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The political economy of Land Reform: A new perspective applied to Latin America

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Abstract/Resumo:

We define in section 1 our notion of land reform, on section 2, the most important social and political movements of land reform in Latin America are presented. On section 3 we use a theoretical model in the context of economic growth with human capital learning-by-doing to evaluate land reforms. Section 4, discusses the results. Section 5 presents some economic efficiency estimates for the “Cédula” project of 2000 in NE Brazil - a market led land bill project, sponsored by the World Bank (WB) and the Ministry of Agricultural Development (MDA). Finally, section 6 concludes, and section 7 presents the references.

Palavras-chave/Keyword: Brazil, “Cédula”, human capital, Land Reform, Latin America, Learning by doing, “MST - Movimento dos Sem Terra”.

Classificação JEL/JEL Classification: Q15

"The political economy of Land Reform: A new perspective applied to Latin America"

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1. Land reform: definition and motivation

Land reform is an ancestral political economic instrument that has been used by governments and political agents in different ways. In this section we try to define our notion of land reform. The literature, especially in economics, regarding this issue is vast. So we must narrow our aim at defining this object of study.

My definition of land reform includes only land redistribution from large estates (*latifundia*) to smaller ones (*minifundia*). Thus, we exclude the reverse action of gathering *minifundia* into a larger *latifundia*.

Branco and Rocha de Sousa (2006) have established a typology of land reforms, using a matrix between the economic component and the political component. Below we present this definition on Table 1. For the economic component we tried to evaluate if a land reform was well succeeded, so that (total factor) productivity of the land increased. For the political assessment we tried to distinguish between revolutionary land reforms, structural change, accompanied by a coup d'état or revolution; and reformist land reforms, so that there is not a sudden change but a gradual and swift sustained change in government (Zakarya, 2004).

Table 1: Actual Land Reforms

Economic System *VERSUS* *Political System*	CENTRALIZED (C) [+ STATE]	DECENTRALIZED (D) [+ MARKET]
REFORMIST (R) WITHOUT SUDDEN POLITICAL CHANGE (WITHOUT REVOLUTION OR COUP)	(C,R) BRAZIL (MST 2000); VIETNAM (1988) MOZAMBIQUE (2004-5)	(D,R) BRAZIL (CÉDULA 2000) JAPAN (1945); THAILAND (90'S) GUATEMALA (1952-1954) - Arbenz Regime CHINA (1978-present)
STRUCTURAL (S) WITH SUDDEN POLITICAL CHANGE (WITH REVOLUTION OR COUP)	(C,S) PORTUGAL (1975) GUATEMALA (1954-1990)- military junta ZIMBABWE (1990-2005)	(D,S) Eastern Europe countries after the fall of the Berlin Wall, e.g.. UCRAINE (1991)

Source: Branco and Rocha de Sousa (2006)

Additionally, Kawagoe (1999) also has established his political economic typology of land reforms.

Table 2: Feasible Land Reforms

		Ex-Post Land Reform		
		Market Economy (M)		Socialist (S)
		Peasant (p)	Commercial (c)	
Ex Ante Land Reform	Market Economy Peasant (p)	Asian Model (1.1.) Mp-->Mp	(1.2.) Mp--> Mc	Socialist Model (1.4.) Mp-->S
	Half-feudal (F)	Latin American Model (3.1.) F--> Mp	(3.2.) F--> Mc	(3.4.) F-->S
	Socialist (S)	Transition Eco. Model (4.1.) S--> Mp	(4.2.) S--> Mc	

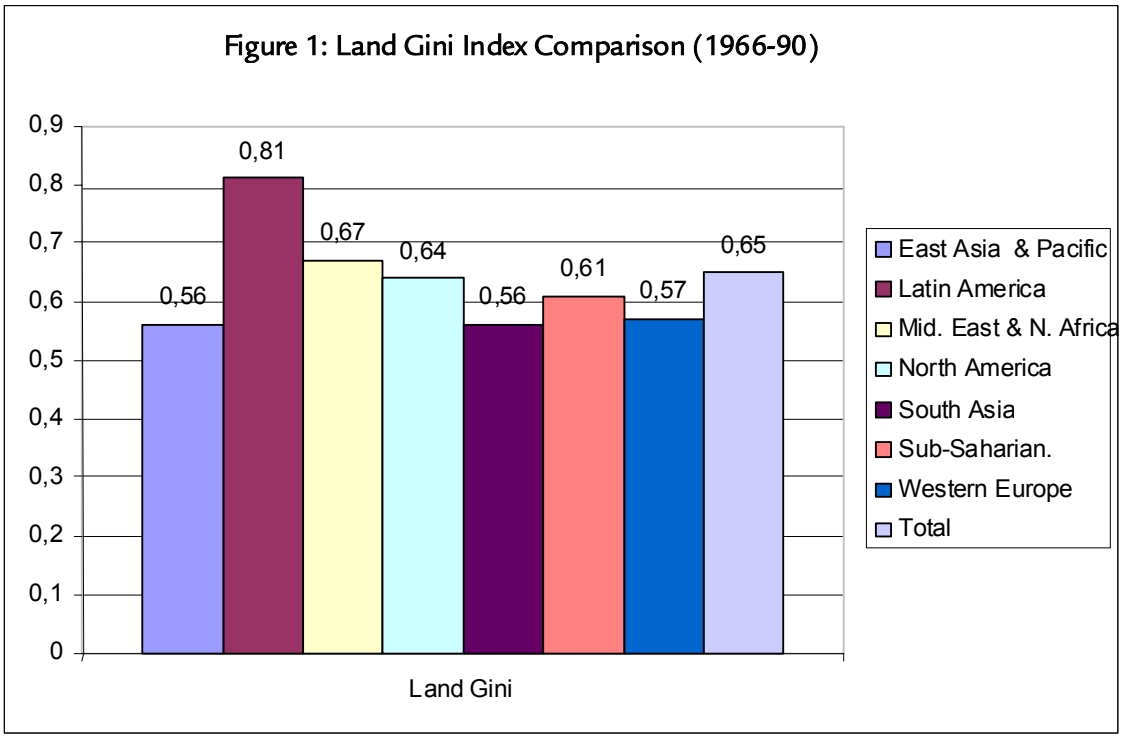
Source: Kawagoe (1999: 44) based on De Janvry (1981a,b) [also Rocha de Sousa (2006: 70)]

