Political Reform with Time-Inconsistent Voters

Jisoo Hwang and Johanna Mollerstrom

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Abstract

Political reforms are often designed in a gradual manner, even though it would be more efficient to make use of available complementarities and implement the reforms as "big bang." We show that this inefficient behavior can be explained by a simple citizen candidate model where voters are time-inconsistent. The result is not only that gradualism arises in equilibrium, but that it is second-best. Gradualism is inefficient compared to the first-best outcome where complementarities are not lost and the reform is carried out at the optimal point in time. However, it is welfare-enhancing compared to the case where gradualism is not an available option, because then the reform would have been delayed even further. We also show that when voters are sophisticated (i.e. aware of their time-inconsistency), they elect an agenda setting politician who is more patient than the median voter in order to commit to a reform schedule where the negative consequences of the time-inconsistency are less severe.

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‡Department of Economics, Harvard University, Cambridge MA 02138 (hwang2@fas.harvard.edu, jmollers@fas.harvard.edu)
1 Introduction

It has been widely known for over a decade that the social security system not only in the U.S. but in many countries around the world must change in order to assure sustainability. Similarly, there is widespread knowledge about environmental challenges, but only small, gradual steps have been taken to solve them. In this paper, we take a closer look at why efficiency enhancing political reforms are often delayed, and why when a reform does happen, it is often implemented gradually even though it would be more efficient to carry it out at once.

At the time when the Soviet bloc collapsed and a large number of formerly planned economies faced the question about whether, and how, to create a market economy, research on reforms began to flourish. The models studied the transition from a planned economy to a market economy, with its package of price, trade, and market liberalization reforms (see Roland, 2000 for an overview of the literature; see also Lipton & Sachs, 1990; Murphy, Shleifer, and Vishny, 1992; Aghion and Blanchard, 1994).

In this context, three branches of models arose to explain why it may be that reforms are delayed or designed and implemented in an inefficient gradual manner. First, inefficient gradualism was shown to be a possible equilibrium in a situation where people differ substantially in the costs or benefits they get from a certain reform (Wei, 1993). In this case, the role of gradualism is one of building political alliances in support of the reform.

Second, the absence of welfare-improving reforms or inefficient gradualism was shown to potentially arise as a result of some uncertainty—either uncertainty about the aggregated outcome of the reform (Dewatripont and Roland, 1992 and 1995) or about the distribution of the benefits (Fernandez and Rodrik, 1991). When this is the case, gradualism provides information about whether or not a reform is worth implementing at all.

Third, gradualism may arise because of political concerns. Incumbents want to avoid initiating costly reforms during their terms in order to stay popular (often important even to an autocrat) or to get re-elected. This would be more so when interest groups or firms
providing campaign funds lobby against reform (Grossman and Helpman, 1994; Classeans, Feijen, and Laeven, 2007; Brock and Magee, 1978; Farzin and Zhao, 2003). Alesina and Drazen (1991) also shows how stabilization can be delayed as a result of a war of attrition between different socioeconomic groups.

However, many policies do not necessarily fall into the categories above and yet gradual reform is still being contemplated as a political alternative. In order to understand this, we propose a simple model where delay and gradualism may arise even when there is no heterogeneity in costs or benefits, neither aggregate nor individual uncertainty, and when politicians are not solely driven by concerns for popularity and re-election.

Our source of gradualism is simply that voters are time-inconsistent, i.e., they value positive utility in the present disproportionately higher than the same positive utility at any period in the future. In accordance with ample theoretical work and empirical evidence, we introduce agents who discount the future in a hyperbolic manner: in addition to a regular discounting parameter, \( \delta \leq 1 \), the agents also discount everything that is "not now" with an extra \( \beta < 1 \) (see Laibson, 1997 for an overview). Time-inconsistent preferences play a critical role because most policies have costs and benefits that accrue over time, and the decision that agents have to make is when to start a project and how to spread out the costs and benefits.

We show that gradualism is second-best in nature when people have time-inconsistent preferences. That is, gradualism is inefficient compared to the first-best situation where complementarities are not lost and the reform is carried out at the optimal point in time. However, welfare with gradualism can be higher than when this is not an alternative, because without gradualism the reform would have been undertaken at an even later point.

In an extended version of the model, we let sophisticated agents vote for an agenda setter instead of having her given exogenously. Voting for an agenda setter who is more patient than oneself, i.e., an agenda setter who has a higher \( \beta \) than one’s own, is optimal since it provides a commitment device. In equilibrium, an agent with a \( \beta \) higher than the median
voter’s $\beta$ is always elected.\textsuperscript{1}

While the logic is general, we use environmental policies and social security reforms as examples to motivate our approach and the model. Not only are these important current issues, but they are typical examples of policies that have costs and benefits spread across different time periods. Specifically, both reforms have immediate costs—higher input prices and/or higher taxes, but delayed benefits—cleaner environment and a sustainable social security trust fund, and can thus be subject to procrastination. It is all the more interesting that the delays we observe in these reforms cannot be driven by lack of knowledge, information asymmetry, or conflicting interest groups. Everybody is aware that something must be done in order to prevent an environmental catastrophe or a bankrupt social security fund in the future, and everybody loses in the long run when the reforms are implemented too late.

