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

Miguel Rocha Sousa

Miguel Rocha Sousa
Researcher at NICPRI
Assistant Professor at University of Évora – School of Social Sciences
Dept. of Economics
mrsousa@uevora.pt

ABSTRACT:
This article presents an economic growth model with human capital, based upon Arrow (1962), which evaluates 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 and formulates 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.

KEY-WORDS:
Arrow's model, Human capital, Learning by doing (LBD), Political leadership, Rotation of leaders, Time to recover from political leadership change.
JEL Classification: J24; O41

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, 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.

What is *"Learning by doing"* (LBD)?

Politicians, as everybody, as any worker, always "learn by doing" (LBD). "Learning by doing" (LBD) is an economic term, which has a clear cut mathematical definition, and which was first adopted and explored by Arrow (1962), even though the first references to it are Wright (1936) and Veerdorn (1956). That simple means we have dynamic scale economies, which means that as far as our experience accumulates our productivity increases, that is if we repeat the same process our time to do it decreases drastically, so more experience means that the average cost to society decreases. The economic literature has clearly adopted this notion – much of the current growth models, the modern ones with endogenous growth comply with it – see Aghion and Howitt (1998). As far as we know this has not yet been applied to politics or the political process.

In terms of political process, this just means as far as a politician stays in office he gathers more political prowess, he learns to better handle meetings with opponents, to foster and develop new ways of better express himself and convey the political message. In sum, we are assuming here a higher political dynamic productivity due to better experience in the political process.

As time goes by, a politician becomes himself better. In economics, dynamic scale economies, can be seen in processes of assembling products. But what about our representative political agents? Are there any specifics to them?

Of course there are. Eventually we can say that here might arise a new trade-off, from a certain point old age politicians are averse to major changes and do try to avoid political systemic crises, thus there might eventually be a point of no return to older political agents.

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.

This interest in the Arrowian model gets back as our 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 will not 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 relaxed to partial human capital loss or eventually to a gain in human capital.

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:

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

In which ρ is the inter-temporal discount rate (or the interest rate or opportunity cost of project's evaluation), $\gamma[H(t)]$ 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 θ 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_{AGN}), 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_{TB}):

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

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

Hypothesis 2: we assume that the interest rate ρ is the same (i.e. is not affected by political leadership change), that wage growth rate, θ, is the same and that the production $\gamma[H(t)]$ 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_{AGN} and S_{TB} 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:

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

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

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

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

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

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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 implicit 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 $Z(T_{RA})$).
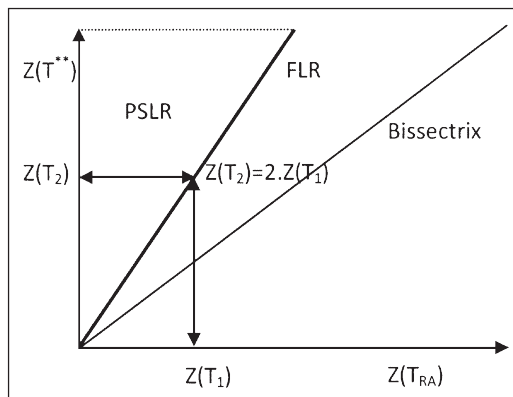

FIGURE 1. Possibility Sets of Leadership Reform on ARROW's model (1962)

For a simple case in which the gain function is linear (thus T**=2TRA), it is the inferior line which defines the Possibility Set of Leadership Reform (PSLR) – see next figure.
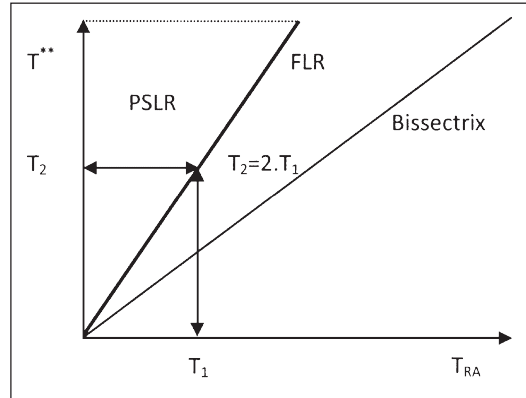
FIGURE 2. Possibility Sets of Leadership Reform with linear
gain in ARROW (1962)

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 (DRT-
TLC)?

