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# Political leadership change: A theoretical assessment using a human capital "learning by doing" model*

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**Abstract/Resumo**:

We present an economic growth model with human capital, based upon Arrow (1962), in which we assess the impact of political leadership change either in governments or political parties. The change of leadership might be seen as a change in embedded human capital, and thus we might evaluate the loss or gain for society due to these political activities. The approach is theoretical using Arrowian economic setting. We formulate the conditions in which it is worth it, or how long does it take to recover from a political leadership change. The embedded process is an economic one, known as "*learning by doing*", but this time applied to political processes.

## 1. Motivation

The motivation of this paper is to answer the question: *How does political leadership change affects the performance of the cabinet and/or parties, and thus, what are their impacts on society due to human capital leadership change?*

The question is daunting and defying, and thus we shall confine us to a small formal model in which we use human capital change to evaluate the framework. Aside, epistemic considerations, namely Popperian, Nozickian, Khunian and a lot more that could be expressed, we only assess the impact of the following formal human capital model on growth, and thus on society.

The framework we would like to use is the economic framework of the Nobel laureate, Kenneth Arrow (1962). Basically, we start from a human capital approach to political leadership, then we use the extended human capital framework, with (LBD) learning by doing.

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This interest in the Arrowian model gets back as my PhD dissertation (Rocha de Sousa, 2008) where we applied it to human capital effects of land reforms, in the economic domain. The roots of the model are the same, but the context is rather new, now it is applied in a political framework.

## 2. Literature on the subject: From economic human capital to political leadership

The literature on human capital goes as far back as Smith (1776), but the recent explosion of human capital assessment started in the Chicago School of Economics, namely firstly with Mincer in the 60's, and more recently with all the work (of also Nobel laureate) Gary Becker.

Human capital by these authors can be classified in two types: i) **formal education**, as degrees (primary, secondary and tertiary education with Bas, masters, PhDs) and ii) **experience**, that can be attributed as on the job training.

There are proxy variables for human capital, for instance in the sense of economic development, health indicators are used as proxies for human capital, because for workers or students to work in order to get experienced or to study in order to get a degree, they need to be healthy.

In our model we consider the two types of human capital embedded indistinctively, but nevertheless, we can consider that, even the model works for both types, in the political case of leadership change we must focus more on the experience side. Why, we might ask? We can immediately recall political leaders without formal education, namely Jacques Delors – see Grant (1994), but whose experience more than compensated his lack of formal training.

The higher focus on experience side, lead us to adopt the Arrowian setting of (LBD) learning by doing.

We won't spend time and space resuming again the original approach of Arrow (1962), but we must stress that his application was done only to physical capital, but some economists have thus extended this approach to human capital. Again, Rocha de Sousa (2008) does an extension of the effects of human capital shocks to land reform economic growth assessment.

### 3. Our approach: Arrowian model with LBD

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

**Main Hypothesis:** During traditional leadership reform all the human capital is destroyed since we have the substitution of experienced managers and politicians by leaders to be 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 leadership change?*

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

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

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

So we must now compare two profits streams: the discounted incumbent leader profit flow since the beginning till the time of political leadership change, that is **Agent Gain** (S<sub>AGN</sub>), with the profits flow of the new leader (leader **To Be**) since the time of change or reform announcement (**RA**) till a period in which all the human capital is recovered (**T\*\***), and we name it (S<sub>TB</sub>):

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

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

**Hypothesis 2:** we assume that the interest rate $\rho$ is the same (i.e. is not affected by political leadership change), that wage growth rate, $\theta$, is the same and that the production $\gamma\big[H(t)\big]$ 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 Leadership Change (DRTTLC)

In this analysis we aim to compare S<sub>AGN</sub> and S<sub>TB</sub> to obtain T\*\*. This is the time value from which after a political reform all human capital is totally recovered by the new leader.

