Utilization of Surplus Rural Labor in Developing Economies- A Flexible Spreadsheet Model

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This article contains a model for the utilization of surplus rural labor, through partnerships between participating village families and businesses. The needs of participating families are treated in some detail, as are inducing the business investments. Also discussed is the political context. There is a suggestion that advantage might be taken of the extremely rapid changes, due to technology, in both the manufacturing and the design of products. Regarding design, there is now great emphasis on affordability e. g. products such as cookstoves. More important could be components for some of the remarkable new house designs. The model is embodied in a spreadsheet. The spreadsheet is parameterized for easy flexible use for testing various technical and behavioral assumptions.

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Introduction

This article is an update of one that appeared in the April 2009 issue of The Indian Journal of Industrial Relations, titled "Utilization of Surplus Rural Labor in Developing Economies – a Model" (Errinton, 2009). The spreadsheet illustration, to make the case very strongly, was based on assumptions such as three shifts a day which may not apply to a real-life situation. Hence the introduction of flexibility, through parameterization in this article.

The Basic Model

The socio-economic model presented in this paper concerns utilization of surplus labor (the disguised unemployment phenomenon) in rural communities in developing economies. The economics in the model are very simple - a couple of wrinkles, but still very simple. The social considerations are less so.

It is assumed that the families supporting the disguised unemployed want to be able to use this labor, which at present has zero or near zero opportunity cost, to leapfrog through time to a significantly better

way of life. (Think of villages in India, which are aware of economic growth in which they are not sharing.) Moreover, these families are aware of the dangers of causing envy and resentment among the people in their vicinity who do not have such supported labor as a resource.

The course of action taken by our collection of families is to induce a business to partner with them in establishing a particular kind of enterprise. The labor, the individual families, has shares in the enterprise, along with the business. This in lieu of wages. The enterprise is modestly sized to start with, but because of product/technology choice, scales upward without great difficulty according to an agreed-on investment schedule. The investment is done by the village families from most of the income from their shares, with the individual families acquiring an increasing proportion of the shares as the result.

Basically, what is happening here is that the villagers are investing their surplus labor in their own job creation. Of particular interest from a national standpoint, the afore mentioned situation where villagers feel they are not sharing in economic improvement. Consider, for example, Indian national elections in recent years. From a regional standpoint, a region where substantial industrialization is taking place fairly nearby very densely populated rural areas (South Karnataka/Kerala?)

Defusing Envy & Resentment

The key initial decision, when planning was being done for the new enterprise, was that the participating families must not compete with ordinary wage earners. (Which they could do, very effectively, because of the family support.) But it would be terrible to undercut the wages of people who mostly have great need for all the wages they earn. The villagers realize that their plan should combine business with an acceptance strategy.The new enterprise must coexist decently with what is already there in the local economy. Although taking advantage of labor intensity, it should not decimate existing labor-intensive operations.The new industry should not pollute the village. Some charitable activity by the enterprise certainly would not hurt.It will be argued later that some of the workers' profits should go for present consumption (health and morale reasons) rather than being included in the investment schedule. But of course anything remotely ostentatious would be avoided, at least during the early years when working for acceptance.

Meeting the Needs of Participating Families

The usefulness of some present consumption should be recognized. Merely from a morale standpoint, it would be counter-productive to postpone all consumption. In fact, without some increase in present consumption, it could be argued that the villagers would never become interested in the new arrangement in the first place. Moreover, there is one area where more than morale is involved. Providing basic health care has both humanitarian benefits and enables the enterprise labor to work with energy and

enthusiasm. An obvious case of the enterprise doing well by doing good.

Consider enthusiasm. Years ago there appeared an article criticizing W.A. Lewis and others for their writings about disguised unemployment. The point of the article was "aren't you forgetting about the disutility of work - economic theory has always included the disutility of work."Obviously work can be associated with a great deal of disutility, such as working when feeling poorly. And there are other reasons, such as boredom, or bitterness (e.g. feeling exploited because of an extremely low' wage).

What would be ideal would be for the workplace to be a setting where there would be considerable psychic income associated with work - being a valued member of a group working toward a goal, with the hope for a considerably better future for their families.

Hope can be extremely energizing, but it should be handled with care. There must be no overselling, because disappointed expectations are bitter indeed. And God forbid the hopes of the workers be undermined by any sort of cheating or unfairness. Recall the earlier emphasis on transparency in management.

Legal & Market Considerations

Because of the labor ownership, it is to be hoped that whatever rigidities exist in national or local labor laws to protect workers could be avoided. Also, the environment for producing and selling seems to be on the verge of fast changes. It needs only to mention 3D printers, and the concept of engineering for "radical affordability" as examples. Possibly being a latecomer would be advantageous.