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:

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

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 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 1: (Adapted from Rocha de Sousa (2008: 224-5) follows below).

If we start from the hypothesis $\theta_2 > \theta_1$, then for positive wage growth rates (which is natural and quite intuitive) we will have:

$$e^{\theta_2} > e^{\theta_1}$$

For the symmetric we will have:

$$-e^{\theta_2} < -e^{\theta_1}$$

Thus, as W and the inter-temporal discount factor $e^{-\rho t}$ are both positive, we can write the following condition, without changing the inequality:

$$e^{-\rho t}.\left(1 - W e^{\theta_2}\right) < e^{-\rho t}.\left(1 - W e^{\theta_1}\right)$$

Adopting the human capital based production function and assuming that $\gamma[H(t)] \geq \gamma[H(t - T_{RA})] > 0$ we can write:

$$e^{-\rho.t}.\gamma\left[H\left(t - T_{RA}\right)\right].\left(1 - W.e^{\theta_2.t}\right) < e^{-\rho.t}.\gamma\left[H(t)\right].\left(1 - W.e^{\theta_1.t}\right)$$

Integrating both functions that have resulted from these transformations, we end up with 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 leads exactly to a contradiction, exactly of a negative sign of the condition which would be necessary to yield an existing and resulting DRLLC, which can be confronted with hypothesis 3:

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

Thus, it is imposssible to exist a Dynamic Recovery Threshold for Leadership Change (DRLLC) with wage increase. QED.

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 2: See Annex at the end of the article.

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 3: See Annex at the end of article.

Proposition 4

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

Demonstration 4: See Annex at the end of article.

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 can be only partial**, or eventually we can have a gain.

If we can measure it by a factor of literacy which we name η, then part of them are not 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?

The reply to this question is contained in the next proposition:

Proposition 5: Human capital recovery will be faster with partial human capital destruction resulting from leadership change.

Demonstration 5:

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.

But again, our model conveys and relaxes the hypothesis of total human capital loss (see section 3), because we introduce a bequest factor (eta=η), which can between 0% and 100%. In a sense, total disruption and total human capital loss (our first benchmark-100%), and for instance 50%, the ousted politician leaves a bequest of 50%, the new incumbent only has to learn 50% of the new processes. Of course, as it is, this is not just "opinable", but we can state for instance (see Blair(2010), *A Journey*), politicians can have a bequest higher than 100% (for instance 125%), this means that the new incumbent is so efficient that he/she will immediately enter with a rise of 25% facing the productivity of previous politician. Tony Blair and his team immediately after entering office, started to be very efficient and do major changes, but in our model we could say that he had already a very high bequest (eta=η>100%) due to his previous experience as opposition leader for many years facing John Major, apart from his previous experience as a local MP. Eventually, on Figure 3, the new leader will have a possibility set larger than before, thus below the bissectrix. QED
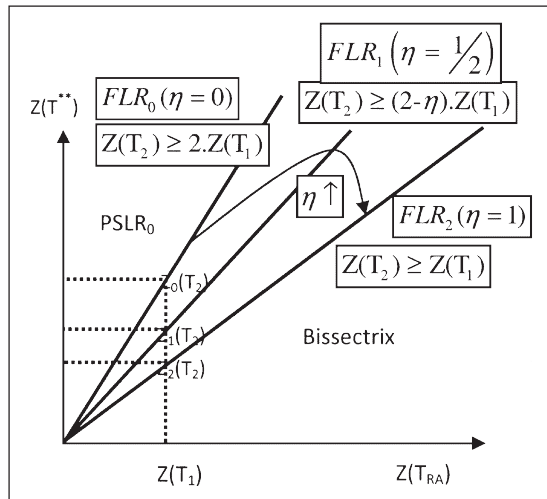
This leads us to formulate **Proposition 6**.