2. Land reform and peasant movements in Latin America

"Amor é latifúndio, sexo é invasão."[4]

MPB's, singer Rita Lee

In this paper we focus our analysis on Latin American land reforms[5,6]. Dorner (1991) and De Janvry (1981 a,b) have studied this issue at length. There are also several studies of peasant movements in Latin America, namely for MST – *Movimento dos Sem Terra* (Landless Workers) in Brazil (Masselli, 1998; Fernandes, 1999; Ricci, 1999). Forman (1974) presented the evolution of *campesinos*, and how the structure of the land defined power relations among different agents, also in Brazil. Wright and Wolford (2003) present an updated version of MST's formation. Lapp (2004) scrutinizes voting power of *campesinos* for all Latin America.



Source: Data adapted from Deininger and Olinto (1999: 23)

[4] Freely translated as: "*Love is large estate, sex is invasion.*" Brazilian popular singer, Rita Lee.

[5] There are a lot of studies of land reform in Africa, for the general case (Juul and Lund, 2002; Lund, 2002; Peters; 2002; Manji, 2006), Ethiopia (Benin and Pender, 2001; Taddese; 2001), Ghana (Berry, 2002), Mozambique (Unruh, 1998; Virtannen; 2004), Nigeria (Omotayo, 2003), Kenya (McPeak, 2005), Sahel (Grigsby, 2002; Thébaud, 2002), Senegal (Juul, 2002), South Africa (Williams et al., 1996; Zyl et al., 2001; Cousins, 2002), Tanzania (Wanitzek and Sippel, 1998) and Zimbabwe (Moyo, 2001; Hammar, 2002; Addison and Laakso, 2003).

[6] For Asia there are the following studies: Bangladesh (Devine, 2002), Phillipines (Borras, 2003), Japan (Dore, 1959; Hayami et al., 1991; Kawagoe, 1999), India (Banerjee and Iyer, 2002), Mongolia (Neupert, 1999; Fernandez-Gimenez, 2002), Thailand (Byamugisha ,1999a, 1999b) and Vietnam (Ravallion and Van de Valle, 2001, 2003).

Figure 1 presents the grassroots for all the land political movements, and we can observe that in Latin America, the Gini for land inequality had, for the period 1966-90, the highest average of all continents, respectively 81% (of a maximum allowed of 100%). Thus, we can state that inequality in land distribution, which is particularly striking in Latin America, caused discontent and thus political struggle for these lands.

The crucial nexus of the landed power is that land occupation, later could yield a legal title for that land, if it would be legally recognised by the government. In Brazil we have clearly two types of land reform: i) occupation and invasion of lands by the MST (the dominant one), and ii) a market led land reform (land bill land reform, called "*Cédula da Terra*") in which the landless might buy land from a farmers' association, with bonus interest, with a waiting period[7] of two years, and in which they choose the best land for their aims, and have access to technical support by qualified agronomists – see Buainain et al. (1998; 1999a,b; 2002, 2003).

More than defend itself one mode or the other we must perceive that reality is sufficiently enough complex in order to comply both systems.

Nevertheless, at the political economic level, the struggle of the farmers for better conditions has been for a long time in the economic literature (e.g. Kautsky (1898) in general, and for Portugal, Cunhal (1976), presented an updated version of Kautsky's work.).

Binswanger et al. (1995) analyses the political landed elite relations and has become a classical corner-stone of this literature. Huizer's (2001) work presents several recent political rooted *campesinos* movements.

