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Abstract: Modern democracies use regulatory structures to control many types of behaviour. In the theoretical literature these regulatory structures, which could be income tax codes, sets of tariffs or traffic laws, are presented as systems of rules that are constant over time. However in practice regulatory structures are often observed to change over time. A model is developed to explain why we might observe regulatory structures cycling between periods of increasing complexity and episodes of reform. The model is used to identify the features of stable versus cyclical regulatory structures.
Regulatory cycles: Or why does the tax code get bigger every year?

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July 2006

Abstract: Modern democracies use regulatory structures to control many types of behaviour. In the theoretical literature these regulatory structures, which could be income tax codes, sets of tariffs or traffic laws, are presented as systems of rules that are constant over time. However in practice regulatory structures are often observed to change over time. A model is developed to explain why we might observe regulatory structures cycling between periods of increasing complexity and episodes of reform. The model is used to identify the features of stable versus cyclical regulatory structures.

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Introduction

In their 1978 series “Foreign Trade Regimes and Economic Development” Bhagwati and Krueger (1978), drawing on examples of changing tariff structures in developing countries, identified in a simple narrative several phases that regulatory structures go through. Over time the complexity of a regulatory structure changed as the regulatory structure went through these phases. By an increase in complexity, Bhagwati and Krueger meant an increase in the number of different categories, distinct rules, exemptions or processes contained within the regulations.

The phases were described as:

Phase I- initial implementation of a simple set of rules;

Phase II- the regulatory structure becomes increasingly complex as changes are made incrementally; and

Phase III- a sudden episode of reform in reaction to the complexity of the structure.

At this point Krueger and Bhagwati set out two possible futures- either a return to a simple set of rules and a continuation of rising complexity in a following Phase II or an end to change and a stationary structure in Phase IV (or an abolition of the structure altogether which they labelled Phase V).

Phase IV- liberalisation of the structure- no further changes.

As Krueger and Bhagwati saw it, regulatory structures have two possible sets of structures of time. Structures either alternate between Phase II and Phase III or end at Phase IV or V.
Figure 1: Bhagwati and Krueger phases of regulatory structures

The first type of history is what I call “regulatory cycles”. The second type, either Phase IV/V or Phase I, I will call “stationary” regulatory structures. It is an open question currently why some structures have regulatory cycles while other structures do not.

Data- Stylized Facts

There is some support for the descriptive narrative of the evolution of some regulatory structures as described by Bhagwati and Krueger. There does seem to be a built-in tendency for gradually increasing complexity over time in these structures (Phase II). There are also the episodes of reform (Phase III).

Krueger and Duncan (1993), in an earlier work by one of the authors, set out a short history of the rising complexity of the U.S. income tax code.

- Initially instructions for the 1040 US Income Tax Form consisted of 1/2 a sheet of paper.
- By 1948 these instructions had grown to 10 pages.
- By 1961 they had doubled to 20 pages.
- By 1975 they had doubled again to around 40 pages.
- By 1992 the instructions for the 1040 Form cover 81 pages.

The gradual rise in complexity of the tax code is evidenced by the rising number of pages of instructions. Over the history of the tax code, this slow increase in complexity is a normal feature. Yet there are also rare moments of reform, such as the 1976 and 1986 Tax Reform Acts, which flattened some of the tax scales and removed certain exemptions- reducing the complexity of the regulatory structure. The trend in complexity for the tax code was then a slow trend upwards interrupted by sudden drops.
during periods of reform. The reform periods were again followed by periods of gradually increasing complexity.

Many regulatory structures do not exhibit this cyclical behaviour. Regulations, such as traffic laws or building codes, are relatively stationary. These structures display neither a tendency to increase in complexity over time nor to undergo periodic episodes of reform.

**What does the existing theory explain or not explain?**

There are two features of regulatory structures that stand out from this analysis:

1. Some structures grow more complicated over time, whereas other structures remain the same.
2. Some structures undergo regular episodes of reform, whereas other structures can remain the same for very long periods.

The dominant models of regulatory structures in economics do not have either of these features. The lobby group models grew out of the papers of Stigler (1971), Peltzman (1976) and Posner (1974). Regulations are assumed to be the equilibrium outcome of a competitive process between competing lobby groups. In these papers the decision-makers are the lobby groups, while the government takes only a passive role. The outcome will be a set of taxes and subsidies— the size of which depends on the relative political power of the different groups.

The political contestability approach is an alternative formulation of this problem where the state takes on a maximizing role. This literature is well set out in Hillman (1989). The more recent versions of this framework are based on Grossman and Helpman (1994) where a maximizing state balances off the political gains from the contributions of lobby groups to the political losses from the economic inefficiencies of higher tariffs. Mitra (1999) used the Grossman-Helpman framework, but instead of assuming a fixed number of lobby groups, assumed that there were potential lobby groups that would be formed if the net benefit of this formation was positive. The outcome again will be a set of taxes and subsidies that depend on the relative weighting in the government’s utility of social welfare versus political contributions.

