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Towards a theory of policy timing*

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The article presents a theory of policy timing that relies on uncertainty and transaction costs to explain the optimal timing and duration of policy reforms. Delaying reforms resolves some uncertainty by gaining valuable information and saves transaction costs. Implementing reforms without waiting increases welfare by adjusting domestic policies to changed market parameters. Optimal policy timing is found by balancing the trade-off between delaying reforms and implementing reforms without waiting. Our theory offers an explanation of why countries differ with respect to the length of their policy reforms and why applied studies often judge agricultural policies to be inefficient when actually they may not be.

Key words: agriculture, dynamic model, policy analysis, transaction costs, uncertainty.

1. Introduction

Whenever a government makes a policy decision, it ultimately has to decide on three distinct issues: the choice of policy instruments, the setting of the levels of these instruments and the timing of their implementation. In theoretical and applied policy analysis, the time dimension of policy formation is often ignored or simply taken as an occurrence exogenous to the rest of the policy formation process. The aim of this article is to consider the timing of policy as an integral part of the process, explicitly chosen by government. In particular, we draw insights from transaction cost economics and from developments in the theory of decision making under temporal revelation of information and incorporate those insights into a political economy model.

The central element of our theory is that government balances the costs of delaying policy reforms against the benefits. Costs are in the form of welfare losses, brought about by delayed adjustment to changes in the economic and political environment and by the costs of the political process that accompany policy changes. Benefits of delaying policy reforms stem from receiving better information by waiting. In a world in which no further information is revealed over time and in which setting or changing policy is costless, government would set an optimal policy and never change it. In a world in which

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new information, that is, world market prices, is continuously revealed over time but negotiation costs and other costs of policy change are zero, government would change policy every time it receives additional information and hence very often. However, in the real world, we observe neither situation, but rather observe governments changing policies discretely.

In our model, the value of waiting for information and the costs of policy change balance in political economic equilibrium and result in intermittent policy change. Our analysis shares much with the option value part of the investment literature, except that we do not require irreversibility of policies. Instead, we allow policies to change back and forth, but we still incorporate the concept of irreversible costs of policy change. We derive testable theoretical results from the model that could be further developed and investigated.

Although the set-up of our model is fairly simple, the analytical solutions are quite complex and not necessarily tractable. By using data related to a reform of the EU Common Agricultural Policy (CAP) in 1992, we were able to create numerical simulative illustrations of our general results. Also, we have contributed to the literature that seeks to present the rationale behind the 1992 reform (Mahé and Roe 1996; Kay 1998, 2003; Daugbjerg 1999, 2003) by explaining how the timing of policy change relies on irreversible transaction costs, that is, once a reform was made, it would have been quite costly to reverse.

The remainder of the article is organized as follows. The next section sets out the main ideas of our theory of policy timing. Section 3 uses data from around the 1992 CAP reform to analyse and illustrate the model with a numerical simulation. Section 4 presents the main results of our simulations. Section 5 concludes with a discussion.

2. Theory of policy timing

Our theory of policy timing relies on the concepts of option value and the transaction costs of the political process. When decisions are made under uncertainty, and when more and better information arrives over time, having the ability to wait before making a decision has value. This value is commonly called the 'option value' in the finance literature (Dixit and Pindyck 1994) or the 'quasi-option value' in the environmental economics literature (Arrow and Fisher 1974; Smith 1983; Kolstad 1996).

The issue of optimal timing is far from new to the economics profession. It typically arises in the analysis of decision making under uncertainty and involves irreversibilities and sunk costs (Arrow and Fisher 1974; Fisher and Hanemann 1990; Dixit and Pindyck 1994). Numerous studies in various fields attempt to capture timing aspects of policy making. Pindyck (2002) studies optimal timing problems in environmental economics. Szymanski (1991) addresses similar issues with regard to infrastructure investment. Aoki (2003) and Taylor (1993) analyse timing aspects in monetary policy. Stern (2007) and Gerlagh *et al.* (2009) provide examples from economic research related to climate change.