This paper contributes to the existing literature in several ways. First, to the best of our knowledge, it is one of the first attempts to combine political economy with behavioral economics by introducing hyperbolic discounting into a model of political reform. Time-inconsistency, and particularly the hyperbolic discount model, has been used in various contexts in the economics literature but have not yet been widely exploited in policy settings involving voting.\textsuperscript{2}

Second, our model is more generally applicable than the models that are structured around the specific historic context of transitional economies. In fact, the model can have implications for any policies with an intertemporal nature.

Third, the results of this paper allow us to differentiate between reforms that can benefit from gradualism, and those that cannot. Hence, it provides a normative implication as well as a positive analysis of gradualism.

Lastly, this is the first paper to incorporate the voting stage into the reform model. In previous models, a benevolent social planner or an agenda setter is assumed to exist from

\textsuperscript{1}This result can be compared to the result of Rogoff (1985) that people may elect a central banker with preferences different from their own in order to solve their time-inconsistency problem.

\textsuperscript{2}Bisin et al. (2011) is, to our knowledge, the only other paper which explores the consequences of time-inconsistent voters in relation to political reform.
the start and the focus has been on how to schedule the reforms thereafter. This has been a common assumption in the reform literature but we think it is a major caveat when it comes to understanding how reforms are actually designed, since the objective of the policy maker is critical in determining the equilibrium strategy.

The outline of the paper is as follows. In Section 2 we present the simplest version of our model with an exogenously given patient agenda setter. In Section 3 we develop the citizen candidate model and endogenize the agenda setter. Section 4 discusses further applications of our model and Section 5 concludes.

2 The Model: Simplest Case with Immediate Costs and Patient Agenda Setter

The areas of political reform that we have in mind for this model are ones where costs and benefits are spread out over time. In the most realistic case, the costs come one or more time periods before the benefits (immediate costs). This matches for example environmental policy or social security reform well; in both of these cases, some action must be taken before benefits can be accrued. This is the case that we will focus on in this section. At the end of this section, we will say a few words on how the model can be applied when the benefits come before the costs (immediate benefits) and when there is no time lag between costs and benefits.

Previous models of gradual reform have had only two alternatives: big bang, meaning an immediate implementation, and gradualism, meaning a fixed split of the reform between two time periods. We make this setting more general in two different ways. First, we introduce a political agenda setter (AS), who can decide what alternatives to put to vote. In the simplest version of the model we assume that this agenda setter, unlike most of the voters, is completely patient. Later we endogenize the choice of agenda setter and show that a patient agenda setter will indeed be elected at a constitutional stage in equilibrium.

Second, we model gradualism as any shift in the stream of costs/benefits compared to
the default. More specifically, the agenda setter contemplates whether or not to propose to shift a fraction $\alpha$ of the costs to a later period.\footnote{Defining $\alpha$ like this, or as a fraction of benefits to be moved closer in time yield identical results.} This is more realistic than a setting where the gradual option is fixed since this allows the agenda setter to propose any relative cost/benefit proportion in a given period. In addition to that, this enables us to consider comparative statics with regards to the specifics of the reform design.

$\alpha$ should be interpreted as any action that makes the cost/benefit stream deviate from the path it would have taken under the big bang implementation; it can for example be borrowing against future benefits in order to not have to take costs immediately or it can take the form of subsidies for changes, making the reform feel less costly in the present period to agents.

Our model builds partly on a seminal paper by O’Donoghue and Rabin (1999), where it is considered under what circumstances impatient agents undertake certain actions and when they fail to do so. In addition to that, we borrow elements from several other political economy models of gradual political reform (see Roland, 2000, for an overview).

### 2.1 Set-up of Model

Our model is populated by voters who have an exponential discount factor of $\delta \leq 1$ and a hyperbolic discount factor $\beta \leq 1$. The agents all share the same $\delta$ but for the moment we leave it open whether $\beta$ is heterogeneous or not. We denote the median voter’s $\beta$ as $\beta^M$.

The agenda setter (AS) has $\beta = 1$ but shares the same $\delta$ as the rest of the population. As noted above, we let this agenda setter be exogenously given for the moment but relax this assumption in the next section. It is important to note that the role of the agenda setter is not that of a dictator as she cannot alone decide how to implement the reform. Instead, the agenda setter has the power to decide which alternatives to put to vote. An agenda setter of this type is a common feature of models of political reform.

Since we are now looking at the case with immediate costs, we assume that benefits are
realized one period after costs. Benefits from the reform are constant whether the reform is implemented in period 1 or 2 and we denote this as \( v = (v, v) \). The costs of implementation are denoted by \( c = (c_1, c_2) \). Let \( U^t \) be the utility of an agent in period \( t \). Then the utility payoff from implementing the reform at period 1 or 2 for an agent living in period 1 can be expressed as:

\[
\begin{align*}
U^1(1) &= -c_1 + \beta \delta v \\
U^1(2) &= \beta \delta (-c_2 + \delta v)
\end{align*}
\]

We assume that the benefit and costs are such that the following inequality holds:

**Assumption (A0)** \( \beta^M \delta c_2 + \beta^M \delta v(1 - \delta) < c_1 < \delta c_2 + \delta v(1 - \delta) \)

This assumption simply means that delays are costly (because \(-c_1 + \delta v > \delta(-c_2 + \delta^2 v)\)) but that the median agent would choose to procrastinate anyway \((-c_1 + \beta^M \delta v < \beta^M \delta(-c_2 + \delta v)\)). We will discuss cases where \( A0 \) is relaxed at the end of this section.