Inducing the Business Investment

Table I in the Appendix shows the operation of the original unparameterized model for a seven year period. The purpose is to show in a general way how the workers could offer a business investor a low risk investment opportunity with a very attractive upside.This version of the model has the villagers maximizing the value of what they are offering, no-cost labor. This is why three shifts are assumed. This in exchange for the initial stake and fast-growing ownership.

Table 1 is a spreadsheet application: the spreadsheet formulas used are contained in Table 2. Risk is lowered for the business investor because of three assumptions underlying the model. First, his initial capital investment, the only capital investment he will have to make, is heavily leveraged by the labor inputs (e.g. multiple shifts). Second, the point of profitability is reached much sooner, because a large cost, wages, is eliminated for the seven year period shown. The consequence of the shift from wages to profit shares is of course the dilution of the profits, but regarding this, see the third assumption. Third, the business investor will continue to receive additional profit shares, which grow in proportion to labor's investment, although he himself will not be investing further. (The model assumes 20% of the additional shares.) There are good reasons for this

profit share distribution. He will be providing management, as well as having done the initial investing. As the enterprise grows, to some extent there will be more to manage. And from a fairness standpoint, keeping him happy, there should not be grounds for jealousy – having him feel that he should benefit from part of the enterprise's growth because he was instrumental in setting it up. Undoubtedly he had to work very hard managerially getting it set up (e.g. training people). The management of the enterprise should be very open and transparent with respect to the villagers' knowledge of what is going on.

More Details on the Model

The model quantifies what has been discussed earlier. At the end of a year, in the seven year timeframe, labor invests 80% of its income for that year in additional productive assets. The model assumes straight capital widening, i.e. unchanged position on the production function, labor inputs increasing proportionately to the increase in capital. The new capital is available for use at the beginning of the following year. The firm's yearly profits increase by 50% of the cost of the additional capital (remember, this capital is being worked very hard). If a payback period of two years still seems short, taking labor-intensive measures such as multiple shifts into account, remember also the shift of the wage bill into the profit category.

New shares, corresponding to additional profits, are distributed 80% to labor and 20% to the business investor.

Table I has a blank line separating YR5 from YR6. This blank line has a purpose, as will be explained. As one can see from Table I, the rate of growth in the shares of both labor and the business

Table 1 The Model Results

	Shares, Start of Period - Claim on Period's Income:		Labor, Percent Income to be	Labor, Amount Income to be	Resulting Additional Income, next Period		Resulting New Shares Allocated to Labor		Resulting New Shares Allocated to Bus. Investor	
	Business Investor	Labor	Invested	Invested	Percent	Amount	Percent	Num.	Percent	Num.
	C	D	E	F	G	H	I	J	K	L
YR1	50	50	80%	40	50%	20	80%	16	20%	4
YR2	54	66	80%	52.8	50%	26.4	80%	21.1	20%	5.3
YR3	59.3	87.1	80%	69.7	50%	34.8	80%	27.9	20%	7
YR4	66.2	115	80%	92	50%	46	80%	36.8	20%	9.2
YR5	75.4	151.8	80%	121.4	50%	60.7	80%	48.6	20%	12.1
YR6	87.6	200.4	80%	160.3	50%	80.1	80%	64.1	20%	16
YR7	103.6	264.5	80%	211.6	50%	105.8	80%	84.6	20%	21.2
end of period	124.8	349.1								

	Percent Gain Labor Shares	Percent Gain Business Investor Shares	Base, Total Shares	Percent Gain Total Shares
MNO	P			
YR1	0.32	0.08	100	0.2
YR2	0.32	0.098	120	0.22
YR3	0.32	0.118	146.4	0.238
YR4	0.32	0.139	181.2	0.254
YR5	0.32	0.161	227.2	0.267
YR6	0.32	0.183	288	0.278
YR7	0.32	0.204	368.1	0.287

investor are startling. This is not unusual in growth models with a high coefficient of invested income. Column M, "Percent Gain Labor Shares" is the driver. The rate of growth here is a constant 32 percent. Columns N and P, "Percent Gain Business Investor Shares" and "Percent Gain Total Shares", contain growth rates which would eventually converge through time to 32 percent.Now for the blank line in Table I. At some point the set

Table 2 The Spreadsheet Formulas Used to Derive Table I.