The literature on optimal timing problems frequently regards policy change to be irreversible (e.g. Pindyck 2002). This assumption seems strong. By their very nature, policies can shift back and forth, and policy makers frequently make use of this by regularly introducing, changing, removing and re-introducing policies. For decisions to be made in the political arena, most nations have in place institutions that facilitate the meeting and bargaining of varying interest groups or their representatives. There is a growing literature that analyses the costs of social interaction in general (Williamson 1985) and the costs of making economic policy in particular (Dixit 1996). These transaction costs include the costs associated with searching for information, bargaining, making contracts, enforcing contracts and protecting property rights (Eggertsson 1990). Our focus is on the costs of political negotiations. One part of those costs is associated with the actual physical meeting and bargaining (the legislators' salaries, travel costs, costs of upkeep of government buildings in which the legislative process takes place). But more broadly, we think of negotiation costs as the costs of agenda setting, that is, the costs associated with 'what issues will be covered by the media, brought to the attention of decision makers, and identified as problems requiring government solutions' (Dye 2011, p. 50). We maintain that this costliness of meeting and agenda setting, and especially the cost of citizens' efforts to engage in politics, affects how often legislatures meet, how often elections are held and how often major pieces of policy legislation are passed. It is this cost which keeps governments from finely tuning policies on a day-by-day basis. We therefore suggest a conceptual theory of policy timing that allows for flexibility in changing policies back and forth, but requires irreversible negotiation costs whenever a policy change takes place.

There are other costs to policies and policy change that lie beyond the focus of this article. There may be costs of adjustment as producers, consumers and taxpayers change their decisions in line with the new policies. For decisions that have long-lasting effects, for example, investments, adjustment costs may be of particular importance to decision makers. We abstract from these costs as our focus is on costs of the policy process.

3. Model

3.1. Theoretical model

Consider a government that is able to change policy once per period if it so desires. At each period $t = 1, \ldots, T$, the government makes final decisions and provisional decisions. It makes a final decision on whether to meet (i.e. deal with the issue as part of the formal agenda) in period t, and it makes a final decision on period t's policy. If it decides not to meet in t, then changing t's policy is infinitely expensive, and therefore, government will also decide not to change policy. Also in period t, government makes provisional decisions about meetings and policies for future years. We let ${}^{t}m_{r}$ be a variable representing the plan made in period t about meeting in period $r \geq t$. If $r > t$, then the meeting plan made in period t for period r is provisional. If $r = t$, then we have ${}^t m_t$, a variable representing the final decision made in period t about whether to meet in period t. In all cases, setting ${}^t m_r$ to one means that the plan made in period t is to meet in period r, and setting ${}^t m_r$ to zero means that the plan made in period t is to not meet in period r. Similarly, ${}^t \boldsymbol{a}_r$ is a vector of policy instruments, which are variables.[1] When ${}^t \boldsymbol{a}_r$ is assigned a value, it represents the policy planned in period t to be enacted in period r. If $r > t$, then the policy plan is provisional. If $r = t$, then the policy plan is final.

Utility obtained by group $i = 1, \ldots, N$ in period r is u_{ir}, which depends on ${}^r m_r$ (i.e. on whether a meeting is held in period r), on ${}^r \boldsymbol{a}_r$ (the policy set in period r), on ${}^{r-1} a_{r-1}$ (the policy that was set in period $r - 1$), on β_r (the world price in period r) and on $\boldsymbol{b}_r$, which describes the (deterministic) exogenous economic environment in period r (e.g. specifications of supply and demand functions): $u_{ir} = \psi_i\left({}^r \boldsymbol{m}_r, {}^r a_r, {}^{r-1} a_{r-1}, \boldsymbol{b}_r, \beta_r\right)$. Current utility thus depends on current decisions and past decisions, that is, on the policy that was set in the previous period. In a generic year $t \in \{1, \ldots, T\}$, the optimization problem for the government is to determine a planned meeting schedule ${}^t \boldsymbol{m} = ({}^t m_t, {}^t m_{t+1}, \ldots, {}^t m_T)$ and a planned policy schedule ${}^t \boldsymbol{a} = ({}^t \boldsymbol{a}_t, {}^t \boldsymbol{a}_{t+1}, \ldots, {}^t \boldsymbol{a}_T)$ to maximize the expected value of the discounted weighted sum of future interest group welfare. This expected value is conditioned on the current value of the (stochastic) world price, β_t, so the government's problem is

$$\max_{\substack{{}^t m_t, \ldots, {}^t m_T \\ {}^t a_t, \ldots, {}^t a_T}} = \sum_{i=1}^{N} \alpha_i \Bigg(\psi_i\left({}^t \boldsymbol{m}_t, {}^t \boldsymbol{a}_t, {}^{t-1} \boldsymbol{a}_{t-1}, \boldsymbol{b}_t, \beta_t\right) + \boldsymbol{E}\left\{ \sum_{r=t+1}^{T} \rho^{r-t} [\alpha_i \psi_i({}^t \boldsymbol{m}_r, {}^t \boldsymbol{a}_r, {}^t \boldsymbol{a}_{r-1}, \boldsymbol{b}_r, \beta_r) | \beta_t] \right\} \Bigg) \tag{1}$$