A very different and only partial analysis was used in Krueger and Duncan (1993). The analysis did explain incremental addition of complexity to a regulatory structure by the pressures brought to bear by 3 different groups:

- Regulatees- parties subject to the regulations;
- Regulators- parties who administer the regulations; and
- Intermediaries- parties who interpret the regulation and advise the regulatees.

It is in the interest of all 3 parties to make changes to the regulations that will result in an increase in the complexity of the regulatory structure.
- Regulatees seek to make changes which exempt or lessen the burden of the regulation on themselves by creating more and different categories of goods or behaviours to be regulated.
- Regulators seek to make changes to close loopholes used by regulatees.
- Intermediaries seek to increase the complexity of the regulation so as to make their services more valuable.

To the extent that regulators become future intermediaries, current regulators desire increased complexity since increased complexity will increase the value of their human capital when they become intermediaries. Regulators may also desire increased complexity with more discretion as greater discretion increases the power of the regulators and the possibility and value of corruption of regulators.

There are several weaknesses of the Krueger and Duncan analysis. Firstly it is not placed in an equilibrium setting. Secondly there is no mechanism to explain why these groups would delay increasing complexity. If it is in a lobby group’s interest to increase complexity, why would this not happen immediately? The cross-country case studies in Bhagwati and Krueger showed that regulatory complexity does evolve slowly during Phase II, but we have no current model to explain this fact. The model developed in the next section is an attempt to solve some of the difficulties in the literature.

A model of endogenous complexity

Of the three groups presented in the Krueger and Duncan paper, the weakest group is the intermediaries. The existing literature stresses the roles of the regulatees, or their lobby group representatives, and the regulators, the state. An explanation that turns on the power of a “conspiracy of accountants” is a weak one, so we will follow the Hillman framework and consider only the regulatees and the state as actors.

There are M regulatees in the economy divided across N potential lobby groups. If all the regulatees in a lobby group are identical or the regulatory burden falls at a constant rate across all regulatees, we can ignore the regulatees and treat the lobby groups as the decision-making parties. The decision-making units are assumed to be the lobby groups rather than the individuals within each lobby group.

Initially we assume that the regulatory structure is an income tax or business tax code. The application of this model to tariff structures and to pollution regulations is discussed later. Assume each lobby group has an income $I_i$ for $i$ over 1 to $N$ and that this income is simply the sum of the incomes of all the regulatees in the lobby group. Taxable income is taxed at a constant marginal rate of $\tau$.

Each lobby group is only a potential lobby group. We assume that each lobby group can control the free riding problem among its own members, so that the decision of the lobby group and of its individual members is identical. Each potential lobby group can form at a cost of $c_i$, where $c_i$ will depend on the characteristics of the members of the lobby group. Once a lobby group forms, it organizes the legislators to exempt 50% of
the lobby group’s incomes from taxation. Lobbying then is an example of a “rent- seeking” activity from Krueger (1974) or of a “directly unproductive, profit-seeking activity” (DUP) in Bhagwati’s (1982) terminology.

When a lobby group forms and creates a special exemption for its members, the lobby group increases the complexity of the regulatory structure, as additional regulations will have to be created to handle the new exemption. More complex regulatory structures are therefore ones with more formed lobby groups.

The state or government has a budget constraint which requires the state to raise the amount $B$ in taxes. The state sets the tax rate after the lobby groups have formed. Let $L$ denote the set of lobby groups that have formed. We can express the state’s budget constraint as

$$B = \sum_{i \in L} \tau I_i + \sum_{i \in L} \frac{\tau}{2} I_i$$

The tax rate then depends on the number and size of the lobby groups that have formed.

This model is a simplified version of the Mitra (1999) model but with the addition of a government budget constraint. The budget constraint changes the dynamics considerably. As we will see, the act of forming a lobby group imposes an externality on all other potential lobby groups- directly by raising the average tax rates for all and indirectly by making the formation of other lobby groups more likely.