There are three time periods in the model, \( t = 1, 2, 3 \). Since \( T = 3 \), the reform must be implemented at \( t = 2 \) by default. The interpretation of this is that the status quo is unsustainable and a reform will be impossible to avoid sooner or later.

We define economic efficiency (and hence social welfare) by what an agent with \( \beta = 1 \) chooses at hypothetical \( t = 0 \). This means that we stay close to the welfare definition of O’Donoghue and Rabin (1999) which is centered around what an agent, if fully informed, would like to do when planning her future actions. Our welfare definition is also related to the psychological distinction of a "hot" and a "cold" state of mind, where the hot state is the decisions made under the influence of short term emotions whereas the "cold" state is the planning stage where long term decisions are made with no influence of short term emotions. Social welfare is then defined by the more rational decisions made in the "cold" state. (See Loewenstein, 2000.)
As discussed above, gradualism means moving a fraction $\alpha$ of the costs further away in time. This can only be done at a cost of foregone complementarities and $x\alpha c_1$ is the extra cost that is incurred from moving $\alpha c_1$ from $t$ to $t+1$. We denote gradualism between periods 1 and 2 as $GR(\alpha)$ and let $BB_t$ mean implementing the reform as big bang in period $t$.

2.2 Solving the Model

When making their decision at $t = 1$, agents know that if the reform has not been implemented when period $t = 2$ is reached, it will be implemented by default. Since we have assumed that the agenda setter has $\beta = 1$, we know that she would prefer $BB_1$ to $BB_2$ given $A_0$. Therefore, we know that if $U^1(BB_1) > U^1(BB_2)$ for the median voter, the agenda setter will indeed propose $BB_1$, which will be implemented.\footnote{Since this problem is single peaked in $\beta$ we know that the median voter theorem is applicable.} However, if $U^1(BB_1) \leq U^1(BB_2)$ there may be a role for gradualism. In order for the agents to prefer $GR$ to $BB_1$ we must have that:

\begin{align*}
-(1-\alpha)c_1 - x\alpha c_1 + \beta^M \delta(v - \alpha c_1) & \geq -c_1 + \beta^M \delta v \\
\alpha c_1 (1 - x - \beta^M \delta) & \geq 0
\end{align*}

Equation (1) tells us that if $x \geq 1 - \beta^M \delta$, the cost of moving costs is simply too high, and gradualism won’t arise because agents prefer $BB_1$ to $GR$ regardless of $\alpha$. However, when $x < 1 - \beta^M \delta$ there is room for gradualism and the agenda setter has to propose an $\alpha$, i.e. decide how much of the costs to move one period into the future if $GR$ is implemented. Since the agenda setter has $\beta = 1$ she will propose a policy (i.e. propose an $\alpha$) that will maximize social welfare, $SW$:
\[ SW = \delta \{ - (1 - \alpha) c_1 - x\alpha c_1 + \delta (v - \alpha c_1) \} \]

\[ = \delta \{ -c_1 + \delta v + \alpha c_1 (1 - \delta - x) \} \]  

From (2) we get the following three cases: (a) if \( x > 1 - \delta \), social welfare is decreasing in \( \alpha \); (b) if \( x < 1 - \delta \), social welfare is increasing in \( \alpha \); and (c) if \( x = 1 - \delta \), \( \alpha \) does not matter for \( SW \). This simply tells us that if the extra cost \( x \) is big, it is better to decrease the shifting of costs to the future; if \( x \) is small, it is better to increase shifting to the future.

Keeping this in mind, let us solve for the political constraint for gradualism. Given \( U^1(BB1) \leq U^1(BB2) \), the political constraint \( U^1(GR) \geq U^1(BB2) \) must hold for the median voter in order for \( GR \) to be preferred to \( BB2 \):

\[- (1 - \alpha) c_1 - x\alpha c_1 + \beta^M \delta (v - \alpha c_1) \geq \beta^M \delta (-c_2 + \delta v) \]  

(\text{PC})

Combining the results from (2) and (\text{PC}) we get the following proposition.

\textbf{Proposition 1} The reform schedule that a patient agenda setter will propose depends on the size of \( x \). When \( x \geq 1 - \beta^M \delta \) the agenda setter will choose \( \alpha = 0 \) and hence \( BB2 \) will arise. When \( x < 1 - \beta^M \delta \) the agenda setter will choose gradualism—with \( \alpha = 1 \) when \( x < 1 - \delta \); with any \( \alpha \) that satisfies \( \alpha > \alpha^* \) when \( x = 1 - \delta \); and with \( \alpha = \alpha^* \) when \( 1 - \delta < x < 1 - \beta^M \delta \). We have that \( \alpha^* \) is given by (3).

\[ \alpha^* = \frac{\beta^M \delta (-c_2 + \delta v) + c_1 - \beta^M \delta v}{c_1 (1 - \beta^M \delta - x)} \]  

(See Appendix for proof.) Expression (3) is derived from (\text{PC}).