For the case of Mexico, Bobrow-Strain (2007) presents the formation of Chiapas struggle, in which *ladinos* (indigenous who do not follow ancestral traditions) fight against traditional farmers. Additionally, Collier and Quaratiello (1999) abridge the same subject.

What kind of conclusion can we withdraw from all these studies?

The first point is that violence against the landed elite pays off for the offender, sooner or later, they will get a title for land that they eventually can negotiate and enter again in the political struggle for new lands. Of course, there is some risk in this struggle, some landless workers can eventually get killed or severally injured in the

[7] Or grace period, as is also usually referred in the financial literature, which means that the loan starts to be repaid only after this time has elapsed.

process. Buainain (2003) refers using CPT's (*Comissão Pastoral da Terra*) data that in 2002, for Brazil, there were 743 land conflicts, of which 43 deaths, 425 780 people involved, and 3 million ha of land involved. Figure 2, illustrates recent MST workers land's occupation in Brazil for 2002 [Fernandes based on CPT, 2003].

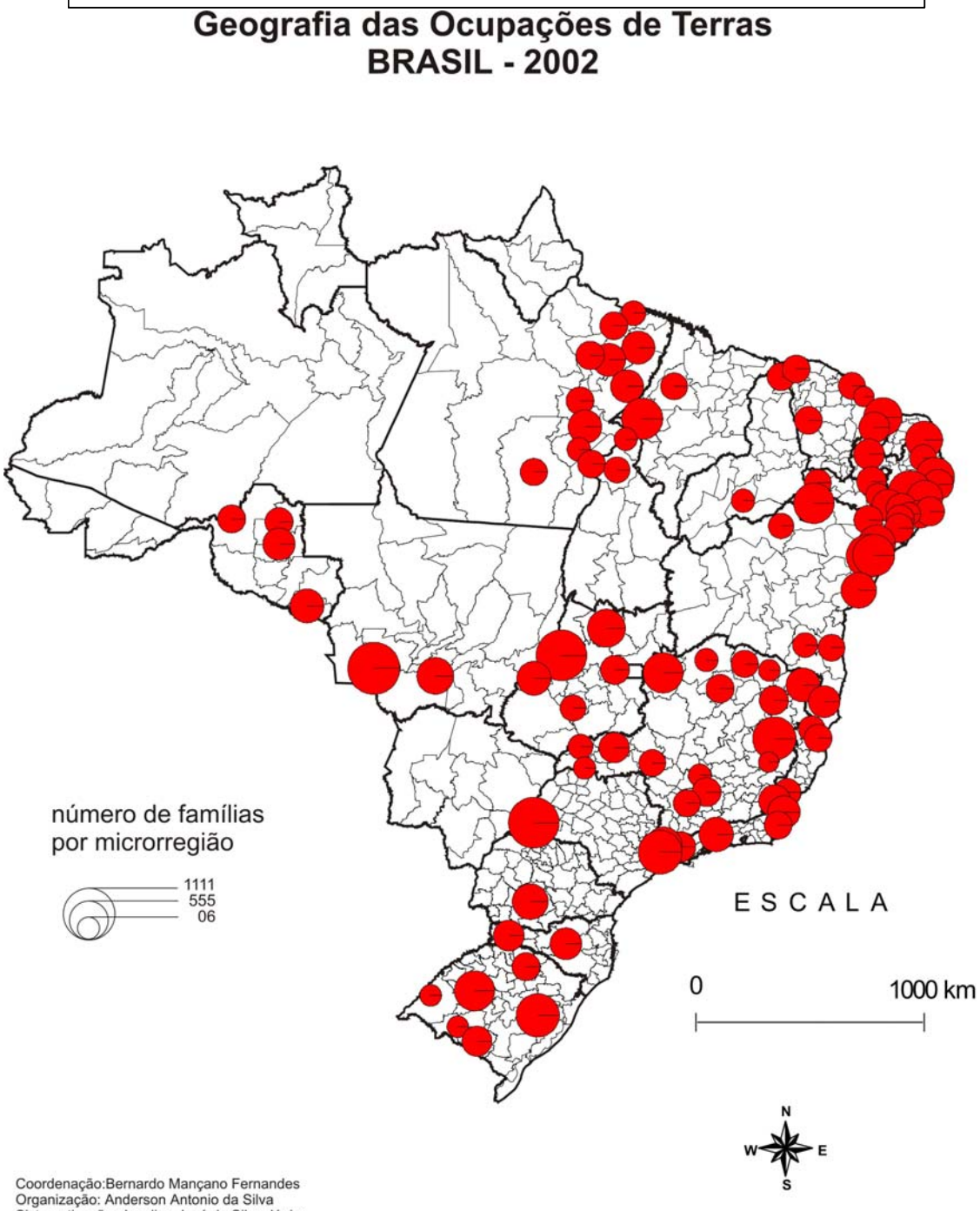
The second point, which led me further to study the subject, is: *What are the aggregate gains or losses of land reform?*

Do the gains of some outreach the losses of others, in a sense that we can talk about a net welfare gain?