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

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

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

$$S_{TB} = \int_{T_{RA}}^{T^{**}} e^{-\rho.t}.\gamma\big[H(t - T_{RA})\big].\big(1 - W.e^{\theta.t}\big).dt \geq \int_0^{T_{RA}} e^{-\rho.t}.\gamma\big[H(t)\big].\big(1 - W.e^{\theta.t}\big).dt = S_{AGN}$$

Like all variables and integrand functions (given all our resctritive initial hypotheses) are the same, the DRTTLC 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[1]:

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

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

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 leadership reform.

Figure 1 presents the Possibility Set of Leadership 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 1 – Possibility Sets of Leadership Reform on ARROW's model (1962)
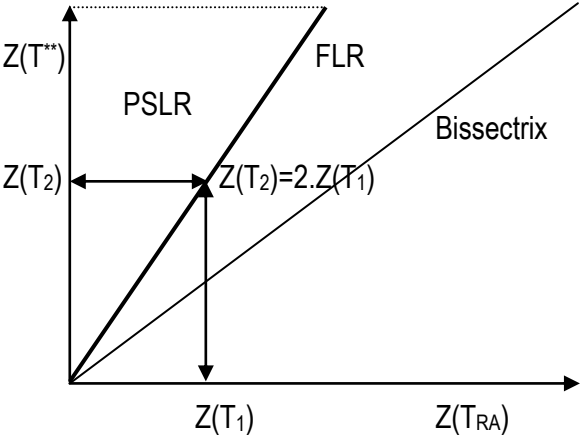


For a simple case in which the gain function is linear (thus T**=2TRA), it is the inferior line

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[1] The initial hypothesis we 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.

which defines the Possibility Set of Leadership Reform (PSLR)– see next figure.

**Figure 2 - Possibility Sets of Leadership Reform with linear gain in ARROW (1962)**
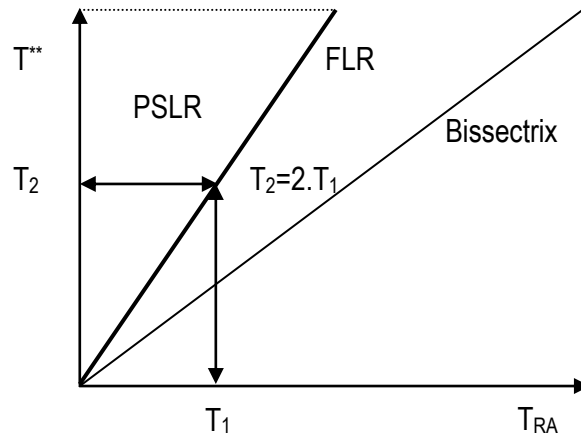


Some interesting questions might arise in this model in which we proceed to leadership change reform (even without formal political variable). Let us change the wage growth .

### Hypothesis 3

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

Let's analyze the cash-flow condition of an ex-post wage rate increase after the leadership 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 leadership reform recovered all the lost human capital.

## 4. Principal theoretical results

### Proposition 1:

An **increase in the growth rate** of (unskilled[2]) wages $\theta_2 > \theta_1$     ex-post leadership reform

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[2] We refer to unskilled or undifferentiated wages, thus to non-specific functions and for those which do not

yields **leadership 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 leadership reform inefficient; i.e. the loss generated by the eviction of agent gain (AGN) and by theirs human capital loss will never be recovered with wage increase.[3]

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

### Proposition 2

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

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

### Proposition 3

If the **inter-temporal discount rate increases** ceteris paribus the Dynamic Recovery Threshold of Traditional Leadership Change becomes unattainable, thus leadership 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 Leadership Change becomes more easily attainable.

Demonstration: Rocha de Sousa (2008: 227).

### Hypothesis 4 – New working hypothesis – partial human capital destruction

If the eviction of the incumbent agent (AGN) by leaders to be (TB), 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 which we name $\eta$, then part of them are not

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demand human capital – thus for factor L and not H. This proposition becomes interesting because empirically tends to be checked as after leadership 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.