Most papers in the reform literature assumes the cost \( x \) without specifying the size of \( x \) or the possibility that the cost of gradualism would be proportional to the degree of gradualism. The \textit{existence} of this cost is quite obvious, of course. The inefficiency from
not being able to exploit complementarities between different parts of the reform package, the extra administrative work that is required for a gradual approach, plus the potential distortions that arise from manipulating the payoff streams are all examples of what \( x \) may capture.

The size of \( x \) is less trivial, however. For the rest of this paper, we will assume that \( 1 - \delta < x < 1 - M \beta \). This is the most interesting case of the three outlined in Proposition 1 and we regard it as the most realistic as well. What this assumption tells us is that the lost complementarities are larger than the actuarially fair rate, \( 1 - \delta \), of moving resources between periods (the interest rate payment in a broad sense), but low enough from the perspective of the median voter with a hyperbolic discount factor of \( \beta^M \) to make him want to exploit the possibilities of gradualism.

### 2.3 Comparative Statics

We can understand the gradualism that will arise better by looking at comparative statics of \( \alpha^* \). We firstly note that \( \alpha^* \) is increasing in \( c_1 \), and decreasing in \( c_2 \) and \( v \). This tells us that if the cost today, \( c_1 \), is higher, more must be moved to the future in order to make it worthwhile to start the reform today at all and not just postpone it entirely until \( t = 2 \). If costs tomorrow, \( c_2 \), are larger we need move less of \( c_1 \) to the future in order to make it worthwhile starting to take the costs today instead of tomorrow. Also, if the benefits in total are larger, less of the costs need to be postponed in order to make agents feel that it is a good idea to at least start the reform in the present period.

Furthermore, \( \alpha^* \) is increasing in \( x \). This is also intuitive and illustrates the time-inconsistent nature of the arising gradualism: if more complementarities are lost when a reform is implemented gradually, i.e. \( x \) is higher, more of the costs must be moved to the future period in order to make it worthwhile to take costs today. However, note that a higher \( x \) makes it less likely that \( x < 1 - M \beta \delta \) holds and that gradualism arises at all. It is also the case that \( \alpha^* \) is decreasing in \( \beta^M \) when \( A2 \) holds. When the median voter is less
time-inconsistent, which is mirrored in a higher $\beta$ of the median voter, $\beta^M$, gradualism can be implemented with a lower loss of complementarities. Also, it is less likely that gradualism arises at all, for a given $x$, since the condition that $x < 1 - \beta^M \delta$ becomes more restrictive.

### 2.4 Calibrated Example

Before moving on and making the agenda setter endogenous, let us consider an example where people are characterized by $\delta = 0.97$ and $\beta^M = 0.5$ and the reform is such that $v = 15$, $c_1 = 6$ and $c_2 = 10$. The benefit of the reform is higher than the costs, but the cost structure is such that a patient agent would prefer to do the reform at $t = 1$. Lastly, set $x = 0.3$, i.e. there is a cost of lost complementarities of 30 percent if costs are pushed back in time.

We have that $-c_1 + \beta^M \delta v < \beta^M \delta(-c_2 + \delta v)$ so that if gradualism was not an option, the median voter would prefer $BB2$ to $BB1$. At the same time, since $1 - \delta < x < 1 - \beta^M \delta$, we are in case (a) so that social welfare is decreasing in $\alpha$ but the median voter would be happy to set $\alpha = 1$, if allowed. The agenda setter will hence propose $GR$ with $\alpha^* \simeq 0.72$ according to (PC) which will be passed by the voters since they are indifferent between that option and $BB2$. This example leads us to the following proposition.

**Proposition 2** Gradualism can be both inefficient and welfare-enhancing. It is inefficient compared to the first-best choice under time-consistency but welfare-enhancing compared to the default choice under time-inconsistency.

To see why this is, note that from a social welfare perspective, we have that $BB1 \succ GR(\alpha^*) \succ BB2$. This tells us that the gradualism that arises in equilibrium is inefficient, since it leaves money (in the form of complementarities) on the table when choosing $GR$ over the first-best option $BB1$. At the same time gradualism is welfare enhancing since it leaves society better off than it would have been without the gradualism option, because then $BB2$ would have been implemented.
Furthermore, we see that the fact that the agenda setter chooses which $\alpha$ to propose serves as a commitment device for the agents. If left to themselves and faced with the option of gradualism they would preferred $GR$ with $\alpha = 1$ to both $BB1$ and $BB2$ as well as to $GR(\alpha^*)$. This observation leads us to make the following proposition:

**Proposition 3** The existence of a gradualism option without the existence of an agenda setter who is more patient than the median voter may result in decreased welfare.

From the perspective of social welfare, we have $BB1 \succ GR(\alpha^*) \succ BB2 \succ GR(1)$, so that the choice of $GR$ with $\alpha = 1$ would make society worse off than with the simple procrastination and subsequent implementation of $BB2$. This shows us that it is not necessarily welfare enhancing to have the opportunity of gradualism unless one also has the possibility of using the agenda setter as a commitment device.