I addressed this issue of analysing the aggregate effect of land reform on growth, as defined on the first section (a redistribution of large estate to smaller productive estates) using Arrow's learning by doing (LBD) growth model. The novelty of this approach is the use of human capital in the assessment of land reform.

Figure 2: Land occupations in Brazil by number of families (2002)

Source: CPT- Comissão Pastoral da Terra (2003)



3. Human capital land reform assessment

We use Arrow's (1962) economic growth model with "learning by doing" (LBD) to evaluate and assess the aggregate loss of welfare due to land reform. Besides, we use Arrow's model adapted with human capital.

Main Hypothesis: During traditional land reform **all the human capital is destroyed** since we have the substitution of experienced managers (agronomists) by farmers (campesinos) with few or at all no experience.

This hypothesis will be further enlarged to partial human capital loss.

Main Question: How many years does it take to recover human capital loss due to land reform?

We have the stream of future profits (S) with human capital:

$$S = \int_0^T e^{-\rho.t}.\gamma\left[H(t)\right].\left(1 - W.e^{\theta.t}\right).dt$$

In which ρ is the inter-temporal discount rate (or the interest rate or opportunity cost of project's evaluation), $\gamma\left[H(t)\right]$ is a production function which results from human capital investment till moment t, and $1 - W.e^{\theta t}$ r represents unitary profit derived from a wage cost W, with θ denoting wage growth rate.

So we must now compare two profits streams: the discounted agronomist's profit flow since the beginning till the time of land reform (S_{AGN}), with the profits campesinos flow since the time of land reform till a period in which all the human capital is recovered (T**), and we name it (S_{TB}):

$$S_{AGN} = \int_0^{T_{RA}} e^{-\rho.t}.\gamma\left[H(t)\right].\left(1 - W.e^{\theta.t}\right).dt$$

$$S_{TB} = \int_{T_{RA}}^{T^{**}} e^{-\rho.t}.\gamma\left[H(t - T_{RA})\right].\left(1 - W.e^{\theta.t}\right).dt$$

Hypothesis 2: we assume that the interest rate ρ is the same (i.e. is not affected by land reform), that wage growth rate, θ, is the same and that the production $\gamma\left[H(t)\right]$ and the profit rate is also the same: $1-W.e^{\theta t}$.

Do notice that these hypotheses can be changed without major changes in the quality of the model's results.

Dynamic Recovery Threshold of Traditional Land Reform (DRTTLR)

In this analysis we aim to compare S_{AGN} and S_{TB} to obtain T**. This is the time value from which after a land reform all human capital is totally recovered by the farmers/*campesinos*.

The following condition allows us to formalize **DRTTLR**:

$$S_{TB} \geq S_{AGN}$$

Thus, replacing by the respective function discounted cash-flows values:

$$S_{TB} = \int_{T_{RA}}^{T^{**}} e^{-\rho.t}.\gamma\left[H(t-T_{RA})\right].\left(1-W.e^{\theta.t}\right).dt \geq \int_{0}^{T_{RA}} e^{-\rho.t}.\gamma\left[H(t)\right].\left(1-W.e^{\theta.t}\right).dt = S_{AGN}$$

Like all variables and integrand functions (given all our resctritive initial hypotheses) are the same, the DRTTLR analysis is based upon the integration limits:

$$\int_{T_{RA}}^{T^{**}} Z'(t-T_{RA}).dt \geq \int_{0}^{T_{RA}} Z'(t).dt$$

Thus, solving for the gain function(Z(t)):

$$Z(T^{**}-T_{RA})-Z(T_{RA}-T_{RA}) \geq Z(T_{RA})-Z(0)$$

Which will be equivalent, since $Z(T_{RA}-T_{RA})=Z(0)$ can be eliminated by being common to both members, and if *Z(t)* monotonous increasing[8]:

$$Z(T^{**}-T_{RA}) \geq Z(T_{RA})$$

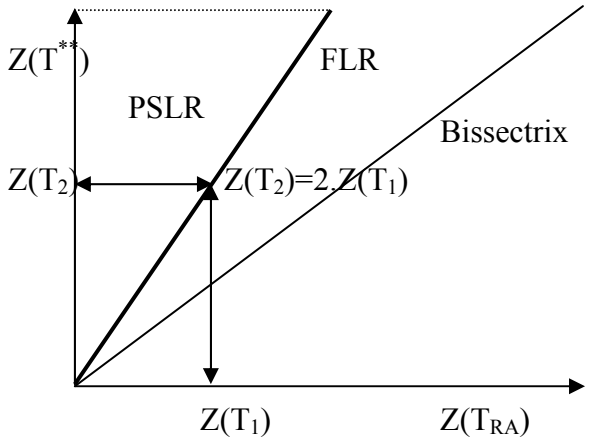
$$Z(T^{**}) \geq 2.Z(T_{RA})$$

From here we can derive that the dynamic profitability comes defined by the implict function. By the injectivity of the gain function (Z(.)) we can state that the gains on the threshold T** have to exceed at least the double of accumulated gains till land reform.

