	Type	Qty.	Cost	Source	
	C9	GE	TH	2FM	2 hrs	-	HTH	1.5 Q	8%	(221)	
	A3+C4 + A4 + C5 + A6+C7	GE	TH	2FM, 1FC	1 day	-	HTH	4 Q	8 %	(221)	
	-do-	GE	Transport of straw	2FM	2 days	—	—	—	—	—	

Figure A.2: The PVS-H schedule, or the cultivation schedule.

Appendix to Chapter 5

Proof of Proposition 1:

Recall that equilibrium wages always minimize $C(w, k, \mathbf{w})$.

Since $w(k_1)$ and $w(k_2)$ are both equilibrium wages, it follows that for the individual farmer with land k_1, who finds it optimal to pay $w(k_1)$,

$$\rho(k_1)w(k_1) + E[\theta c(p(w(k_1), \theta, \mathbf{w}))] \leq \rho(k_1)w(k_2) + E[\theta c(p(w(k_2), \theta, \mathbf{w}))] \quad (A.5.1)$$

and for the individual farmer with land k_2 who finds it optimal to pay $w(k_2)$,

$$\rho(k_2)w(k_1) + E[\theta c(p(w(k_1), \theta, \mathbf{w}))] \geq \rho(k_2)w(k_2) + E[\theta c(p(w(k_2), \theta, \mathbf{w}))]. \quad (A.5.2)$$

Subtracting (A.5.2) from (A.5.1) we get

$$w(k_1)(\rho(k_1) - \rho(k_2)) \leq w(k_2)(\rho(k_1) - \rho(k_2))$$

or,

$$w(k_1) \leq w(k_2).$$

Proof of Proposition 3:

Proof of Part (i): The reader can easily construct the argument. It is very similar to that of Proposition 2.

Proof of Part (ii): We must prove that for any w^*, $w^{*'}$ with $w^* > w^{*'}$,

$$w^* = arg\ min_{[0,w^*]} C(w, k_1, w^*, w^{*'}), \quad (A.5.3)$$

and

$$w^{*'} = arg\ min_{[0,w^*]} C(w, k_2, w^*, w^{*'}); \quad (A.5.4)$$

iff $w^* \in [w_3, w_4]$ and $w^{*'} \in [w_3, min\{w_2, w_4\}]$.

Necessity: First, we prove that unless $w^{*'} \in [w_3, min\{w_2, w_4\}]$, and $w^* \in [w_3, w_4]$, either of conditions (A.5.3) or (A.5.4) will be violated.

1. The function $\rho(k_2)w - c\tilde{e}Z(w)$ is minimized at w_2.

   Under our assumptions, for any choice of $w^{*'} > w_2$, and any $w \in [w_2, w^{*'}]$,

   $$\rho(k_2)w - c\tilde{e}Z(w) < \rho(k_2)w^{*'} - c\tilde{e}Z(w^{*'}).$$

   Since
   $C(w, k_2, w^*, w^{*'}) = \rho(k_2)w - c\tilde{e}Z(w) + \{c\tilde{e}Z(w^{*'}) + c\hat{e}(Z(w^*) - Z(w^{*'}))\}$ for all $w \in [0, w^{*'}]$ and any $w^* > w^{*'}$; we conclude that

   $$\begin{aligned} &\forall\, w^{*'} > w_2 \\ &\exists w \in [0, w^{*'}] \textit{ such that } C(w, k_2, w^*, w^{*'}) < C(w^{*'}, k_2, w^*, w^{*'}). \end{aligned} \tag{A.5.5}$$

   Therefore condition (A.5.4) is violated if $w^{*'} > w_2$.

2. The function $\rho(k_2)w - c\hat{e}Z(w)$ is minimized at w_3.

   Since $\rho(k_2)w - c\hat{e}Z(w)$ is continuous in w, there exists some $\epsilon > 0$ such that the function is decreasing in the interval $[w_3 - \epsilon, w_3]$.