### 2.5 Immediate Reward Reforms

Even though many reforms have the investment character discussed above, i.e. have costs that are preceding the benefits, there are also policy areas that have a different structure in terms of the timing of costs and benefits. For example, when a law concerning citizens’ rights is changing, and the increase in the right is viewed as a benefit but the costs will only be accrued later when people are actually making use of their newly acquired right, we have a reform that is of the immediate reward type, i.e. with benefits preceding costs. As we will show, there will be no room for gradualism in such a setting:

**Proposition 4** Gradualism never arises in equilibrium for immediate reward reforms; gradualism is not politically feasible nor efficient in this case.

To see this, let the model remain the same as above, except that now the benefits from the reform are $v = (v_1, v_2)$ with $v_1 < \delta v_2$ while the costs are constant $c = (c, c)$. Again $T = 3$ so the reform must be implemented at $t = 2$ by default. If we interpret gradualism in the
same way as above, it means moving a fraction $\alpha$ of the costs closer in time. $\Delta ac$ is the extra cost that is incurred from moving $\alpha c$ from $t + 1$ to $t$. The question is whether people would ever prefer $GR$ to $BB1$. Unlike the immediate cost reforms, $GR$ here would never be attractive to the median voter since this would involve bringing forward the costs, given the same benefit. This result is made stronger since there is also an extra cost involved with bringing forward the costs.

The patient agenda setter may have reason to propose $GR$ instead of $BB1$, however, because that would make waiting till $t = 2$ a more attractive option for the median voter. However, $GR$ will never be the equilibrium. Unlike in the immediate cost case where $GR$ is both inefficient and welfare enhancing at the same time as explained above, in the immediate reward case, it is only inefficient. The default option $BB2$ is always superior to $GR$, and if left by themselves, people will choose $BB1$, so there is no reason for $GR$ to become the final outcome. In this case it can hence only play the role of deterrence.

2.6 Reforms without Time Lags in Costs and Benefits

We can also imagine reforms where the costs and the benefits are realized at the exact same time.

**Proposition 5** Gradualism never arises in equilibrium when reforms do not have time lags between costs and benefits (i.e. immediate cost and reward reforms).

Hyperbolic discounting creates a tension between what an agent at $t = 0$ would want to do at $t = 1$ and what she would actually do at $t = 1$. The reason is that how she discounts future periods differ depending on which period she is living in. In other words, time-inconsistency has bite only when there are time lags in costs and benefits because only then would there be a discrepancy between how an agent evaluates $BB1$ versus $BB2$ at $t = 0$ and at $t = 1$. When there are no time lags, the relative comparison between $BB1$ and $BB2$ would be identical across all $\beta$ and hence there would be no role for gradualism.
From propositions 1, 4 and 5 above we can draw an important conclusion, namely that there are reforms that can benefit from gradualism and those that cannot.

3 Endogenizing the Agenda Setter: A Citizen Candidate Model

3.1 Set-up of Model

In the simplest case of the model which we worked through above, we assumed that the agenda setter is exogenously given and has $\beta = 1$. We now relax this assumption and consider a citizen candidate model where any agent in the society has the opportunity of running for office (i.e. to become the agenda setter). We therefore add a voting stage $t = 0$ to the above model, and at this period people vote on a candidate with a specific $\beta$. Thereafter the model proceeds as before: in $t = 1$ the agenda setter proposes a reform schedule and seeks majority support and people vote on the reform. If the reform has not been implemented when $t = 2$ is reached, it is implemented as $BB2$ by default.

Together with $A0$, the following is assumed to hold throughout this section:

**Assumption 1 (A1)** $1 - \delta < x < 1 - \beta^M \delta$

This follows from the discussion in the previous section (Proposition 1).

Just as we narrowed down the range of $x$ in order to focus on the case when gradualism may arise, we assume that the parameters are such that they satisfy $c_1 + (-c_2 + \delta v - v) (1 - x) < 0$.

**Assumption 2 (A2)** $c_1 + (-c_2 + \delta v - v) (1 - x) < 0$

This condition is derived from $U^0(GR) \geq U^0(BB2)$. That is, when the costs and benefits are such that $A2$ does not hold, any sophisticated agent in $t = 0$ would refrain from planning for gradualism but would rather plan to choose $BB2$. The result is obviously then to procrastinate. We do not study this trivial case further but instead solve the model for
the case when the parameters are such that gradualism is preferred to procrastination from
the long-run perspective but there is room for conflict due to the agents’ time-inconsistency.

Lastly, to have a well-defined problem, we need to make an assumption about people’s
awareness of their self-control problem. This did not matter in the last section because the
agenda setter was exogenously given regardless of the agents’ awareness of their \( \beta \). Now
since agents vote for the agenda setter at \( t = 0 \) and must compare their long-run utilities
from this standpoint, we have to be more explicit about the agents’ sophistication.

**Assumption 3 (A3)** Agents are sophisticated, i.e. they are aware of their own \( \beta \).

The fact that agents are sophisticated means that they are aware of their true \( \beta \) in the
future and do not believe that it will be equal to one, as the naive agents incorrectly believe.
Not only is this the more realistic assumption, it is also the more interesting case to study.
When the society is composed of naives only, the agenda setter’s \( \beta \) will not matter in the
agents’ voting decision. The elected agenda setter’s \( \beta \) will be a random draw from the
population and there will be nothing to analyze.