where $\rho \leq 1$ is a discount factor, $\alpha_i \in [0, 1]$ is the weight of group i, $\alpha_1 + \ldots + \alpha_N = 1$, and ${}^t \boldsymbol{a}_{t1}$ is a decision made before period t and in period t must be taken as given.[2] Expectations are taken over the future periods' world prices, $\beta_{t+1}, \ldots, \beta_T$, given that the value of the current world price β_t has been revealed and is known.[3]

[1] Our modelling of policies and policy instruments follows several examples in the literature, including Harsanyi (1963, 1977), Zusman (1976), Gardner (1983) and Bullock *et al.* (1999).

[2] In assuming that government solves a problem that includes exogenous 'weights' of interest groups, our model treats issues of interest group power in the simplest manner we know of. Several studies offer persuasive critiques of this type of model (e.g. Bullock 1994). While basing our model on more detailed political economy models (e.g. Becker (1983) or Grossman and Helpman (1994)) would make our model realistic, we maintain the simple base model to maintain focus on the policy-timing issues that are the focus of our study.

[3] Government might also have to form expectations about market parameters $\boldsymbol{b}_r$. To focus on the time-related aspects of the problem, we abstract away from this possibility.

For illustrative purposes and to simplify the calculations, we switch in the remainder of this article from the general model presented in Equation (1) to a specific version. We assume two interest groups ($N = 2$) and three time periods ($T = 3$). Our focus is on one commodity market (the wheat market) and on one policy instrument a, the wheat intervention price. There is one stochastic variable, the wheat world price, denoted by β_t. We assume that β_t enters linearly in the empirical application and in Equation (3) below. Wheat suppliers and 'others' are indexed by s and c. We assume further that policy change involves negotiation costs. The negotiation costs include a component that does not depend on the size of the policy change, but must be paid to obtain even the smallest policy change. We call this the fixed cost of political 'meetings' (i.e. the social costs of placing any issue 'on the agenda' in order to conduct the debate). Negotiation costs also have a variable component, which depends on how large the policy change is. That is, we assume that bigger policy changes involve higher negotiation costs than do small policy changes. They take up, for example, more time and media 'space'. For a generic year t, negotiation costs are a function of whether a meeting is held, the previous year's policy and the current year's policy:

$$N\left({}^{t}m_t, {}^{t}a_t, {}^{t-1}a_{t-1}\right) = {}^{t}m_t\left[\phi + \lambda\left({}^{t}a_t - {}^{t-1}a_{t-1}\right)^2\right] + \left(1 - {}^{t}m_t\right)\left[\omega\left({}^{t}a_t - {}^{t-1}a_{t-1}\right)^2\right] \tag{2}$$

In Equation (2), ϕ denotes the fixed part of the negotiation costs and is measured in mill ECU, while parameter $\lambda > 0$ determines how costs increase with the size of the (square of the) policy change. Policy instruments ${}^{t}a_t$ and ${}^{t-1}a_{t-1}$ represent a price support policy variable in periods t and $t - 1$ and are denoted in ECU, the precursor of the Euro, per tonne. For example, if $\lambda = 0.25$, then a price change of 20 ECU/tonne would give a variable negotiation cost of 100 mill ECU. The greater the changes in policy, the more costly it is to implement the policy. A simple justification would be that the debate takes longer, so the opportunity costs of the time spent at the meeting increase. In addition, the opportunity costs of alternative policy issues to focus on increase. The parameter $\omega > 0$ is assumed to be very large and has the effect of making any non-negligible policy change prohibitively costly if no meeting is held (${}^{t}m_t = 0$).

Both negotiation costs and the monetary expenditures made by government to implement its policies are paid by the interest groups according to their shares of the population, δ_s and δ_c. Our negotiation cost function is an admittedly simple, though intuitive, construct. As Kingdon (1995) has argued, the process of agenda setting is a complicated and diffuse process involving the partly stochastic nature of problems that cause policy issues to be put on the agenda (e.g. natural disasters), politics (e.g. elections that bring new administrations with new political priorities) and the participants of the process (e.g. legislators, political parties).