   Choose $w^{*'}, w$ in the interval $[w_3 - \epsilon, w_3]$ such that $w > w^{*'}$ and choose $w^* \geq w$. Then

   $$\begin{aligned} &\forall\, w^{*'} < w_3 \\ &\exists\, w \in [w^{*'}, w^*] \textit{ such that } C(w^{*'}, k_2, w^*, w^{*'}) > C(w, k_2, w^*, w^{*'}), \end{aligned} \tag{A.5.6}$$

   since $C(w, k_2, w^*, w^{*'}) = \rho(k_2)w - c\hat{e}Z(w) + c\hat{e}Z(w^*)$ for all $w \in [w^{*'}, w^*]$.

   Therefore (A.5.4) is violated if $w^{*'} < w_3$.

3. The function $\rho(k_1)w - c\hat{e}Z(w)$ is minimized at w_4.

   For any choice of $w^* > w_4$ and $w^{*'} \leq w^*$,

   $$\exists w \in [w^{*'}, w^*] \textit{ such that } C(w^*, k_1, w^*, w^{*'}) > C(w, k_1, w^*, w^{*'}). \tag{A.5.7}$$

   This can be proved by proceeding in exactly the same manner as for proving $w^{*'} \leq w_2$.

   Therefore, condition (A.5.3) stands violated if $w^* > w_4$.

4. By Proposition 1, $w^* \geq w^{*'}$ always.

   Therefore, it is necessary that

$$w^{*'} \leq w_4. \tag{A.5.8}$$

   and

$$w^* > w_3. \tag{A.5.9}$$

   It follows from equations (A.5.5) to (A.5.9) that in order to fulfil conditions (A.5.3) and (A.5.4) it is necessary that $w^{*'} \in [w_3, min\{w_2, w_4\}]$, *and* $w^* \in [w_3, w_4]$.

Sufficiency: Now we prove that if $w^{*'} \in [w_3, min\{w_2, w_4\}]$ and $w^* \in [w_3, w_4]$ then (A.5.3) and (A.5.4) are satisfied.

1. As in Corollaries 1 and 2 of the main body of this chapter, any $w^{*'} \in [\underline{w}(k_2, \tilde{e}), w_2]$ minimizes $\rho(k_2)w - c\tilde{e}Z(w)$ in the range $[0, w^{*'}]$.

   Now, $\underline{w}(k_2, \tilde{e}) < \underline{w}(k_2, \hat{e})$ since $\rho(k_2)/c\tilde{e} < \rho(k_2)/c\hat{e}$, and $\underline{w}(k_2, \hat{e}) \leq \overline{w}(k_2, \hat{e}) = w_3$.

   Therefore,

$$[w_3, w_2] \subset [\underline{w}(k_2, \tilde{e}), w_2]. \tag{A.5.10}$$

   For any fixed choice of $w^{*'} \in [w_3, w_2]$ and $w^* > w^{*'}$, we know that

$$C(w, k_2, w^*, w^{*'}) = \rho(k_2)w - c\tilde{e}Z(w) + c\tilde{e}Z(w^{*'}) + c\hat{e}(Z(w^*) - Z(w^{*'})).$$

   Therefore,

$$\forall\, w^{*'} \in [w_3, min\{w_2, w_4\}],\ arg\ min_{[0, w^{*'}]} C(w, k_2, w^*, w^{*'}) = w^{*'} \tag{A.5.11}$$

   for any $w^* > w^{*'}$.

2. Note that $\rho(k_2)w - c\hat{e}Z(w)$ is increasing in $[w_3, \infty)$ because of the shape of $\zeta(w)$.

   $C(w, k_2, w^*, w^{*'}) = \rho(k_2)w - c\hat{e}Z(w) + c\hat{e}Z(w^*)$ in the interval $[w^{*'}, w^*]$.