	Shares, Start of Period - Claim on Period's Income:		Labor, Percent Income to be	Labor, Amount Income to be	Resulting Additional Income, next Period		Resulting New Shares Allocated to Labor	
	Business Investor	Labor	Invested	Invested	Percent	Amount	Percent	Num.
	C	D	E	F	G	H	I	J
YR1	50	50	80%	(D9*0.8)	50%	(F9*0.5)	80%	(H9*0.8)
YR2	(C9+L9)	(D9+J9)	80%	(D10*0.8)	50%	(F10*0.5)	80%	(H10*0.8)
YR3	(C10+L10)	(D10+J10)	80%	(D11*0.8)	50%	(F11*0.5)	80%	(H11*0.8)
YR4	(C11+L11)	(D11+J11)	80%	(D12*0.8)	50%	(F12*0.5)	80%	(H12*0.8)
YR5	(C12+L12)	(D12+J12)	80%	(D13*0.8)	50%	(F13*0.5)	80%	(H13*0.8)
YR6	(C13+L13)	(D13+J13)	80%	(D14*0.8)	50%	(F14*0.5)	80%	(H14*0.8)
YR7	(C14+L14)	(D14+J14)	80%	(D15*0.8)	50%	(F15*0.5)	80%	(H15*0.8)
end of period	(C15+L15)	(D15+J15)						

	Resulting New Shares Allocated to Bus. Investor		Percent Gain Labor Shares	Percent Gain Business Investor Shares	Base, Total Shares	Percent Gain Total Shares
	Percent	Num.				
	K	L	M	N	O	P
YR1	20%	(H9*0.2)	(J9/D9)	(L9/C9)	(C9+D9)	(H9/O9)
YR2	20%	(H10*0.2)	(J10/D10)	(L10/C10)	(C10+D10)	(H10/O10)
YR3	20%	(H11*0.2)	(J11/D11)	(L11/C11)	(C11+D11)	(H11/O11)
YR4	20%	(H12*0.2)	(J12/D12)	(L12/C12)	(C12+D12)	(H12/O12)
YR5	20%	(H13*0.2)	(J13/D13)	(L13/C13)	(C13+D13)	(H13/O13)
YR6	20%	(H14*0.2)	(J14/D14)	(L14/C14)	(C14+D14)	(H14/O14)
YR7	20%	(H15*0.2)	(J15/D15)	(L15/C15)	(C15+D15)	(H15/O15)

of assumptions underlying this pure example of capital widening will cease to be valid. There is not an unlimited supply of already supported labor in the participating families. In Table I, after 5 years, the total new capital resulting from the workers' investing is 375.9 units, nearly double the initial capital investment of 200 units. Capital widening has thus increased labor utilization by 188%. The arbitrarily placed blank line indicates that it is appropriate to consider new rules, either capital deepening or supplementation of the families' labor force with outside wage earners. Of these two alternatives, one would suspect that the participating workers and their familieswould prefer capital deepening. Granted the outside wage earners would get no shares, still it would seem more attractive to increase the per capita productivity of the existing work force. No longer would increases in family returns depend solely on increasing labor input. The goal of a better life would be advanced by increasing per capita productivity.

A change in operations, which may occur within the investment period as described above, will certainly occur after the investment period and should be planned for from the start. For example, the workers may receive a wage in addition to income from the shares they own. Guidelines for division of profitability should be established in advance so as to preclude conflict when that time arrives.

Parameterization Explained, in the Appendix Table 3 shows the changes in the spreadsheet formulas to give the users easy flexibility in adapting the model to their own circumstances.

The values "plugged in" in Table 3 are the same as "hard-wired" in Table II, which has meant that Table I has been reproduced unchanged.

Appendix

Explanation for the Model, Table 1

Table I contains the data from a spreadsheet run of the model through a seven year period of agreed-on investment activity. The column designations, C through P, derive from the fact that a spreadsheet was used (Quattro Pro in this case). The columns will be described in some detail.

C: The shares held by the businessman at the start of a particular year. This is his claim on the value added, the profits, of that year.

D: The shares held by the individuals making up the labor force of the new enterprise, labor's share.

E: The percent of labor's share of the particular year's profits which will be invested in productive assets, available for production the following year.

F: The amount of labor's share invested.

G: Additional profit as a percentage of the additional investment made available at the start of the particular year.

H: The amount of profit the new investment will produce.