**The case of identical potential lobby groups**

The following analysis will hold for any number of identical groups, so for simplicity assume there are only two. There are two potential lobby groups with identical incomes $I$ and costs of formation $c$. Each lobby group is assumed to make up 50% of the population. The average tax rate for the economy depends on how many lobby groups are formed:

- no lobby group forms- $\tau = B/2I$
- one lobby group forms- $\tau = 2B/3I$
- two lobby groups form- $\tau = B/I$

If we imagine a game where the strategies of the two groups are to form a lobby group “Lobby” or not form a lobby group “NL”, then we have a pay-off matrix of
Figure 2: Lobby game with 2 identical players

<table>
<thead>
<tr>
<th>Lobby group 2</th>
<th>Lobby</th>
<th>NL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lobby</td>
<td>$I - B/2 - c, I - B/2 - c$</td>
<td>$I - B/3 - c, I - 2/3B$</td>
</tr>
<tr>
<td>NL</td>
<td>$I - 2/3B, I - B/3 - c$</td>
<td>$I - B/2, I - B/2$</td>
</tr>
</tbody>
</table>

Both groups prefer the outcome (NL, NL) to (Lobby, Lobby). However for $c < B/6$, forming a lobby group is the dominant strategy, so (Lobby, Lobby) is the Nash equilibrium. The cost of lobbying activities or the DUP activities could be as large as $B/3$ for society.

This is a standard Prisoner’s Dilemma matrix. Intuitively both groups are better off agreeing to not form lobby groups, however neither group could credibly commit to not forming a lobby group. Both groups are “stuck” in the obviously inferior (Lobby, Lobby) outcome.

If we introduce this game into a setting of repeated interaction with discounting, we have the standard “Folk Theorem” result that a cooperative (NL, NL) solution could arise if the future was not discounted too heavily by the lobby groups. In a repeated setting, both the cooperative (NL, NL) and non-cooperative (Lobby, Lobby) outcomes can be supported depending on the strategies of the lobby groups- see standard texts such as Fudenberg and Tirole (1991).

One interpretation of the Bhagwati and Krueger phases in this setting would be based on changing strategies or changing beliefs about the strategies of the lobby groups. Periods of rising complexity, the Phase II’s, are periods of non-cooperative interaction between the potential lobby groups. The reform episodes, the Phase III’s, are cooperative periods where the lobby groups agree to dissolve themselves and lose their exemptions.

**Where the potential lobby groups differ in lobbying costs**

Instead of identical potential lobby groups, we now allow for lobby group formation costs, $c_i$, to differ across the $N$ potential lobby groups which are otherwise identical. Lobby groups will differ in lobby costs due to existing organization within the groups, the costs of monitoring and communication within the groups and the degree with which individual interests are aligned within groups among other factors. Order the groups so that lobbying costs increase in the index variable $i$. As in the case for identical groups, there can again be multiple equilibria. The number of equilibrium will depend on the distribution of the lobbying costs.

Let $m$ be a particular value of the index variable. At a given tax rate, if it is profitable for lobby group $m$ to form, then it will also be profitable for all lobby groups $i$ for 1 to $m-1$ to form. Likewise if it is not profitable for lobby group $m$ to form, then it will also
not be profitable for any lobby group \( i \) for \( m+1 \) to \( N \) to form. To specify an equilibrium, we only need to specify the index number of the highest cost lobby to form and the tax rate, \( \tau \), that satisfies the government budget constraint for that set of lobby groups.

If \( m \) lobby groups are formed and \( N - m \) are potential lobby groups, the tax rate is

\[
\tau = \frac{B}{(N - \frac{m}{2})I}
\]

If \( m-1 \) lobby groups are already formed, then the \( m \) potential lobby group will form if the gain from a lower taxable income is larger than the loss due to a higher tax rate as well as the cost of forming the lobby group. This is true for lobby group \( m \) if

\[
I - \frac{B}{(N - \frac{(m-1)}{2})} \leq I - \frac{1}{2} \frac{B}{(N - \frac{m}{2})} - c_m
\]

We can use this inequality to define a new function, \( c^*(i) \), which is the highest value for \( c_i \) for which the lobby group \( i \) will form given that \( i-1 \) other lobby groups have already formed.

\[
c^*(i) = \frac{(2N - i - 1)B}{(2N - i)(2N - i + 1)}
\]

where is \( c^*(i) \) is increasing in \( i \) for \( i \) between 1 and \( N \).

An equilibrium in this case is a \( \tau \) and an \( m \) so that for all lobby groups \( i \) in \( L = \{1 \ldots m\} \):

\[c_i \leq c^*(m) \text{ for } i \in L\]

(and lobbying costs exceed \( c^*(m) \) for all lobby groups not in \( L \)) and

\[
B = \sum_{i \in L} \tau I + \sum_{i \in L} \frac{\tau I}{2}
\]

For a given budget constraint \( B \) and a distribution of lobbying costs, the equilibria can be derived by comparing lobbying costs to the maximum lobby formation cost, \( c^*(i) \). This is illustrated graphically in Figure 3. In this example potential equilibria involve 2, 6 or 11 lobby groups forming.
As in the previous case, there can be gains from cooperation. Lobbying is a pure rent-seeking activity—simply redistributing resources at a positive cost to society. A sufficiently large coalition of lobby groups could agree to disband their lobbies and shift the regulatory structure from one equilibrium outcome, say 11 lobby groups, to another equilibrium outcome, say 6 lobby groups. It is not in the interest of any one lobby group to individually disband, but the externalities created by a sufficiently large coalition of lobby groups could create sufficient gains from cooperation.