   Therefore, for any arbitrary choice of $w^* > w_3$, and

$$\forall\, w^{*'} \in [w_3, w^*], arg\ min_{[w^{*'}, w^*]} C(w, k_2, w^*, w^{*'}) = w^{*'}. \tag{A.5.12}$$

3. Note that any $w^* \in [\underline{w}(k_1, \hat{\epsilon}), w_4]$ minimizes $\rho(k_1)w - c\hat{\epsilon}Z(w)$ in the interval $[0, w^*]$.

   Since, $\rho(k_1)/c\hat{\epsilon} < \rho(k_2)/c\hat{\epsilon}$, it follows from that $\underline{w}(k_1, \hat{\epsilon}) < w_3$, or, $[w_3, w_4] \subset [\underline{w}(k, \hat{\epsilon}), w_4]$.

   Now one can prove following arguments similar to the earlier ones that

   $$\forall\, w^* \in [w_3, w_4], arg\ min_{[w^{*'}, w^*]} C(w, k_1, w^*, w^{*'}) = w^*. \qquad (A.5.13)$$

   for any $w^{*'} < w^*$.

4. Finally, it remains to prove that

   $$C(w^*, k_1, w^*, w^{*'}) \leq C(w, k_1, w^*, w^{*'})\ \forall\ w \in [0, w^{*'}] \qquad (A.5.14)$$

   for any $w^* \in [w_3, w_4]$, and $w^{*'} \in [w_3, min\{w_2, w_4\}]$ such that $w^* > w^{*'}$.

   Since $C(w^*, k_1, w^*, w^{*'}) < C(w^{*'}, k_1, w^*, w^{*'})$, for the above choice of w^* and $w^{*'}$, it is sufficient to prove that

   $$arg\ min_{[0, w^{*'}]} C(w, k_1, w^*, w^{*'}) = w^{*'}. \qquad (A.5.13)$$

   It can be proved using arguments similar to earlier ones that $[w_3, w_4] \subset [\underline{w}(k_1, \tilde{\epsilon}), \overline{w}(k_1, \tilde{\epsilon})]$ since $\rho(k_1)/c\tilde{\epsilon} < \rho(k_2)/c\hat{\epsilon}$, and any $w^{*'} \in [\underline{w}(k_1, \tilde{\epsilon}), \overline{w}(k_1, \tilde{\epsilon})]$ satisfies the equation

   $$w^{*'} = arg\ min_{[0, w^{*'}]} \rho(k_1)w - c\tilde{\epsilon}Z(w) + \{c\tilde{\epsilon}Z(w^{*'}) + c\hat{\epsilon}(Z(w^*) - Z(w^{*'}))\}.$$

   The two together imply that (A.5.14) is true.

   Equations (A.5.11) to (A.5.14) together imply the sufficiency of the characterization.

Appendix to Chapter 6

Example A.6.1: Consider a hypothetical utility function

$$u(w) = 1 - \epsilon^{-w} + 0.05w, \quad w \geq 0 .$$

It may be easily checked that this utility function is concave and $u(0) = 0$. Let the pure rate of time preference be 0.5 for both the labourer and the farmer. Let us apply the analysis of Sections 6.2 and 6.3 to this utility function. Normalize the slack season spot wage to zero. Also set $q = 0$. This will simplification makes the incentive constraints easier to satisfy, and therefore will not affect the validity of this exercize. After this simplification, the labourers' incentive constraints become:

$$\textit{acceptability } u(\underline{w}) + \delta u(\tilde{w}) \geq u(\underline{w}) + \delta u(\bar{w}),$$

and

$$\textit{incentive compatibility } \delta u(\underline{w}) + u(\bar{w}) \geq \delta u(\underline{w}) + u(\bar{w}).$$

The necessary and sufficient condition for labour tying becomes

$$\delta^2 u'(\underline{w}) > u'(\bar{w}).$$

Note that in this example, incenitve compatible labour tying is possible for any peak season wage $\bar{w} \geq 1.55$.