[8] The initial hypothesis I used was the separability of the function, but this one is too restrictive. It is enough to state that the function is increasingly monotonous to withdraw the conclusion in the text.

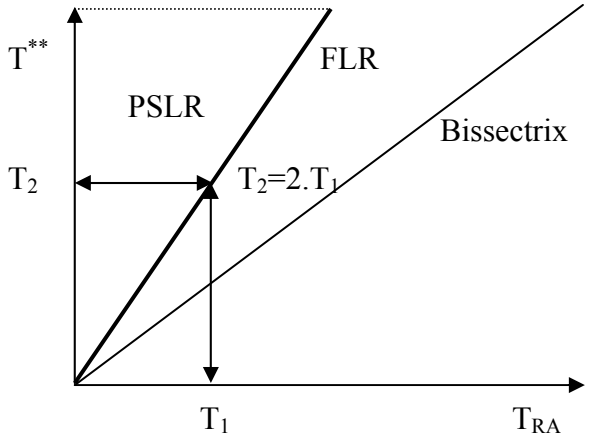
Figure 3 presents the Possibility Set of Land Reform (PSLR), accordingly to the condition of recovery of human capital loss in the space of possible gains ($Z(T^{**})$ *vs* $Z(T_{RA})$).

Figure 3 – Possibility Sets of Land Reform on ARROW's model (1962)



For a simple case in which the gain function is linear (thus $T^{**}=2T_{RA}$), it is the inferior line which defines the Possibility Set of land Reform (PSLR)– see next figure.

Figure 4 – Possibility Sets of Land Reform with linear gain in ARROW (1962)



Some interesting questions might arise in this model in which we proceed to land reform (even without formal land variable). Let us change the wage growth.

Hypothesis 3

If the growth wage rate increases due to a process of land reform, what happens to the dynamic recovery threshold of land reform (DRTTLR)?

Let's analyze the cash-flow condition of an ex-post wage rate increase after the land reform, i.e. with $\theta_2 > \theta_1$, we will have the following condition:

$$S_{TB}(.;\theta_2) = \int_{T_{RA}}^{T^{**}} e^{-\rho.t}.\gamma\left[H(t-T_{RA})\right].\left(1-W.e^{\theta_2.t}\right).dt \geq \int_{0}^{T_{RA}} e^{-\rho.t}.\gamma\left[H(t)\right].\left(1-W.e^{\theta_1.t}\right).dt = S_{AGN}(.;\theta_1)$$

This condition will be the one which will allow in this context that land reform recovered all the lost human capital.

4. Results of the model

Proposition 1:

An increase in the growth rate of (unskilled[9]) wages ex-post land reform $\theta_2 > \theta_1$ *yields* ***land reform unviable in terms of economic efficiency.*** *Thus, in this context and under the referred hypotheses there will be an aggregate welfare loss which yields in dynamic terms land reform inefficient; i.e. the loss generated by the eviction of agronomists and by theirs human capital loss will never be recovered with wage increase.*[10]

Demonstration: see Rocha de Sousa (2008: 224-5).

Proposition 2

If there is a decrease on wage growth rate after land reform, then it is possible to define a new possibility set of land reform accordingly to the Dynamic Recovery Threshold of Traditional Land Reform.

Demonstration: See Rocha de Sousa (2008: 225-6).

[9] We refer to unskilled or undifferentiated wages, thus to non-specific functions and for those which do not demand human capital – thus for factor L and not H. This proposition becomes interesting because empirically tends to be checked as after land reform there tends to have an increase in these types of wages due to the greater *lobbying* union power – specially on those LR of the more interventionist type.

[10] Notice we are considering T** fixed. This result might change with T** variable, but within Arrow's model capital (in our case human capital) tends to have a finite life, and thus the plausibility of this hypothesis.

Proposition 3

If the inter-temporal discount rate increases ceteris paribus the Dynamic Recovery Threshold of Traditional Land Reform becomes unattainable, thus land reform is inefficient.

Demonstration: Rocha de Sousa (2008:226).

Proposition 4

If the inter-temporal discount rate decreases ceteris paribus the Dynamic Recovery Threshold of Traditional Land Reform becomes more easily attainable.

Demonstration: Rocha de Sousa (2008: 227).

Hypothesis 4 – New working hypothesis – partial human capital destruction

If the eviction of agronomists by *campesinos*, instead of being totally un-experienced and illiterate, they inherit some experience, thus human capital loss is only partial.

If we can measure it by a factor of literacy[11] which we name η, then part of them are not totally un-experienced in terms of farm management and agricultural techniques. These *campesinos* might possess some knowledge of phyto-sanitary and modern agronomy techniques. Nevertheless, even if we assume a decrease on the knowledge gap, we still assume certain uniformity on the literacy and numeracy differentials between agronomists and *campesinos*.

Question 2: What happens to Land Reform in this setting?

Human capital recovery will be faster.