### 3.2 Solving the Model

We solve the model by backward induction starting from \( t = 2 \). In this period, the only
option available is \( BB2 \). This implies a utility for the agenda setter and the median voter
such that:

\[
U_{AS}^2 = -c_2 + \beta^{AS} \delta v \\
U^2 = -c_2 + \beta^M \delta v
\]

where \( \beta^{AS} \) is the hyperbolic discount factor of the elected agenda setter, and \( \beta^M \) is that of
the median voter as before.

At \( t = 1 \), the available options are \( BB1, GR \) and \( BB2 \). As is the case in citizen candidate
models, the agenda setter makes the proposal in order to maximize her own utility from
reform:

$$\max U_{AS}^1 = \max \{-c_1 + \beta^{AS} \delta v, \ - (1 - \alpha)c_1 - x\alpha c_1 + \beta^{AS} \delta (v - \alpha c_1), \ \beta^{AS} \delta (-c_2 + \delta v)\}$$

If the agenda setter prefers $BB2$, she will not propose anything else, but just let the default option be implemented. However, if the agenda setter would prefer $BB1$, she has to contemplate if $BB1$ could pass a majority vote against the default option $BB2$, i.e. whether $U^1(BB1) \geq U^1(BB2)$ would hold. In this case, both the agenda setter and the majority of voters prefer $BB1$ over $BB2$ and so there will be no need for gradualism to be offered, and no procrastination problem arises. Assumption $A0$ rules out this trivial case.

Hence, we study the situation when the agenda setter would prefer $BB1$ over $BB2$, but the majority of voters would like to procrastinate. Here agenda setter has the incentive to propose gradualism in order to deter $BB2$ from happening, as long as the inefficiency attached to $GR$ is not too large. For $GR$ to be politically feasible we must have that $U^1(GR) \geq U^1(BB1)$ and $U^1(GR) \geq U^1(BB2)$ hold for the majority of voters at $t = 1$. This means that we must have:

$$-(1 - \alpha)c_1 - x\alpha c_1 + \beta^M \delta (v - \alpha c_1) \geq \max \{-c_1 + \beta^M \delta v, \beta^M \delta (-c_2 + \delta v)\}$$

Under $A1$, $U^1(GR) \geq U^1(BB1)$ is satisfied for the median voter (and for all agents with $\beta \leq \beta^M$) and hence $BB1$ is not a politically feasible option for the agenda setter. $U^1(GR) \geq U^1(BB2)$ is satisfied as well for the median voter (and all agents with $\beta \leq \beta^M$) when the following political constraint holds:

$$\alpha \geq \frac{\beta^M \delta (-c_2 + \delta v) + c_1 - \beta^M \delta v}{c_1 (1 - \beta^M \delta - x)} = \alpha^* \quad (PC)$$

The agenda setter will choose between just leaving the default option $BB2$ or proposing $GR$ knowing that $(PC)$ must hold if she proposes $GR$. Whether she will prefer $GR$ over
BB2, and if so, which $\alpha$ the agenda setter will propose for $GR$ depends on her own $\beta^{AS}$:

$$\max U^1_{AS} = \max \{- (1 - \alpha)c_1 - x\alpha c_1 + \beta^{AS} \delta (v - \alpha c_1), \beta^{AS} \delta (-c_2 + \delta v)\}$$  \hspace{1cm} (4)

such that $(PC)$ holds for $\alpha$

When moving forward in the analysis we have to distinguish between two cases: first, when $-c_2 + \delta v < 0$ and second when this inequality is reversed. Let us start by analyzing the first case. Solving for (4) given $A0 - A3$, we can infer how various agenda setters will act once they are elected. For given values of $x$, $\delta$ and $\beta^M$ we can summarize the reform that will be proposed by the agenda setter with $\beta^{AS}$ as the following:

\begin{align*}
  \text{if } & \frac{1 - x}{\delta} \leq \beta^{AS} \leq 1 \text{ we get } GR(\alpha^*) \hspace{1cm} (5) \\
  \text{if } & \frac{c_1 - (1 - x)v}{\delta (c_2 - \delta v)} \leq \beta^{AS} < \frac{1 - x}{\delta} \text{ we get } GR(1) \\
  \text{if } & 0 \leq \beta^{AS} < \frac{c_1 - (1 - x)v}{\delta (c_2 - \delta v)} \text{ we get } BB2
\end{align*}

We can move to $t = 0$ to understand which agenda setter will be elected by voters now that we know which policy would be implemented by each citizen candidate. We know that sophisticated agents will compare $U^0(\textit{GR})$ and $U^0(\textit{BB2})$. There is no need to consider $U^0(\textit{BB1})$ because the agents are aware that $BB1$ will never be proposed by any agenda setter at $t = 1$. Thus the long-run payoffs that will be compared by the sophisticated agents at $t = 0$ are:

$$
U^0(\textit{GR}) = \beta \delta \{- (1 - \alpha)c_1 - x\alpha c_1 + \delta (v - \alpha c_1)\} \\
U^0(\textit{BB2}) = \beta \delta \{-\delta c_2 + \delta^2 v\}
$$

Since we have that $1 - \delta < x$, among the $GR$ options agents at $t = 0$ prefer the one with the
lowest $\alpha$. And $GR$ is preferred to $BB2$ only when:

$$\alpha \leq \frac{c_1 - \delta c_2 + \delta^2 v - \delta v}{c_1 (1 - x - \delta)} \quad (6)$$

Indeed, this always holds for the $\alpha$ of our interest, i.e. $\alpha^*$, since $A2$ was derived from solving (6) with $\alpha = \alpha^*$.