Consider, however, incentive compatible labour tying with *full insurance* to the labourer. The three numerical examples below demonstrate that there is no systematic relation between seasonality and the existence of a fully insurance providing, incentive compatible labour contract. For this particular utility function, even for arbitrarily high levels of seasonality, such a contract will not exist.

Case I : First I shall demonstrate that for a value of $\bar{w}$ well above 1.55, incentive compatible labour tying is not possible if *full insurance* is to be provided.

Let $\bar{w} = 3$. Then the highest possible consumption smoothing wage to the tied labour is $c = 1$. The corresponding utilities are $u(\bar{w}) = 1.100$ and $u(c) = .6821$.

Then we have $(1 + \delta)u(c) = 1.023 < 1.1 = u(\bar{w}) + \delta u(0)$, or, labour tying with full insurance to the labourer cannot be incentive compatible, although nontrivial, incentive compatible labour tying is possible.

Case II: next I demonstrate that at a higher level of seasonality, incenitve compatible labour tying is possible even after providing full insurance to the labourer.

Let $\bar{w} = 7.5$. The highest possible consumption smoothing wage to the tied labourer is $c = 2.5$. The corresponding levels of utility are $u(\bar{w}) = 1.3744$ and $u(c) = 1.0429$. so that $(1 + \delta)u(c) = 1.5643 > u(\bar{w})$ or incentive compatible labour tying with full insurance to the labourer is possible at this level of seasonality.

Case III: In this example the reader will see that at a much higher level of seasonality, incentive compatible labour tying with full insurance is not possible. The reader can verify that for all higher levels of seasonality, the above assertion is true.

Let $\bar{w} = 21$. Then the highest possible consumption smoothing wage to the tied labourer is $c = 7$ and $u(\bar{w}) = 2.05$ and $u(c) = 1.3491$. Therefore, $(1 + \delta)u(c) = 2.0236 < 2.05$ implying that in spite of an even higher level of seasonality as compared to Case II, labour tying with full insurance *cannot* be incentive compatible.

Lemma 1: For any $\mathbf{z}$, *the solution to the problem*

$$\min \ \underline{w} + \delta\tilde{w}$$

subject to

$$\bar{w} \geq \tilde{w} \tag{A.6.1}$$

$$u(\tilde{w}) + \delta(1-q)\underline{W} \geq u(\bar{w}) + \delta(1-q)V_{\bullet} \tag{A.6.2}$$

$$\underline{w} + \delta\bar{w} \geq \underline{w} + \delta\tilde{w} \tag{A.6.3}$$

is identical to that of the problem

$$\min \ \underline{w} + \delta\tilde{w}$$

subject to (A.6.2), (A.6.3) and

$$\underline{W} \geq V_{\bullet}. \tag{A.6.4}$$

Proof: We show that the two feasible sets are the same. Let $(\underline{w}, \tilde{w})$ satisfy (A.6.1) to (A.6.3). To verify (A.6.4), simply note from (A.6.2) and (A.6.1) that $\delta(1-q)(\underline{W} - V_{\bullet}) \geq u(\bar{w}) - u(\tilde{w}) \geq 0$.

Consequently, let $(\underline{w}, \bar{w})$ satisfy (A.6.2) to (A.6.4). From (A.6.4), it is easy to check that $\underline{u} > \underline{u}$. Now, suppose on the contrary that (A.6.1) is not satisfied. Then $\bar{w} < \tilde{w}$. By (A.6.3), we get, therefore, $\underline{w} > \underline{w}$. Combining these last two pieces of information with $\underline{u} \geq \underline{u}$ and the strict concavity of the utility function $u(\cdot)$, we get $\underline{w} + \delta\bar{w} < \underline{w} + \delta\tilde{w}$, which contradicts (A.6.3) and completes the proof. ■