It could be these episodes of cooperation that we observe in Phase III’s. Only a large coalition of lobby groups can generate a sufficiently large drop in the average tax rate to warrant the individual lobby groups giving up their income exemptions. The difficulty of organizing large coalitions of lobby groups might explain why Phase III’s are observed to be rare events.

Over time governments in developed and developing countries have generally been increasing the share of national income that is taken in income taxes. In this model we would represent this by an increase in the state budget constraint, \( B \), relative to the lobby groups’ income, \( I \). An increase in \( B \) will shift up the \( c^*(i) \) function. Examining Figure 3, there are three possible outcomes to a small shift in \( c^*(i) \).

1. An equilibrium might remain an equilibrium. In this case, we simply have a small increase in \( \tau \) with no response by the lobby groups.

2. The equilibrium might shift up by one lobby group. A higher tax rate has encouraged one more potential lobby group to form. A shift could induce the 7th lobby group to form if 6 were already formed in Figure 3.
3. The equilibrium might disappear and lead to a large increase in the number of lobby groups. A higher tax rate will encourage new lobby group to form, but the externalities from the formation of the new lobby groups magnifies this effect. A shift could lead to a jump from an equilibrium with 2 lobby groups formed to one with 6 lobby groups formed in Figure 3.

In an economy where the budgetary demands of the national government are rising over time, we would observe a shifting up of the number of lobby groups formed over time. This process would appear like the Phase II of the regulatory cycles that Bhagwati and Krueger observed.

A rising budget constraint in a lobby group model can replicate the dynamics that were reported about the U.S. income tax code over time. Slowly rising budget demands result in an increase in complexity of the code over time as more lobby groups form. When coalitions of lobby groups can form, we can observe dramatic reductions in complexity, such as the reforms of 1976 and 1986.

However as the \( B \) and \( c^*(i) \) is rising over time, the minimum number of lobby groups, which occurs at the lowest potential equilibrium in Figure 3 (or the minimum complexity of the code) is rising over time. In this case we would observe a regulatory cycle around a slow upward trend in complexity over time, with rising levels of political lobbying, greater use of intermediaries and rising costs of compliance for regulatees.

The driving force in the dynamics is the rising budget constraint over time. While the application here has been one of an income or company tax code, changing government budget constraints can occur in other applications, such as in tariff schemes or in pollution control regulations. Rising tariff revenue needs of a government lead to the same budget process for a tariff scheme. Lower total pollution emissions of a government lead to the same budget process for pollution control. Lobby groups for industries lobby for industry exemptions under income tax codes just as the lobby groups do under tariffs and pollution regulations. We would expect to see regulatory cycles in tariff schemes, as Bhagwati and Krueger did, and in pollution control regulations.

Statements about comparative statics are difficult to make given that we have placed little structure on the distribution of the lobbying costs. Making some strong assumptions about the distribution of the \( c_i \)'s in Figure 3 would enable us to derive some comparative statics results but at the cost of further loss of generality. Without a structure to the lobbying costs, we are left with the possibility of multiple equilibria and the result that small changes in parameters can lead to abrupt changes in the equilibria.

We can make statements about the lowest equilibrium- the equilibrium with the fewest number of lobby groups. There is not sufficient room to provide proofs for these statements. In the lowest equilibrium:
• The number of lobbies formed (and the complexity of a tax code) is positively related to the amount of revenue that needs to be raised and is negatively related to the costs of lobbying.
• The tax rate is positively related to the amount of revenue to be raised and the number of lobby groups formed.

What policy proscriptions can be drawn? Since lobbying is a rent-seeking activity, an increase in the number of lobby groups formed is a loss to social welfare. We can rank the equilibria according to social welfare, as social welfare is declining in the number of lobby groups formed. Higher government revenue requirements and lower lobbying costs lead to a fall in social welfare. Reform episodes in which complexity is reduced and lobby groups disbanded improve social welfare. Measures that improve communication and coordination between lobby groups may then improve social welfare.

Conclusions

The current economic literature in regulation develops equilibrium for regulatory structures which are constant over time. However, the observed dynamics of some regulatory structures such as tax codes are not static, but rather go through stages of slow increases in complexity and sudden bursts of reform, as evidenced by Bhagwati and Krueger and in Krueger and Duncan (1993).

The introduction of a rising government budget constraint in a lobby group model allowed us to replicate these observed dynamics. This simple model suggests that further research on endogenous regulatory structures should include budget constraints where these are empirically relevant.
Bibliography