In period 1, the government's planned choice schedule is a set of strategy variables, two of which are made in each of the three periods: $\{{}^1m_1, {}^1a_1, {}^1m_2, {}^1a_2, {}^1m_3, {}^1a_3\}$. If the government chooses ${}^1m_1 = 1$, then it meets in the first period. If it sets ${}^1m_1 = 0$, then it does not meet in that period. Say that the policy in the period before period 1 was set at some level ${}^0a_0$. If there is a first-period meeting, the government sets a policy ${}^1a_1$. The government's provisional decision in period 1 about whether to meet in period 2 is ${}^1m_2$, and the provisional policy set in period 1 for period 2 is ${}^1a_2$. Note that the government's own actions influence the information that it possesses about future market prices. The world market price that occurs in period $t-1$, called β_{t-1}, is always known with certainty in period t. A government that wants to use information about β_{t-1} to make policy changes in period t can do so meeting in period t. This government, however, then faces negotiation costs. Government will choose to wait for better information if the expected value of this information gain in terms of increased welfare through the policy reform more than offsets the costs of meeting.

The vector of variables ${}^1\boldsymbol{m} = ({}^1m_1, {}^1m_2, {}^1m_3)$ represents the government's planned meeting schedule as of period 1. The set of possible planned meeting schedules is M, and it has eight elements: $M = \{m_1, \ldots, m_8\}$. The first possible strategy is to set $m_1 = \{1, 1, 1\}$, meaning that meetings are planned to be held in every period; the second is to set $m_2 = \{1, 1, 0\}$, meaning that meetings are planned to be held in the first two periods but not in the third; continuing in this manner, the eighth possible strategy is to set $m_8 = \{0, 0, 0\}$, meaning that no meetings are held. When a meeting schedule is made, only the plan about whether to have a first-period meeting is unalterable; ${}^1m_2$ and ${}^1m_3$ are provisionally planned and may be changed in future periods. In period 2, government has no choice about meeting and policy in period 1. Therefore, period 2's plan for period 1 is the same as the actions taken in period 1: $({}^2a_1, {}^2m_1) = ({}^1a_1, {}^1m_1)$. Given this choice from period 1, government solves the maximization problem in Equation (1) by choosing pairs $({}^2a_2, {}^2m_2)$ and $({}^2a_3, {}^2m_3)$ that maximize Equation (1) conditioned on the previous choice $({}^1a_1, {}^1m_1)$. Similarly, when period 3 arrives, government must take its past decisions as given, which means in our framework that it sets $({}^3a_1, {}^3m_1)$ to equal its past choice $({}^1a_1, {}^1m_1)$ and similarly $({}^3a_2, {}^3m_2)$ to equal its past choice $({}^2a_2, {}^2m_2)$, then it chooses $({}^3a_3, {}^3m_3)$.

Given $T = 3$, we use the following welfare measures for $t = 1, 2, 3$ and $r \in \{t, \ldots, 3\}$:

$$\psi_c({}^tm_t, {}^ta_r, {}^ta_{r-1}, \boldsymbol{b}_r, \beta_r) = CS({}^ta_r, \boldsymbol{b}_r) - \delta_c X({}^ta_r, \boldsymbol{b}_r, \beta_r) - \delta_c N({}^tm_t, {}^ta_r, {}^ta_{r-1}),$$

and

$$\psi_s({}^tm_t, {}^ta_r, {}^ta_{r-1}, \boldsymbol{b}_r, \beta_r) = PS({}^ta_r, \boldsymbol{b}_r) - \delta_s X({}^ta_r, \boldsymbol{b}_r, \beta_r) - \delta_s N({}^tm_t, {}^ta_r, {}^ta_{r-1}),$$

where $CS({}^ta_r, \boldsymbol{b}_r) = \int_{{}^ta_r}^{\infty} D(p, \boldsymbol{b}_r)\mathrm{d}p$ is consumer surplus, $PS({}^ta_r, \boldsymbol{b}_r) = \int_0^{{}^ta_r} S(p, \boldsymbol{b}_r)dp$ is producer surplus, $X({}^ta_r, \boldsymbol{b}_r, \beta_r) = ({}^ta_r - \beta_r)[S({}^ta_r, \boldsymbol{b}_r) - D({}^ta_r, \boldsymbol{b}_r)]$

represents export subsidies and $N({}^tm_r, {}^ta_r, {}^ta_{r-1}) = {}^tm_r\left[\phi + \lambda({}^ta_r - {}^ta_{r-1})^2\right] + (1 - {}^tm_r)\left[\omega({}^ta_r - {}^ta_{r-1})^2\right]$ represents negotiation costs.