Demonstration:

Intuitively the human capital loss will be lower in the land reform moment, i.e. there is a kind of heritage from agronomists to *campesinos* – thus the Dynamic Recovery Threshold of Land Reform can be more easily attained than in the initial case.

Formally we must compare:

$$S_{TB} \geq (1-\eta) S_{AGN}$$

Thus, the term $\eta.S_{AGN}$ is the bequest or heritage from agronomist to *campesinos*, and so the human capital recovery must occur only till: $(1-\eta) S_{AGN}$. Formally:

[11] Illiteracy rate (%) will be obviously $0 \leq (\text{Illiteracy} = 1 - \eta) \leq 1$.

$$S_{TB} = \int_{T_{RA}}^{T^{**}} e^{-\rho.t}.\gamma\left[H(t-T_{RA})\right].\left(1-W.e^{\theta.t}\right).dt \geq (1-\eta).\int_{0}^{T_{RA}} e^{-\rho.t}.\gamma\left[H(t)\right].\left(1-W.e^{\theta.t}\right).dt = (1-\eta).S_{AGN}$$

Thus, proceeding as in the initial case, we must take into account $\eta.S_{AGN}$, and solving it for the gain function (Z(t)):

$$Z(T^{**}-T_{RA}) - Z(T_{RA}-T_{RA}) \geq (1-\eta).\left[Z(T_{RA}) - Z(0)\right]$$

Which will lead equivalently, given $Z(T_{RA}-T_{RA}) = Z(0)$ might be eliminated as a common term, and if Z(t) is monotonously increasing and injective:

$$Z(T^{**}) - Z(T_{RA}) \geq (1-\eta).Z(T_{RA})$$

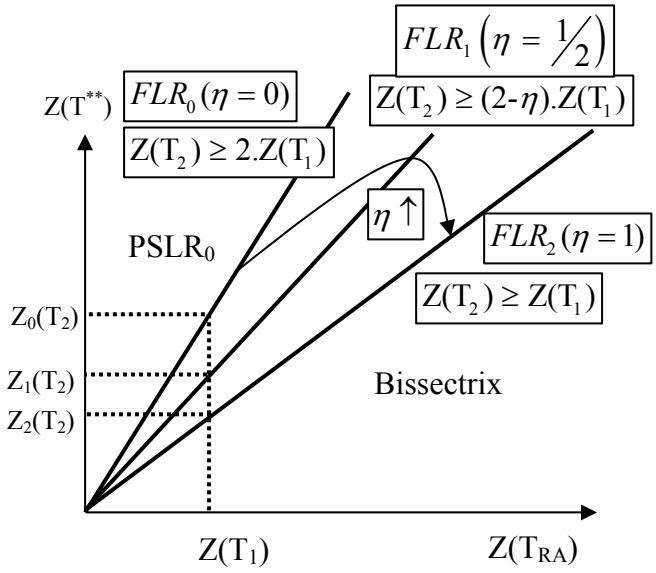
$$Z(T^{**}) \geq (2-\eta).Z(T_{RA})$$

From here we withdraw the dynamic profitability condition in which DRTTL (T**) comes define by the implicit function. Given the injectivity of the gain function, the gains on the threshold T** must exceed the double minus the literacy rate of the accumulated profits till the moment of land reform.

Notice that if the literacy rate is null, then we will be in the case of figure 3, if the literacy rate is 100%, then we will be in the case that the DRTTL will be the bissectrix.

For an intermediate case (namely for the case of developing countries), if the literacy rate is 50%, then the frontier will be defined as: $Z(T^{**}) \geq 1{,}5.Z(T_{RA})$.

Figure 5 – PSLR Expansion with Literacy increase (η)



Proposition 5: An increase in the literacy rate leads to a campesinos' DRTTL improvement and to an expansion of the PSLR.

As a conclusion of the previous section, the increase on the literacy rate leads to an improvement on the dynamic recovery threshold of land reform, i.e. the partial recovery of human capital leads to a more easily viable land reform for campesinos (and landless), which results itself on an expansion of the possibility set of land reforms.

Demonstration: see figure 5 and Rocha de Sousa (2008:228-9)

The learning effects induced in this Arrow (1962) context due to an increase in literacy, can be checked empirically as we shall see on the next section. This further emphasizes the role of human capital, its transmission (bequest or heritage) and its' further enabling viability of land reform.

5. Economic efficiency estimates for the "Cédula da Terra"

The land bill program is a market led land reform program in Brazil funded by the Ministério de Desenvolvimento Agrário and the World Bank of which we estimated the efficiency of land use. To attain the results presented in table 3 we used stochastic frontier estimation analysis (SFA) (Battese and Coelli, 1995).The details are contained in Rocha de Sousa et al. (2004) and Silveira et al. (2008).

The main conclusion we might extract from this table is that the main input of production is labour. In this case we show a Cobb-Douglas production function, we also tried a general Translog and across states Translog functions, but the quality, even though the complexity increases, of the results does not change.