Proof of Fact: Suppose that a nontrivial type 1 labour tying contract is possible. Then $(\underline{w}, \tilde{w}) \neq (\underline{w}, \bar{w})$ and $\underline{w} + \delta\tilde{w} \leq \underline{w} + \delta\bar{w}$. So, by Lemma 1, $\tilde{w} < \bar{w}$ and $\underline{w} > \underline{w}$. ■

Lemma 2: For any $\mathbf{z}$, $(\underline{w}_*(\mathbf{z}) - \underline{w}, \tilde{w}^*(\mathbf{z})) = (\underline{x}_*(\mathbf{z}), \tilde{x}^*(\mathbf{z}))$.

Proof: Simply observe that the type 1 and type 2 contracts have the same feasible set: $(\underline{w}(\mathbf{z}), \tilde{w}(\mathbf{z})$ is acceptable and incentive compatible under type 1 if and only if $(\underline{w}_*(\mathbf{z}) - \underline{w}, \tilde{w}^*(\mathbf{z}))$ is acceptable and incentive compatible under a type 2 contract. The objective function differs by an additive constant $\bar{w}$. So using uniqueness, we are done. ■

Lemma 3: In any equilibrium, where $0 \leq T_1 + T_2 < L_0$, *the equilibrium casual wages* $(w_0, \bar{w}_0)$ *are equal to the benchmark wages* w_0 *and* w^0 *where*

$$w^0 = \max\{w_0, F'(L_0) - \alpha w_0/\delta\}.$$

Proof: Let $(\underline{w}, \bar{w})$ be the casual labour wages. If there is no tied labour in equilibrium, then it is obvious that the equilibrium is the same as that of the benchmark economy and we are done.

Otherwise, $T_i > 0$ for some $i = 1, 2$. Even in this case, by Proposition 2, there is always casual labour in equilibrium. Because tied and casual labour are perfectly substitutable, $\underline{w} + \delta\bar{w} = w_* + \delta w^*$ if $T_1 > 0$ and $\delta\bar{w} = x_* + \delta x^*$ if $T_2 > 0$. But then, the total amount of effective labour employed must be the same as that in the benchmark economy. Therefore, $\alpha w_0 + \delta w^0 = \alpha\underline{w} + \delta\bar{w}$. Moreover, because $\alpha < 1$, there cannot be full employment in the slack. So $\underline{w} = w_0$. Combining the last two observations, we get $\bar{w} = w^0$ and this completes the proof. ■

Proof of Proposition 1:

Consider the following problem, to be called problem B.

$$\min_{\underline{w},\tilde{w}} \quad \underline{w} + \delta\tilde{w} \tag{A.6.5}$$

subject to

$$w^0 \geq \tilde{w} \tag{A.6.6}$$

$$\delta(1-q)u(\underline{w}) + u(\tilde{w}) \geq \delta(1-q)u(w_0) + u(w^0) \tag{A.6.7}$$

$$w_0 + \delta w^0 \geq \underline{w} + \delta\tilde{w}. \tag{A.6.8}$$

I claim that (B) *has a solution with* $\underline{w} + \delta\tilde{w} < w_0 + \delta w^0$ *if and only if* (6.3.1) *holds.*

Suppose, first, that (B) has a solution with $\underline{w} + \delta\tilde{w} < w_0 + \delta w^0$. Then it must be that $w^0 > \tilde{w}$ and so, by (A.6.7), $w_0 < \underline{w}$. Using (A.6.7) again and the strict concavity of $u(\cdot)$, together with $\underline{w} + \delta\tilde{w} < w_0 + \delta w^0$;

$$\begin{aligned} u'(w^0)(w^0 - \tilde{w}) < u(w^0) - u(\tilde{w}) &\leq \delta(1-q)[u(\underline{w}) - u(w_0)] \\ &< \delta(1-q)u'(w_0)(\underline{w} - w_0) \\ &\leq \delta^2(1-q)u'(w_0)(w^0 - \tilde{w}) \end{aligned}$$

which, together with the definitions of w_0 and w^0, establishes (6.3.1).