FIGURE 3. PSLR Expansion with Literacy increase (η)

Proposition 6: An increase in the literacy rate leads to a leaders to be (TB) *Dynamic Recovery Threshold of Leadership Change (DRTTLC)* improvement and to an expansion of the PSLR.

Demonstration 6: See Figure 3 and this follows immediately 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.

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. QED.

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, Limitations and further work

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.

The main point, much more than define the exact transition to specific countries/ politicians and or cabinets reshuffling (the so called empirical part), is that this is a broader theoretical framework, which can convey most of all of the possibilities and bring insights to politico-economic turnouts generally.

I stress the fact that better educated politicians (general human capital), or policies to better and foster improving politicians experience (specific human capital) do convey lesser welfare losses due to political reshuffling – thus, this has implications to policies regarding political economy reshuffling – in general.

I also stress the fact, that in the conditions of the model, an increase of wages (unskilled work) after cabinet reshuffling does lead to an irreversible welfare loss, assuming constant production functions, constant interest rates- (Proposition 1)- Thus, this means that political reshuffling followed by wage inflation can block society welfare. This can be discussed in a more general framework which has to do with politicians´ political economy goals.

Thus, the model, even though simple does contribute to new insights of political economy, and is not just opinable, because the point of departure is just a first benchmark, which as can be seen in section 4, human capital loss is relaxed further, and can eventually be interpreted as human capital gain.

So, 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 for the political-economic framework.

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

6. Annex with some demonstrations

This annex contains all the demonstrations which aren't in the main text. The option to put them here has to do with the ease of reading the text as a whole, and is quite common in all formal scientific journals. Only major and most important demonstrations were kept in the main text, the remaining ones for detailed analysis are shown here. All of these article demonstrations have been adapted from Rocha de Sousa (2008) PhD dissertation. I greatly acknowledge this need expressed by a second anonymous referee.

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: (adapted from Rocha de Sousa (2008: 225-6)):

Based upon the demo of proposition 1, but if instead the wage growth rate is negative $\theta_2 < \theta_1$, following the same steps then we get the following condition for leadership change (DRTLLC):

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

Thus, if we define the function $Z_i'(.) = e^{-\rho.t}.\gamma[H(t)].\left(1-W.e^{\theta.t}\right)$ $Z_i(.)$ as the derivative of the gain function $Z_i(.)$, then integration we end up with the expression of the DRTLLC, with:

$$Z_2(T^{**}-T_{RA};\theta_2) - Z_2(T_{RA}-T_{RA};\theta_2) > Z_1(T_{RA};\theta_1) - Z_1(0;\theta_1)$$

Thus, if we assume that the gain function ($Z_i(.)$) on the first period is nill, then:

$$Z_2(T_{RA}-T_{RA};\theta_2) = Z_2(0;\theta_2) = Z_1(0;\theta_1) = 0$$

Thus, we end up with the following condition for the Possibility Set of leadership reform (PSLR):

$$Z_2(T^{**}-T_{RA};\theta_2) > Z_1(T_{RA};\theta_1)$$

So, if we assume as before, that the gain function is separable, we end up with:

$$\Delta Z_2(.;\theta_2) = Z_2(T^{**};\theta_2) - Z_2(T_{RA};\theta_2) > Z_1(T_{RA};\theta_1) = \Delta Z_1(.;\theta_1)$$

Geometrically on the space of variations of the gain function $\left(\Delta Z_1(.;\theta_1); \Delta Z_2(.;\theta_2)\right)$ above the bissectrix we will have the Possibility Set of leadership reform (PSLR).

Given the strict inequality, the Frontier of Possibility Set of Leadership Reform (FLR) does not make part of the set (PSLR).