In period $t \in \{1, 2, 3\}$, as in Equation (1), the government's objective is to solve,

$$\max_{\substack{{}^tm_t,\ldots,{}^tm_3 \\ {}^ta_t,\ldots,{}^ta_3}} = E\left\{\sum_{r=t}^{3}\sum_{i\in\{c,s\}} \rho^{r-1}[\alpha_i\psi_i({}^tm_r, {}^ta_r, {}^ta_{r-1}, \boldsymbol{b}_r, \beta_r)|\beta_t]\right\} \tag{3}$$

where it is understood that in period 2, ${}^1m_1$ and ${}^1a_1$ have been chosen previously and so are fixed, and in period 3, ${}^1m_1$, ${}^2m_2$, ${}^1a_1$, and ${}^2a_2$ are fixed.

3.2. Empirical application

We illustrate our model using data from the decade prior to the 1992 CAP reform. This reform constituted a major policy change with a considerable reduction in cereal intervention prices, which was partly compensated by direct area payments and other accompanying measures. We chose 1982 as our base year, and for convenience, we assumed that the EU could have implemented a reform every third year, that is, 1985, 1988 and, as it did, in 1991. All values are in 1982 real terms.

We calculated the EU wheat producer price in the base year as the weighted average price of soft and hard wheat in all ten member countries. Utilizing Eurostat (2011) data, we derived an EU wheat price expressed in ECU of 210.08 ECU/tonne. Usable production and internal use were 54.2 million tonnes and 44.4 million tonnes, respectively (Eurostat 2011). We assume 0.3277 as the own-price elasticity of wheat supply (Guyomard *et al.* 1996) and −0.270 as the own-price elasticity of wheat demand (Sullivan *et al.* 1989). We assumed linear functional forms for supply and demand.

The initial world market price is defined as the US wheat producer price in 1982, which was 130 USD/tonne or 127.52 ECU/tonne (USDA 2011). We modelled government's expectations about the development of the world market price from 1982 onwards as an autoregressive process of the form $\beta_t = \mu + \xi\beta_{t-1} + vt + \varepsilon_t$, where β_t is the world market price of wheat at year t. μ, ξ and v are coefficients, while ε_t is a random term. We assumed that government has some knowledge about μ, ξ, v and ε_t from observing past price movements. Hence, we estimate this autoregressive process using OLS regression. To have sufficient observations from a statistical point of view, we used deflated US average wheat producer prices between 1931 and 1990 (USDA 2011). The goodness of fit for this regression was 75 per cent, and coefficients, μ, ξ and v, were significant at the 1 per cent, 5 and 10 per cent levels, respectively. We used these coefficients (also converted to 1982 ECU values) to simulate the deterministic part of the prices movement on a year-to-year basis. Based on this, between 1982 and 1985, the price decreases from 127.52 ECU/tonne to 121.35 ECU/tonne. However, there was also a random aspect to the price movement. For simplicity, we assumed that this random effect was discrete and was either a positive or negative deviation of 25.31 ECU/tonne from the deterministic trend. These deviations represent the 50 per cent limits of normal distributed residuals with a standard deviation as derived in the OLS regression. Hence, the price generated for 1985 could have been 146.66 or 96.04 ECU/tonne, with each occurring with probability 0.5. One of these two values is the starting point to derive the expected price in the following year. The population share of wheat producers and 'others' was calculated based on the number of cereal farms in 1980/1981, assuming four persons per holding: $\delta_c = 0.9967$ and $\delta_s = 0.0033$. The discount rate was set at 2 per cent, $\rho = 0.98$.

To the best of our knowledge, there is no attempt in the literature to empirically measure the transaction costs of policy making, although the influence of transaction costs on (economic) policy making is widely acknowledged (Dixit 1996) As initial values, we use $\lambda = 0.25$, $\phi = 1$ and $\omega = 100{,}000{,}000$. The purpose of the high value of ω is simply to ensure that if there is no meeting, policy change is sufficiently expensive as to be infeasible in the model.

To help keep our focus on policy timing, we employed a simple political economy model sometimes called 'the political preference function approach', based on Rausser and Freebairn (1974), to obtain estimates of our model's interest group weights, α_s and α_c.[4] As argued by Bullock (1994, p. 35), this approach assumes 'observed policies [to be] efficient', and 'the number of policy instruments to be exactly one less than the number of interest groups'. In our model, we assume political–economic equilibrium in the base year, that is, $(\beta_0, m_0) = (127.52, 1)$. In equilibrium, $\alpha_c = 0.451265$ and $\alpha_s = 0.548735$.