Table 3 The Spreadsheet Formulas for Parameterized Version

	Shares, Start of Period - Claim on Period's Income:		Labor, Percent Income to be	Labor, Amount Income to be	Resulting Additional Income, next Period		Resulting New Shares Allocated to Labor	
	Business Investor	Labor	Invested	Invested	Percent	Amount	Percent	Num.
	C	D	E	F	G	H	I	J
YR1	50	50	I20	(D9*I21)	50%	(F9*0.5)	I23	(H9*I24)
YR2	(C9+L9)	(D9+J9)	I20	(D10*I21)	50%	(F10*0.5)	I23	(H10*I24)
YR3	(C10+L10)	(D10+J10)	I20	(D11*I21)	50%	(F11*0.5)	I23	(H11*I24)
YR4	(C11+L11)	(D11+J11)	I20	(D12*I21)	50%	(F12*0.5)	I23	(H12*I24)
YR5	(C12+L12)	(D12+J12)	I20	(D13*I21)	50%	(F13*0.5)	I23	(H13*I24)
YR6	(C13+L13)	(D13+J13)	I20	(D14*I21)	50%	(F14*0.5)	I23	(H14*I24)
YR7	(C14+L14)	(D14+J14)	I20	(D15*I21)	50%	(F15*0.5)	I23	(H15*I24)
end of period	(C15+L15)	(D15+J15)						

	Resulting New Shares Allocated to Bus. Investor		Percent Gain Labor Shares	Percent Gain Business Investor Shares	Base, Total Shares	Percent Gain Total Shares
	Percent	Num.				
	K	L	M	N	O	P
YR1	I26	(H9*I27)	(J9/D9)	(L9/C9)	(C9+D9)	(H9/O9)
YR2	I26	(H10*I27)	(J10/D10)	(L10/C10)	(C10+D10)	(H10/O10)
YR3	I26	(H11*I27)	(J11/D11)	(L11/C11)	(C11+D11)	(H11/O11)
YR4	I26	(H12*I27)	(J12/D12)	(L12/C12)	(C12+D12)	(H12/O12)
YR5	I26	(H13*I27)	(J13/D13)	(L13/C13)	(C13+D13)	(H13/O13)
YR6	I26	(H14*I27)	(J14/D14)	(L14/C14)	(C14+D14)	(H14/O14)
YR7	I26	(H15*I27)	(J15/D15)	(L15/C15)	(C15+D15)	(H15/O15)

continuation of Table 3

parameter 1	display item, labor percent income to be invested	80%	<-cell I20
parameter 2	re calculation, amount of this income invested	0.8	<-cell I21
parameter 3	display item, resulting new shares allocated to labor	80%	<-cell I23
parameter 4	re calculation, number of labor's new shares	0.8	<-cell I24
parameter 5	display item, resulting new shares allocated to founder	20%	<-cell I26
parameter 6	Re calculation, number of founder's new shares	0.2	<-cell I27
parameter 7	display item, potential investable profit	50%	<-cell I30
parameter 8	amount of potential investable profit	0.5	<-cell I31

I: Percent of the new shares allocated to labor.

J: Number of new shares allocated to labor.

K: Percent of the new shares allocated to the business investor.

L: Number of new shares allocated to the business investor.

M: Percent gain in total shares held by labor.

N: Percent gain in total shares held by the business investor.

O: Total shares outstanding at the start of a particular year.

P: Percent gain in total shares.

In Table I, the monetary unit is some arbitrary amount. Arbitrary is alright in this case because the purpose of the table is to show relationships and growth over the seven year timeframe. A share, a claim on profits, comes into being when some number of these monetary units isinvested in productive assets, capital. In this model, two invested monetary units create one new share. Since a rapid payback period of two years is assumed, the two invested monetary units also create an increase of one monetary unit of profit per following year.

Thus at the start of year 1, the initial allocation of 100 shares (50 for the businessman and 50 for the villagers) is the result of 200 monetary units having been invested by the businessman, to get things started. For the first year, 100 monetary units of profit are expected, and realized. Of the 50 monetary units earned by labor from its shares, 80% is invested, 40 monetary units. This translates to 20 new shares at the start of year 2, and 20 monetary units of additional profit for year 2.

The parameterization involving parameters 1 through 6 is pretty straight forward. Columns G and H look like the column pairs associated with parameters 1-6, but the situation here is more complicated. Columns G and H are potential investable profits. For one thing, these are inherently less predictable than the terms between the businessman and labour which have been negotiated. And also, they are enormously dependent on the number of shifts worked. A change from 50% for three shifts to two-thirds of this (two shifts) or one third (one shift) would have a huge impact on the compounding which runs through the model. Moreover, even the behavioral parameters might change, such as a decision by labour to consume a greater percentage of smaller profits.

References

Errington, Peter (2009), "Utilization of Surplus Rural Labor in Developing Economies-A Model",