We used a two step procedure to estimate the efficiency values (that is the differential from what is actually produced from what it could have been) of the program.

Our sample was 309 explorations/farms under the land bill project, for respectively the following states of Brazil: MG-Minas Gerais; MA-Maranhão; CE-Ceará; BA-Bahia; and an omitted state in the regression PE-Pernambuco. Across states differences weren't significant except for CE (Ceará).

Other variables which explain technical inefficiency were respectively: SCH, schooling, a measure of (general) human capital; technical assistance, TA, a measure of specific human capital; CRE, credit, this is credit which was granted within the projects' framework (and was computed as a dummy variable); VSP, value of social

production, this is production for all the village society; and finally AUTO, or more exactly self-consumption, this is the production farmers used for their own consumption.

Table 3: Results of the prodution frontier estimation for the Cédula da Terra

Parameter	Coeficient	Standard Error	*t-ratio*
	Production Function		
Const	0.81498234E+01	0.18336618E+00	0.44445620E+02[3]
Log Land	-0.94764106E-09	0.15489413E-09	-0.61179921E+01[3]
Log Labour	0.32970832E+00	0.61786554E-01	0.53362471E+01[3]
Log Inputs	0.35411607E-09	0.16372147E-09	0.21629177E+01[2]
	Inefficiency Explanatory variables		
Const	0.97548995E+00	0.81808204E+00	0.11924109E+01
MG	-0.10435214E-07	0.81683476E-08	-0.12775184E+01
MA	-0.88520603E-09	0.76959237E-09	-0.11502271E+01
CE	0.10847668E-07	0.53239732E-08	0.20375137E+01[2]
BA	0.73663693E-09	0.71537487E-09	0.10297216E+01
SCH	-0.15632321E+01	0.80377935E+00	-0.19448523E+01[1]
TA	-0.50202264E+01	0.24055359E+01	-0.20869472E+01[2]
CRE	-0.44089913E+01	0.19443393E+01	-0.22676039E+01[2]
VSP	-0.11723769E+01	0.56630320E+00	-0.20702283E+01[2]
AUTO	-0.18471073E+00	0.11115760E+00	-0.16617014E+01[1]
σ^2	0.27500643E+01	0.11017865E+01	0.24960047E+01[2]
γ	0.87437607E+00	0.53754672E-01	0.16266048E+02[3]
Log Likelihood Funtion		0.39807131E+03	
LR Test (dist χ^2(12;1%)=26,12)		0.91367528E+02[3]	
Total observations		309	
[1] significant at 10%			
[2] significant at 5%			
[3] significant at 1%			

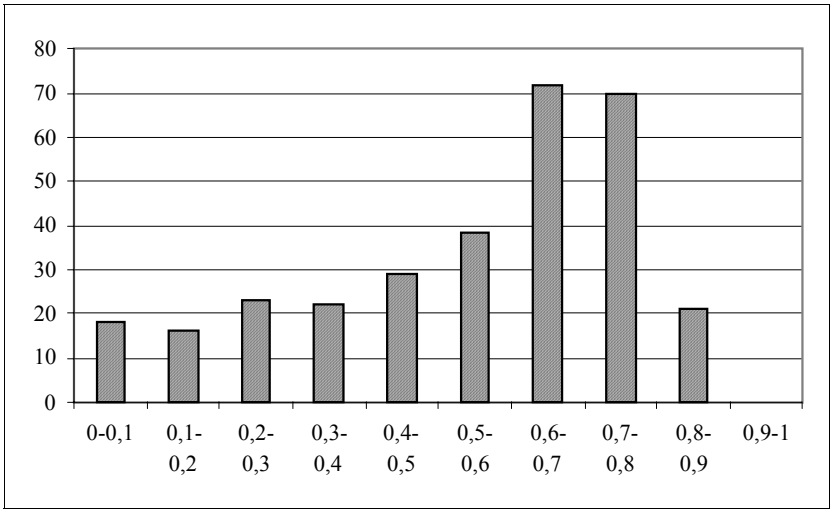
Source: Rocha de Sousa et. al (2004); Silveira et al. (2008)

The main conclusions we might withdraw from table 3, and consequently from the analysis of efficiency in production of the land bill project are the following:

The analysis of technical efficiency addresses some important issues that allow us to understand production limits.

Firstly, the two main factors which reduce technical inefficiency are monthly TA and CRE. One must stress the failure of technical assistance in most states, but nevertheless the monthly agronomists' visitations did take some effect on reducing inefficiency in production. This is a known fact in the literature which our study confirms and that political farmers' vindications have come to stress even more. It shows that farmers face up dire external constraints for the use of their resources, and that land access, is not by itself, a guarantee for higher productions or for the efficient use of resources. Secondly, our analysis confirmed the importance of education, even though starting from very low levels of education, which characterize Cédula's beneficiaries, education interacts with technical assistance, because it eases up the learning of new concepts and processes, and besides also contributes to improving the access to credit – a well educated farmer is more prone to have credit access than an illiterate one. Thus, this is also true for the general access to all markets that more education allows.