Standing at $t = 0$, when agents know that they will enjoy higher welfare with gradualism than with procrastination, they will elect an agenda setter whose $\beta$ is higher than the critical value of $\frac{1 - x}{\delta}$ according to (5). Note that this also means that $\beta^{AS} > \beta^M$, since $x < 1 - \beta^M\delta$ by $A1$. We have hence proved the following proposition:

**Proposition 6** The elected agenda setter is more patient than the median voter but is not necessarily an agent with $\beta = 1$.

The elected agenda setter would indeed propose gradualism with the smallest efficiency cost possible given the political constraint at $t = 1$. Thus we can conclude that sophisticated agents are able to avoid the worst outcome of procrastination by delegating to an agenda setter who is not someone with the median hyperbolic discount factor, but someone more patient. We can also easily see that a candidate with $\beta^{AS} = 1$ will satisfy this condition for whatever $x$, $\delta$, and $\beta^M$ and is thus always a possible agenda setter. The simple model with a benevolent patient agenda setter studied in the previous section is hence a special case of this general model.

We can solve in a similar way for the case when $-c_2 + \delta v > 0$. Following from (4) and solving for each $\beta^{AS}$, we get that the following reform schedules will be achieved at each intervals:
if \( \frac{1-x}{\delta} \leq \beta^{AS} \leq 1 \) we get \( GR(\alpha^*) \)  \hspace{1cm} (7)

if \( \frac{(1-x)v-c_1}{\delta (-c_2 + \delta v)} \leq \beta^{AS} < \frac{1-x}{\delta} \) we get \( BB2 \)

if \( 0 \leq \beta^{AS} < \frac{(1-x)v-c_1}{\delta (-c_2 + \delta v)} \) we get \( GR(1) \)

At \( t = 0 \) agents compare between \( U^0(GR) \) and \( U^0(BB2) \). With (6) satisfied for \( \alpha^* \), agents vote for an agenda setter who will propose \( GR(\alpha^*) \)—someone with \( \frac{1-x}{\delta} \leq \beta^{AS} \leq 1 \). We hence see that Proposition 6 still holds.

### 3.3 Calibrated Example

Lastly we consider the example from above again, i.e. we let \( \delta = 0.97, \beta^M = 0.5, c_1 = 6, c_2 = 10, x = 0.3, \) and \( v = 15 \). Then \( -c_2 + \delta v > 0, 1 - \delta < x < 1 - \beta^M \delta \), and \( \beta^M \delta c_2 + \beta^M \delta v(1 - \delta) < c_1 < \delta c_2 + \delta v(1 - \delta) \) are satisfied. We get \( \alpha^* = 0.72 \) and hence inequality (6) is satisfied and \( GR(0.72) \) is preferred to \( BB2 \) from the \( t = 0 \) perspective. Moreover \( A2 \) holds. And since \( \beta^M \leq \frac{1-x}{\delta} \) (0.5 < 0.72165), agents will vote for an agenda setter with \( \beta > 0.72165 \).

Again we see how agents avoid the worst outcome of the gradualism option by electing an agenda setter who is more patient than the median voter. This results in a gradualism in equilibrium which is less efficient than \( BB1 \) but more efficient than \( BB2 \), which is what would have been implemented without the gradualism option.

### 4 Discussion

Although there may well be more than one cause underlying the different cases of gradual reforms being implemented in the world, in our view many of the previously launched explanations are incomplete in the sense that we see political reforms being put off or gradually
implemented even when uncertainties and heterogeneities are not the prominent reasons. Our approach, that the source of the gradualism can be traced to the time-inconsistency of the voters, is not only more intuitive and realistic but also parsimonious. However, there are limitations and possible extensions that are worth mentioning and in this section we touch on these issues.

The first question to our approach could be: why not politics but preferences? As briefly mentioned in the introduction, we do not believe that re-election and special group interests can explain all of the gradual policies around. If that were the case we would not see politicians suggesting unpopular policies at all. Our model provides a "middle ground" that can explain not only why the most efficient policy (big bang) is not implemented but also why politicians often make decisions that are more efficient than that what the median voter would choose at that point in time.

Second, what explains the differences in how reforms are implemented across countries? It is hard to believe or empirically show that the distribution of the hyperbolic discount factor or the fraction of sophisticates vary vastly across countries. But there is indeed not a lot of difference in how a reform is implemented across countries when we compare across each policy. For instance, environmental policies are carried out gradually in most countries. Another point is that political institutions differ across countries and hence the timeline of the model may have to be adjusted depending on the institutional feature. As shown in a recent paper by Conconi, Facchini, and Zanardi (2011), term limits may affect congressmen’s willingness to support reforms. Looking into this kind of variation is a possible extension to our model.

Third, the agenda setter is assumed to have the authority to propose alternatives that are put to vote but not the authority to implement whichever reform she likes best. We believe that this is indeed the most realistic way to model the world regardless of political institution. There is a list of alternatives that voters compare between, and the agenda setter (whether she is the President or the Prime Minister, or even an autocrat) cannot force one
alternative or the other without some consideration of the public opinion.