4. Numerical results

4.1. Policy duration

We define the duration of a policy as $s - r + 1$, where government first meets and changes policy in period r and next meets and changes policy in period s. Assume government has met in t_1 and therefore $m_1 = 1$, and has met in t_3 ($m_3 = 1$), but not in t_2 ($m_2 = 0$). There are two timings of policy reform in this example. The first policy reform is implemented at the beginning of t_1 and lasts for that period and the following period. The second policy reform is implemented at the beginning of t_3 and lasts for just that period. The longest duration of a policy in our model is four periods, because we assume government to have met and made a policy in the period immediately preceding the first period.

[4] The details of the measurement can be provided by the authors upon request.

The optimal duration of a policy is endogenous and given by the solution to Equation (3). The first-order conditions to Equation (3) implicitly define how the duration of a policy is affected by changes in exogenous parameters. As the analytical solution is quite complex, we provide a numerical illustration to yield insights.

Increases in the parameters ϕ and λ of the negotiation cost function increase policy duration as it becomes more costly to change policy. Figure 1 shows the optimal meeting strategy ${}^1\boldsymbol{m}^* = \left({}^1m_1^*, {}^1m_2^*, {}^1m_3^*\right)$ as a function of the parameters of the negotiation cost function, $\phi \in [0, 5]$ and $\lambda \in [0, 5]$, and for the given random walk of the world price. Figure 1 reports that for fixed negotiation costs ϕ and variable negotiation costs λ sufficiently low, the optimal meeting plan made in the first period is, as expected, to meet in every period: $\{1, 1, 1\}$. In general, as variable negotiation costs λ and fixed negotiation costs ϕ increase, the number of meetings is reduced, starting with meetings in later periods, until $\{0, 0, 0\}$ finally becomes the optimal meeting strategy. Meeting strategy $\{1, 0, 1\}$ is chosen only when $\lambda = 0$ and ϕ is approximately between values 2.9 and 3.9. Meeting strategy $\{0, 1, 0\}$ is chosen only when $\lambda = 0$ and ϕ is approximately between 3.9 and 5.

4.2. Size of policy change

The size of the policy change, $a_t - a_{t-1}$, depends on several of the model's parameters. An increase in the marginal meeting costs γ reduces the size as more resources go into the political process instead of increasing welfare. A change in the fixed meeting costs does not impact the size of the policy change. However, the size of the policy change does depend on the strength of the external shock; the larger the change in the political and economic conditions (i.e. the change in the world price in our model), the larger will be the policy change. This is true both for current and future policy decisions and

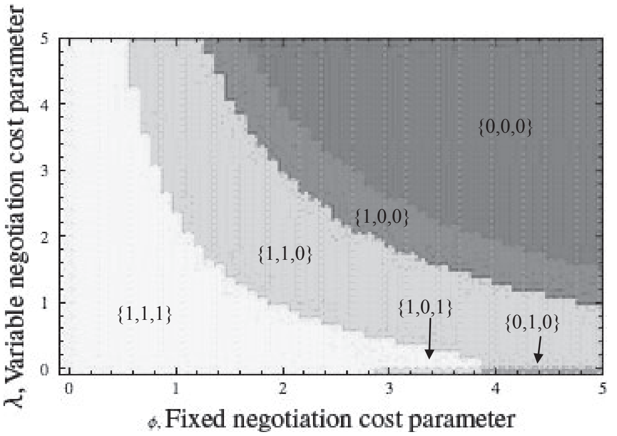

Figure 1 Optimal meeting plan in period 1, ${}^{\mathbf{1}}m^* = \left({}^{\mathbf{1}}m_{\mathbf{1}}^*, {}^{\mathbf{1}}m_{\mathbf{2}}^*, {}^{\mathbf{1}}m_{\mathbf{3}}^*\right)$, shown in $\{\phi, \lambda\}$–space.

independent of whether the change is in the current period or in future periods. Moreover, if we treat meeting plans as exogenous, the size of the policy change depends on policy duration. The longer the period without a reform, the larger will be the policy change both at the time the new policy is implemented and the next time the government accomplishes a new reform. Table 1 illustrates by comparing optimal policies for different meeting scenarios at $t = 1$.