Conversely, suppose that (6.3.1) holds. For $\varepsilon > 0$, define $\underline{w}(\varepsilon) \equiv w_0 + \varepsilon$ and $\tilde{w}(\varepsilon) \equiv w^0 - \varepsilon/\delta$. For the pair $(\underline{w}(\varepsilon), \tilde{w}(\varepsilon))$, (A.6.6) and (A.6.7) are met. We show that for small ε, (A.6.7) is met with *strict ineqality*. To see this, note that for some $\theta(\varepsilon) \in (\tilde{w}(\varepsilon), w^0)$ and $\eta(\varepsilon) \in (w_0, \underline{w}(\varepsilon))$, we have:

$$\frac{u(w^0) - u(\tilde{w}(\varepsilon))}{\varepsilon} = \frac{u'(w_0)}{\delta} - u''(\theta(\varepsilon))\frac{\varepsilon}{\delta^2} \tag{A.6.9}$$

and

$$\frac{\delta(1-q)[u(\tilde{w}(\varepsilon)) - u(w_0)]}{\varepsilon} = \delta(1-q)u'(w_0) + \delta(1-q)\varepsilon u''(\eta(\varepsilon)). \tag{A.6.10}$$

Combining (A.6.9) and (A.6.10) and using (6.3.1), we see that there exists $\hat{\varepsilon} > 0$ such that (A.6.7), holds with *strict* inequality. Consequently, there exists $(\underline{w}, \tilde{w})$ such

that (A.6.6) to (A.6.8) are met, with (A.6.8) holding with strict inequality (simply take $\underline{w} = \underline{w}(\hat{\varepsilon})$ and $\underline{w}$ less than but "close to" $\bar{w}(\varepsilon)$).

This completes the proof of the claim.

Now I finish the main proof. Suppose that there is labour tying in equilibrium. Then, recalling that $\underline{w} = w_0$ and $\bar{w} = w^0$ in equilibrium, and using the fact that labour tying is non-trivial, it is easy to see that a nontrivial solution must exist to Problem (B). By the claim, (6.3.1) holds.

Conversely, suppose that (6.3.1) holds but that there is no labour tying in equilibrium. Then it is easy to see that each employer's labour-tying problem, via Lemma 1, reduces to (B) (simply set $p_1 = p_2 = 0$ and use Lemma 3 to argue that $\underline{w} = w_0$, $\bar{w} = w^0$). But by the claim, there exists a non-trivial solution to (B), which contradicts conditions (6.2.13) and (6.2.14) of the equilibrium, and we are done. ■

Lemma 4: If $\delta^2(1-q)u'(\underline{w}) > u'(\bar{w})$, then there exists a unique pair (w_*, w^*) such that

$$\delta^2(1-q)u'(w_*) = u'(w^*) \tag{A.6.11}$$

$$w_* + \delta w^* = \underline{w} + \delta\bar{w} \tag{A.6.12}$$

$$w_* > \underline{w} \tag{A.6.13}$$

$$w^* < \bar{w}. \tag{A.6.14}$$

Proof: Define a function $g(w)$ by

$$\delta^2(1-q)u'(g(w)) = u'(w). \tag{A.6.15}$$

Then it is clear that $g(w)$ is continuous and monotonically increasing. Moreover, $g(\bar{w}) + \delta\bar{w} > \underline{w} + \delta\bar{w}$ by the condition of Lemma 4. Also, $g(\underline{w}) < \underline{w} < \bar{w}$, so $g(\underline{w}) + \delta\underline{w} < \underline{w} + \delta\bar{w}$. So by the monotonocity of $g(w) + w$, there is a unique $w^* \in (\underline{w}, \bar{w})$ such that $g(w^*) + \delta w^* = \underline{w} + \delta\bar{w}$. Clearly, $g(w^*) > \underline{w}$ (because $w^* < \bar{w}$). Defining $w_* \equiv g(w^*)$, we are done. ■

Lemma 5: In any equilibrium with non-trivial labour tying, the constraint (A.6.2) must hold with equality.