Lastly, our model generates several testable hypothesis related to when and how gradualism arise and for what kind of policies it may be welfare enhancing (although inefficient) to have the opportunity of gradualism.

5 Conclusion

In politics, it is commonly observed that reforms that everyone knows are inevitable and which would be most efficient to be done with right away are still delayed or, when they finally happen, are implemented only gradually. Why this is the case has been puzzling political economists for decades.

We suggest an intuitive explanation that builds on time-inconsistency on the part of the voters. Our model is populated by agents who vary in their degree of time-inconsistency. At least some fraction of the agents are sophisticated in the sense that they are aware of their time-inconsistency. The model also features an agenda setting politician who has the power to make suggestions to the voters about the alternative reform designs.

The main result of the model is that gradualism do arise in equilibrium as the result of a trade-off between the time-inconsistency of the median voter (who want benefits now regardless of the lost complementarities) and the time consistency of the agenda setter (who tries to minimize the complementarities lost). Gradualism is inefficient compared to the first-best option but welfare enhancing compared to what would have been implemented without the option of gradualism. That is, even though complementarities are not fully utilized in equilibrium, it would have been even worse if gradualism would not have been a possibility since the reform then would have been delayed even more.

In the simplest version of our model we assume a patient agenda setter. However, in the extended version of the model we show that when agents have the opportunity to elect an agenda setter at a constitutional stage, an agent who is less time-inconsistent than the
median voter will be elected. Election of the agenda setter serves as a commitment device for the time-inconsistent agents.

We also compare various structures of policy issues and investigate when gradualism arise. We show that gradualism does not arise when costs and benefits arise at the same time or when the benefits precede the costs. The possibility of gradualism is only utilized when costs arise before benefits.

Even though the logic of our model is general, we have social security reform and environmental reform as our motivating examples throughout the paper. Our model sheds light on the fact that even though the awareness of the need for reform in these areas is strong and even though it can be argued that neither uncertainties nor heterogeneities have bite, delay and gradualism still occur.

6 Appendix

Proof of Proposition 1

The proof is divided in two parts. First, if $x > 1 - \beta^M \delta$ we have that $(PC)$ can be rewritten as

$$\alpha < \frac{\beta^M \delta (-c_2 + \delta v) + c_1 - \beta^M \delta v}{c_1 (1 - \beta^M \delta - x)} = \alpha^*.$$ 

Here we are in case (a), where social welfare is decreasing in $\alpha$, since $x > 1 - \beta^M \delta > 1 - \delta$. Hence the agenda setter chooses $\alpha = 0$ which satisfies the political constraint. In this case $GR = BB2$.

Second, if $x \leq 1 - \beta^M \delta$ we can write $(PC)$ as

$$\alpha \geq \frac{\beta^M \delta (-c_2 + \delta v) + c_1 - \beta^M \delta v}{c_1 (1 - \beta^M \delta - x)} = \alpha^*.$$ 

Now if $1 - \delta < x < 1 - \beta^M \delta$, we are in case (a) where social welfare is decreasing in $\alpha$. Hence agenda setter chooses $\alpha = \alpha^*$ and $GR$ arises in equilibrium. However, if $x < 1 - \delta < 1 - \beta^M \delta$, we are in case (b) where social welfare is increasing in $\alpha$. Hence agenda setter chooses $\alpha = 1$ which satisfies the political constraint. Finally, if $x = 1 - \delta < 1 - \beta^M \delta$, we are in case (c) where social welfare does not depend on $\alpha$. Hence agenda setter can choose whichever $\alpha$ that satisfies $\alpha > \alpha^*$. ■
Proof of Expression (5)
Remember that we are in the case where \(-c_2 + \delta v < 0\). Given assumptions \(A0\) to \(A3\) we get three possible outcomes. First, if \(\frac{1-x}{\delta} < \beta^{AS} \leq 1\) we have that \(U^{1}_{AS}(GR)\) is decreasing in \(\alpha\) so \(AS\) will propose the lowest \(\alpha\) possible for gradualism namely \(\alpha = \alpha^*\). Comparing the agenda setter’s utility from \(GR(\alpha^*)\) to the her utility from \(BB2\) by plugging in \(\alpha^*\) as found in \((PC)\), we get that \(\beta^{AS} \geq \beta^M\) has to hold. Second, If \(0 \leq \beta^{AS} < \frac{1-x}{\delta}\) we have that \(U^{1}_{AS}(GR)\) is increasing in \(\alpha\) so agenda setter would choose the highest \(\alpha\) possible, i.e. \(\alpha = 1\) for gradualism. We have that \(GR(\alpha = 1) \geq_{AS} BB2\) only when \(\beta^{AS} \geq \frac{c_1 - (1-x)v}{\delta(c_2 - \delta v)}\). Third, if \(\beta^{AS} = \frac{1-x}{\delta}\) we have that \(U^{1}_{AS}(GR)\) does not depend on \(\alpha\) so agenda setter may choose whatever \(\alpha \geq \alpha^*\).

7 References


Conconi, Paola, Facchini, Giovanni, and Zanardi, Maurizio. "Policymakers' Horizon and Trade Reforms."