We must have an infinitesimal increase in order to have a dynamic welfare increase. The following figure illustrates the condition:
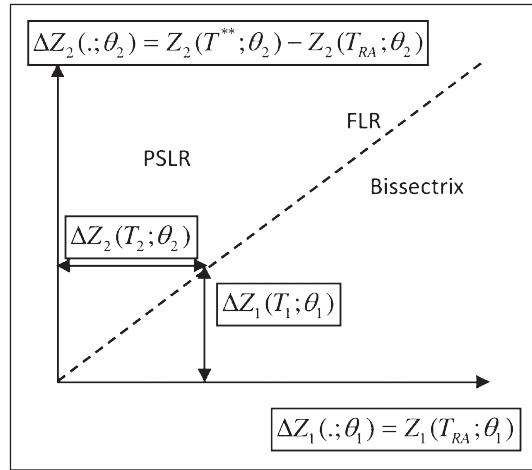
$$\Delta Z_2(.;\theta_2) = Z_2(T^{**};\theta_2) - Z_2(T_{RA};\theta_2)$$

FLR

PSLR

Bissectrix

$$\Delta Z_2(T_2;\theta_2)$$

$$\Delta Z_1(T_1;\theta_1)$$

$$\Delta Z_1(.;\theta_1) = Z_1(T_{RA};\theta_1)$$

FIGURE 4. Possibility Set of Leadership Reform (PSLR) and Frontier (FLR) in the Arrowian model (1962) as a function of discrete variations

QED.

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 3: (adapted from Rocha de Sousa (2008: 226)).

If the inter-temporal discount rate increase from ρ_1 to ρ_2 then, similarly, as we saw for the increase on wage growth, then Leadership change becomes unviable in terms of welfare:

$$\rho_2 > \rho_1 \Leftrightarrow e^{-\rho_2 t} < e^{-\rho_1 t} \Rightarrow S^{TB}(\rho_2) < S^{AGN}(\rho_1),$$

Thus, the discounted flow o leaders to be (TB) will never attain the level of the incumbents (Agents Gain), thus leadership change is dynamically inefficient. QED.

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Proposition 4:

If the inter-temporal discount rate decreases ceteris paribus the Dynamic Recovery Threshold of Traditional Leadership Change (DRTLC) becomes more easily attainable.

Demonstration 4: (Adapted from Rocha de Sousa (2008: 227)).

$$\rho_2 < \rho_1 \Leftrightarrow e^{-\rho_2 t} > e^{-\rho_1 t} \Rightarrow S^{TB}(\rho_2) > S^{AGN}(\rho_1)$$

Thus, in this case, the decline in the inter-temporal discount rate allows to recover more easily the loss of human capital, because the flow of the leaders to be (TB), after Leadership change is more valuable in the future than the previous flow of incumbents agents gain(AGN)on past periods. The intuition is simple: the inter-temporal discount-rate allows to evaluate the opportunity cost of time (i.e. a kind of interest rate), thus if it goes down, it allows the cost of human capital be smaller in the future, thus allowing the leaders to be invest more in human capital, and thus recover, after the leadership change, more easily[4]. Thus we can establish as in the previous case, a figure similar to the one of variations of wages, but instead of increases in wages, variations on the inter-temporal discount rate – as in figure 4 QED.

7. Acknowledgements

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[1] 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. I thank Cesaltina Pires for having me shown me this on a similar and previous version of this article.

[2] 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 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.

[4] It is enough to think if this was a perpetuity (a flow till infinity), the flow generated by the leaders to be (TB), if it was constant each year and in the amount of V, then it would be evaluated by V/ρ. If ρ declines, the total amount of this flow increases, and thus the recovery after leadership change would be faster. Do notice that this example, the flow till perpetuity, can be made even more general and the result would still yield. We gave it for the sake of simplicity and intuition, The general case is assessed by the Net Present Value of each flow (NPV) as in finance.