Examining Table 1, comparing scenario {0, 0, 1} with scenario {0, 1, 1}, the drop in the support price from $t = 2$ to $t = 3$, as measured by $a_3 - a_2$, is larger at 5.37 ECU/tonne in the former scenario, where no meeting was held until $t = 3$, than at 4.11 ECU/tonne in the latter scenario in which a meeting was held in $t = 2$. Similarly, the drop in the support price from $t = 0$ to $t = 1$, as measured by $a_1 - a_0$, is larger at 6.78 ECU/tonne in scenario {1, 0, 0}, where no meeting is held after $t = 1$, than in scenario {1, 0, 1} at 6.25 ECU/tonne, where a new meeting is held in $t = 3$. Our numerical results indicate that the total policy change over the observed time period increases with the number of meetings held. For example, total policy change as measured by $|a_3 - a_0|$ is 13.31 ECU/tonne in scenario {1,1,1} compared to 10.48 ECU/tonne in scenario {0, 1, 1} and 5.37 ECU/tonne in scenario {0, 0, 1}. However, this indication cannot necessarily be generalized as is it non-trivial to derive it from the theoretical model.

4.3. Efficiency of seemingly inefficient policies

Following the seminal work of Stigler (1982), Becker (1983) and Gardner (1983), a long-standing debate in agricultural economics considers whether government redistribution is efficient. Empirical studies have been conducted to support or question this hypothesis (Bullock 1995) and the references therein. But those models do not account for the costs of policy change and so bear the risk of erroneously finding observed policies to be inefficient. To see why, compare the optimal response of the domestic policy a_1 to a change in the world price from β_0 to β_1 for the cases with and without negotiation costs. Intuitively, for a given β_1, the change in the domestic policy will be

Table 1 Optimal policies a_1, a_2 and a_3 at t_1 for different meeting scenarios [ECU/tonne]

$\{m_1,m_2,m_3\}$	a_0	a_1	$a_1 - a_0$	a_2	$a_2 - a_1$	a_3	$a_3 - a_2$	$a_3 - a_0$
{0, 0, 0}	210.08	210.08	0.00	210.08	0.00	210.08	0.00	0.00
{0, 0, 1}	210.08	210.08	0.00	210.08	0.00	204.71	−5.37	−5.37
{0, 1, 0}	210.08	210.08	0.00	203.06	−7.02	203.06	0.00	−7.02
{0, 1, 1}	210.08	210.08	0.00	203.71	−6.37	199.60	−4.11	−10.48
{1, 0, 0}	210.08	203.97	−6.78	203.97	0.00	203.97	0.00	−6.78
{1, 0, 1}	210.08	203.83	−6.25	203.83	0.00	199.69	−4.14	−10.39
{1, 1, 0}	210.08	204.70	−5.38	199.43	−5.27	199.43	0.00	−10.67
{1, 1, 1}	210.08	205.02	−5.06	200.18	−3.41	196.76	−3.41	−13.31

Source: Own calculations.

higher without negotiation costs. A positive policy analysis neglecting negotiation costs would thus observe a domestic policy different from what the model would predict and erroneously judge that policy to be inefficient. Figure 2 provides a graphical illustration.

The two lines in Figure 2 depict the optimal response policy a_1 with and without negotiation costs. The two lines intersect at the point (a_0, β_0) = (210.08, 127.52), as no change in the world price does not require a change in the domestic price either. The grey-shaded area between the two lines indicates the price range of the domestic price for a given change in the world price for which a political economy model neglecting negotiation costs would find the observed domestic policy a_1 to be inefficient. Consider point A which is approximately (140, 70) in Figure 2. Without negotiation costs, a domestic price of 140 ECU/tonne would be the optimal response to a world price of 70 ECU/tonne. However, taking negotiation costs into account and assuming (a_0, β_0) = (210.08, 127.52) from the previous period, the optimal policy would be at point B, approximately (200, 70). A political economy analysis that neglects negotiation costs would find the observed policy $a_1 \approx 200$ ECU/tonne to be inefficient (i.e. too high) as it would assume policy $a_1 \approx 140$ ECU/tonne to be optimal policy given the market parameters and the world price. This is because negotiation costs reduce the benefits of changing policies and thus reduce the size of the optimal policy response. The price range increases with an increase of the change in the world price from the previous period.