[3]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.

totally un-experienced in terms of political management and leadership techniques. These new leaders might possess some knowledge of modern management techniques, new ideas. Nevertheless, even if we assume a decrease on the knowledge gap, we still assume certain uniformity on the literacy and numeracy differentials between incumbent agents (AGN) and leaders To Be (TB).

### Question 2: What happens to Leadership change or Leadership Reform in this setting?

Human capital recovery will be faster.

### Demonstration:

Intuitively the human capital loss will be lower in the leadership reform moment, i.e. there is a kind of heritage from agents to leaders to be – thus the Dynamic Recovery Threshold of Leadership Change 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 agents (AGN) to leaders to be (TB), and so the human capital recovery must occur only till: $(1-\eta) S_{AGN}$ . Formally:

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

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 leadership reform.

Notice that if the literacy rate is null, then we will be in the case of figure 1, 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: $Z(T^{**}) \geq 1,5.Z(T_{RA})$ - see figure 3.

**Figure 3 – PSLR Expansion with Literacy increase ($\eta$)**
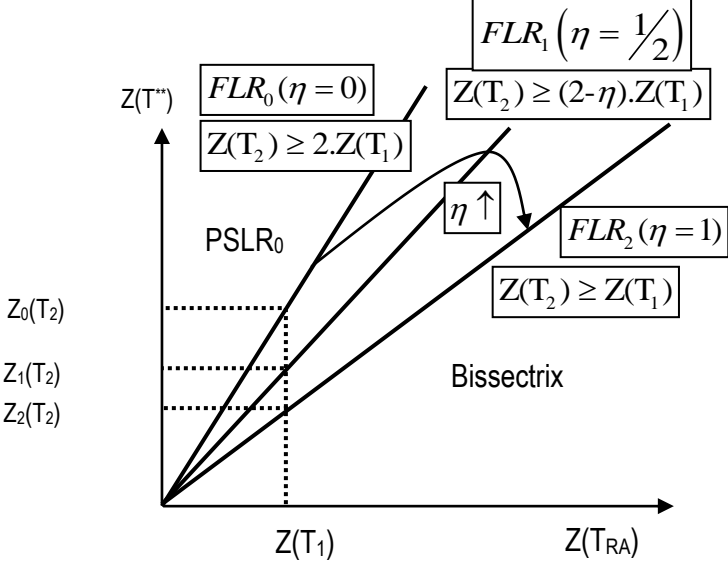


**Proposition 5:** An increase in the literacy rate leads to a leaders to be (TB) DRTTLC improvement and to an expansion of the PSLR.

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

**Demonstration:** see figure 3 and Rocha de Sousa (2008:228-9).

In this new setting of political change we can even assume that a very well prepared leader might appear and thus its bequest be more than 100%. He already possesses more embedded human capital than the agent who is going out. Thus we would have in Figure 3 a line with a less steep slope than the bissectrix. This is the case of rare talent, but which might eventually occur.

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

## 5. Conclusion

We have shown in the context of an economic human capital model the impact of political leadership change on growth.

Proposition 1 stated that wage growth after political leadership change yields economically inefficient outcome for the leader to be; thus, wage growth blocks human capital leadership change in terms of economic aggregate welfare gain.
Proposition 2, stated that a decrease in wage growth after human capital leadership change might turn viable this process.

An analogous result yields for both the increase and decrease of the discount factor or a kind of interest rate (Propositions 3 and 4).

An extension of our formal Arrowian model allowing for partial, total or more than total bequests, enables us to assess again the impact of human capital leadership change. Our figure 3 stresses that bequests of experience, former leaders leaving a legacy, might enable to recover the loss of human capital of the incumbent facing the leader to be. Eventually, our model allows also encompasses for rare talents to appear, there might be more than 100% bequests, the new leader might appear with new ideas, processes and even better human capital.

Thus we have attained the aim of this paper: with a minimum formal model, rooted in the economic sphere, one can assess the impact of leadership change, or at least know what some of the limits and its possibilities are.

More formal work can be done on turning completely endogenous the political process on this formal economic model.

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