Figure 6: Beneficiary frequency (number of beneficiaries) accordingly to their technical efficiency (0 to 1)



Source: Rocha de Sousa et al. (2004)

Figure 6 shows all the efficiency classes from the 309 farms sample of Cédula's land bill. On the horizontal axis we have the efficiency classes form 0% to 100%, and on the vertical axis the number of farms on each class. A quick glimpse shows that there is a

widespread technical inefficiency, around 150 farms distribute themselves between 0% to 60% efficiency, and the other half of the sample has between 60% to 80% efficiency, and an upper class of efficiency between 80%-90% of 20 farms.

The main policy conclusion is that we must reinforce credit and technical assistance as first line priorities in reducing technical inefficiency. In second place one should stress with a long run target expected result the pro-education policies. These variables condition the ability to obtain better prices, better markets, to adopt products and practices which increase not only productivity, but also the value attained by production.

Thus, we have clearly shown that our variables, which we have modeled theoretically, for instance general human capital (education, as literacy and numeracy) and specific human capital (technical assistance) play a key role in sustaining development.

The variable credit, which we have not modeled here, but can be also shown theoretically (as in Rocha de Sousa, 2008, ch.9), has also a key role in the reduction of technical inefficiency of land reform programs and works as an escape clause from poverty equilibria.

6. Conclusions

> *"Rocha de Sousa (2005) examines whether instituting land reform (an issue especially relevant in Latin America) will accelerate or decelerate growth. Land reform splits large properties run by well educated owners into smaller properties run by uneducated farmers. Hence, a trade-off. Splitting up large properties increases competition and efficiency while at the same time entails the loss of human capital. The relative size of the two effects will determine the effect of land reform on growth." in* Roufagalas (2006:3).

We might conclude from section 1, as we defined land reform as redistribution operated by splitting large estates into smaller ones, that we can define a typology of land reforms as in table 1, describing the degree of market intervention (whether it is centralized or decentralized (C,D)) versus the degree of political change (whether it is reformist or structural (R,S)), that is if we have a continuous and gradual swift change or instead a *coup* or political revolution. Table 1 realized actual processes of

land reform, in which we classified MST movement as centralized in the economic sphere and reformist in the political one (C,R) as opposed to the market led land bill (Cédula da Terra) which we characterized as decentralized (pro-market) and reformist in the political domain, thus Cédula was on the (D,R) cell. We also presented another approach due to Kawagoe which further characterized land reforms in Latin America, stating that they operate a change from a half-feudal economic system to a market or peasant economy.

On section 2 we characterized peasant or *campesinos* movements in Latin America, with more emphasis on Brazil, besides focusing on Latin America as the most unequal distribution of land, as measured by the Land Gini Index (81%) – see Fig.1.

The main conclusion is that as we might have inferred from section 1 that **land was an economic asset**, also on section 2, we can conclude that **land is a political asset** – to stress this more see Lapp (2004), where she scrutinizes relations between land tenancy and political power. The second point of section 2 is that violence against the landed elite pays-off for the offender, sooner or later, they will get a title for land, and eventually can negotiate it, and re-enter again in the struggle for new lands. Of course there is some risk involved, they can get killed or severally injured in the process.

On section 3 we modeled the impact of land redistribution on growth, through human capital destruction. To our main question how many years would it take for *campesinos* to recover the loss of human capital due to the eviction of agronomists, we concluded that it would take about the double time it had passed till the date of land reform.

On section 4 we explored the results of the models: under certain hypotheses, constancy of interest rate, production function, wage growth rate, we conclude on Proposition 1, that if there was an increase of (unskilled) wages due to greater union power due to the land reform, then land reform would be totally inefficient- there would never be a recovery of these human capital losses by *campesinos*. Proposition 3 yields the same result for the increase of the inter-temporal discount or interest rate.

Besides we extended the model to comply partial destruction of human capital, allowing it to have a bequest from the eviction of the agronomist to the new *campesino* (it could be a former employee of the agronomist). This yielded that the recovery of (partial) human capital loss would be faster, which is natural due to accumulated

learning by doing processes. Thus, literacy and numeracy increase the pace of recovery.

On section 5 we estimated a stochastic Cobb-Douglas production frontier to assess the economic efficiency of "Cédula da Terra". We concluded that there are five major variables which reduce technical inefficiency: human capital, in its general form, that is education or schooling and its specific form, technical assistance, besides access to credit, the value of social production and the value of self-consumption.

Our main conclusion: **land is both a political and economic** asset and our main policies for **land reform should be market led** if we want to keep up with economic efficiency, as we have shown theoretically and in an applied case for Brazil;

One should **promote credit and technical assistance as a first line priority** and in the **longer run try to foster education**, as a last resort to withdraw *campesinos* from the poverty equilibria they are trapped on.

These kinds of policies will pay off in the long run by including poor people in society and promoting simultaneously more efficiency and equity.

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