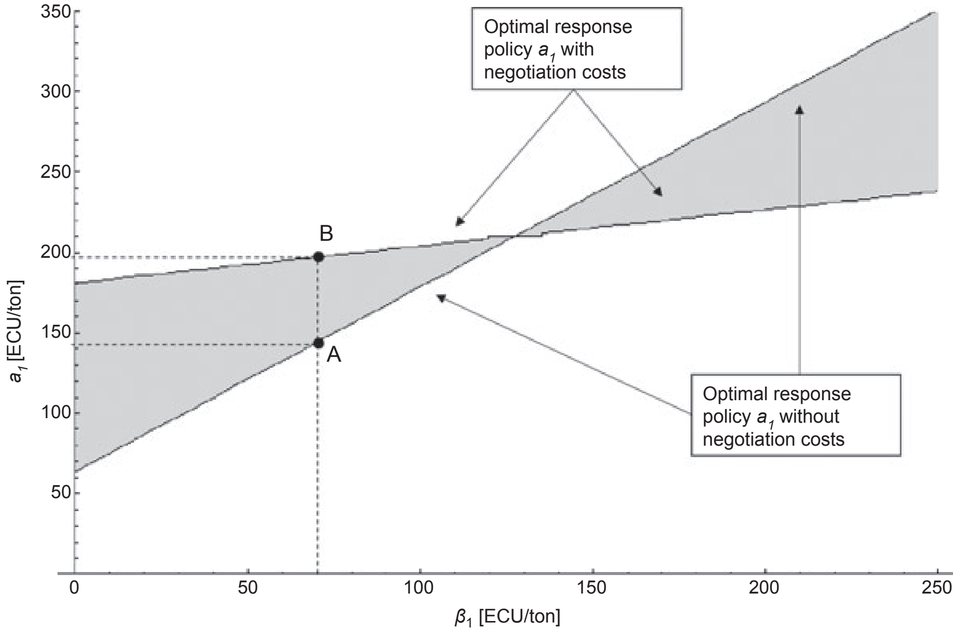

Figure 2 Price range for seemingly inefficient policies.

Note that the optimal response function without negotiation costs has a steeper slope than the optimal response function with negotiation costs. In addition, the latter function is flat around (a_0, β_0). This is because in this neighbourhood, the change in the world price from β_0 to β_1 is too small to outweigh the costs of domestic policy change. Therefore, government chooses to keep the former policy a_0.

5. Discussion and conclusion

This article presents a theory of policy timing based on the cost–benefit trade-offs. On the one hand, there are benefits to adjusting quickly to changes in the economic and political environment. On the other hand, there are benefits of waiting for valuable information, and there are negotiation costs of policy change, as well. The theory is incorporated into a dynamic political economy model in which a government has full flexibility with regard to the design and duration of a policy reform. Improving upon existing literature, the model does not require the irreversibility of policies themselves, but assumes instead the irreversibility of the costs of changing policies. The theory yields some interesting insights and testable hypotheses. It makes a contribution to the question of why countries adopt policy reforms of different lengths. The theory also contributes to the long-standing debate on whether government redistribution is efficient. Policy analysis that does not take into account the dynamics of policy timing may run the risk of finding potentially efficient policies to be inefficient.

The theory of policy timing presented suggests several potentially valuable extensions. Our concept and specification of the negotiation cost function is very simple and awaits a better founded theoretical justification and empirical specification. Although intuitive, agenda setting is not necessarily a straightforward process that, to some extent, depends on the size of a proposed reform.

We model the process of the decision making of policy as a one-dimensional objective: the weighted sum of interest group welfare net of the costs of ‘running the system’. An interesting extension would be to model the governance structure of policy making in more detail and relate it to other types of transaction costs (like asset specificity) (Dixit 1996). Of course we do not claim that our negotiation cost function covers the complexity of EU agricultural policy making, but we acknowledge the costliness of decision making through the inclusion of negotiation costs. In this respect, the collection of empirical data to specify different kinds of transaction costs and their incorporation in a mathematical model of the kind provided in this study constitutes an important venue for future work.

Another possible extension would be to develop a comprehensive model of political economy and to apply it to an observed policy reform. One could then receive an indirect measure of the opportunity costs of agenda setting for that specific case. It would be potentially worthwhile to compare such estimates with other studies or to use them as inputs for other political–economy models.

Extending the political part of the model in either way and extending the economic part of the model by introducing various input and output markets would be expected to yield new insights into the relationships between the causes of (agricultural) policies (derived from the political part of the model) and the consequences of (agricultural) policies (derived from the economic part of the model).

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