Proof: Suppose that (A.6.2) is not binding. Consider a new pair, for small $\varepsilon > 0$, $(\underline{w}', \tilde{w}')$ such that $\underline{w}' = \underline{w} + \varepsilon$ and $\tilde{w}' = \tilde{w} - \varepsilon/\delta$. Then $\underline{w}' + \delta\tilde{w}' = \underline{w} + \delta\tilde{w}$ and it is easy to check that $\underline{W}'$, defined for $(\underline{w}', \tilde{w}')$ in the same manner as $\underline{W}$, will satisfy $\underline{W}' > \underline{W}$, so that constraints (A.6.1) to (A.6.3) hold with strict inequality for $(\underline{w}', \tilde{w}')$. Now define $(\underline{w}'', \tilde{w}'')$ by $\underline{w}'' = \underline{w}'$ and $\tilde{w}'' = \tilde{w}' - \eta$ for η small but positive. Then, too, constraints (A.6.1) to (A.6.3) hold and $\underline{w}'' + \delta\tilde{w}'' < \underline{w} + \delta\tilde{w}$. This is a contradiction to the supposition that $(\underline{w}, \tilde{w})$ is the optimal solution. ■

Proof of Proposition 3:

(i) If condition (6.3.1) fails to hold, then, by Proposition 1, there is no labour-tying in equilibrium. Consequently, the equilibrium is simply that of the benchmark economy.

(ii) If condition (6.3.1) does hold, then the equilibrium involves labour tying. By Lemma 3, the casual wages $(\underline{w}, \tilde{w})$ equal (w_0, w^0), the casual wages of the benchmark economy. By the identical nature of casual and tied jobs, (6.4.1) must hold. Since labour tying is non-trivial, the first order conditions to the employer's minimization problem in Lemma 1 must hold with equality, and using this in conjunction with Lemma 2, we get (6.4.2). Moreover, Lemma 4 tells us that a pair (w_*, w^*) (and consequently (x_*, x^*)) satisfying (6.4.1) and (6.4.2) must exist uniquely.

It is clear that once the probability of tied employment p^* is determined, (6.4.4) to (6.4.6) follow immediately. For this, first use Lemma 5 to argue that (A.6.2) holds with equality. Rewriting (A.6.2) with equality at equilibrium, we get:

$$u(w^0) - u(w^*) = \delta(1-q)[W_* - V_*] \qquad (A.6.16)$$

and by writing out the closed form expressions for W_* and V_*, we get

$$W_* - V_* = \frac{(1-p^*)(1-\delta^2)[u(w_*) + \delta u(w^*) - u(w_0) - \delta u(w^0)]}{[1-\delta^2(1-p)][1-\delta^2(1-q)] - \delta^2 pq} \qquad (A.6.17)$$

Combining (A.6.16) and (A.6.17) and after several tedious but simple steps, we get

$$p^* = 1 - \frac{u(w^0) - u(w^*)}{\delta(1-q)[u(w_*) - u(w_0)]}$$

which is nothing but (6.4.3).

Finally, we need to check that (6.4.3) makes sense. Clearly, $p^* < 1$ as given by (6.4.3). So all we need to do is make sure $p^* > 0$. To do this, I make use of (6.4.1), (6.4.2) and the strict concavity of $u(\cdot)$ in the following calculation;

$$\begin{aligned} u(w^0) - u(w^*) < u'(w^*)(w^0 - w^*) &= \tfrac{u'(w^*)}{\delta}(w_* - w_0) \\ &= \delta(1-q)u'(w_*)(w_* - w_0) \\ &< \delta(1-q)[u(w_*) - u(w_0)] \end{aligned}$$

and the proof is complete. ■

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