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Essays on Political Economy

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INTRODUCTION

"**Essays on Political Economy**" explores the connections between politics and economics in several different contexts. By politics, or more precisely the political game, I mean the social procedures through which collective decisions are made. By economics I mean the economic game once collective decisions have already been selected. Of particular interest are the preferences about collective decisions among agents induced by the economic game. Some of the political institutions for selecting public policies can be easily changed and, hence, should be treated themselves as endogenous collective decisions. Others are very robust. I will refer to the later group as the political structure of society. Similarly, parts of the rules of the economic game do not significantly depend on collective decisions. I will denote them, the economic structure of society. The underlying premise of the thesis is simple. Collective decisions are endogenous outcomes that depend on the form and intensity of social conflict. In turn, the economic and political structure of society shapes the form and intensity of social conflict. The main objective is to improve the understanding of the deep economic and political determinants of collective decisions.

In political economy more than in any other field, it is arbitrary to draw a line between endogenous and exogenous variables. In an effort to minimize this issue, the essays of this thesis rely on formal game theoretic models. Thus, the distinction between endogenous and exogenous variables in each model is always clear and simple to detect. The equilibrium of the model connects the endogenous collective decisions with the exogenous economic and political structure. Sometimes I also go beyond the positive equilibrium-comparative statics analysis and I perform a normative cost-benefit analysis with respect to the exogenous political structure. For such cases, the political structure is interpreted as a long run norm such as a constitution, and the implicit assumption is that the norm is selected to maximize some welfare criteria.

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This thesis is integrated by five essays divided in three sections, each covering a different topic. **Section I** titled "**Economic Structure, Political Power and Institutions**", investigates how the economic and political structure of society (e.g., factor endowments and political competition) shapes its institutions and public policies (e.g., the political regime and trade policy). The mechanism explored is the following. The economic and political structure determines the type and intensity of social conflict; social conflict shapes economic and political institutions; finally, political institutions determine public policies. The section is integrated by two chapters that illustrate this approach.

Chapter 1 titled "**Factor Endowments, Democracy and Trade Policy Divergence**" studies the economic and political determinants of trade policy employing a probabilistic model of electoral competition. The most relevant result of the model is that in natural resource abundant economies specialized in natural-resource intensive exports, or in industrial economies that export manufactures, trade policy is likely to be stable and close to free trade; while in natural resource abundant economies with an important domestic industry that competes with imports, trade policy is likely to be more protectionist and unstable.

There are several novel features in this essay. First, it is important to stress that the essay does not try to address why some industries receive more protection than others within a given country, an issue that has been extensively studied. On the contrary, the focus is on explaining why trade policy is on average more protectionist and/or unstable in some countries, two critical issues for economic development that have received almost no attention in the literature on the political economy of trade policy.

Second, the model generates novel and interesting testable hypothesis about the relationship between factor endowments, the terms of trade and the average level and volatility of trade policy. Indeed, the model provides an explanation for historical changes in trade

policy. For example, it explains why during the nineteenth century U.S. trade policy was on average relatively protectionist and unstable but the country moved toward free trade during the twentieth century.

Third, the chapter makes a double methodological contribution. On the one hand, it brings a new theoretical tool to the analysis of the political economy of trade policy (stochastic electoral models with candidate valences). On the other hand, it shows the importance of combining a political model with a structural model of the economy. Indeed, in this model political competition opens the door to divergence and volatility in public policies, but the structure of the economy determines how likely it is that equilibrium policies change over time.

Chapter 2 titled "**Autocracy, Democracy and Trade Policy**" studies the connections between political transitions and changes in trade policy employing a politico-economic model in which the political regime, trade policy and a redistribution scheme based on income taxation are endogenous outcomes. In the model there are three socioeconomic groups: two elite groups (e.g., industrialists and landlords) and one non-elite group (e.g., workers). The critical point is that income taxation induces a rich-poor/elite-workers political cleavage, while trade policy may induce intra-elite conflict. The most relevant results of the model are the following. First, in the absence of intra-elite conflict, political transitions are associated with changes in trade policy. Specifically, coups (democratizations) tend to open up the economy if and only if both elite groups are pro-free trade (protectionist). Second, in the presence of intra-elite conflict, autocracies could avoid democratization engineering a credible change in trade policy (a reallocation of political power toward the elite group with the same trade policy preference as the workers). Third, in the presence of intra-elite conflict, the non-elite group might not be willing to defend democracy and coups tend to maintain trade policy.

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In the literature about political transitions trade policy is usually taken as an exogenous variable. In the literature on the political economy of trade policy the political regime is usually taken as an exogenous variable. This essay contributes to both literatures making the political regime and trade policy endogenous. On the substantive front, the model generates novel testable predictions on: (i) under what circumstances political transitions should be associated with changes in trade policy; and (ii) when there should be changes in trade policy without a political transition. The model provides an explanation for important historical cases. For example, it explains why there was a critical change in trade policy in the nineteenth century in the U.K. (the repeal of Corn Laws) before democratization, while the posterior democratization process did not bring any substantial change in trade policy. It explains why coups in Latin-America did not change the inward import substitution policies until popular demands became very radicals in the 1970s.

On the theoretical front, the essay shows the importance of intra-elite conflict (in general, any policy dimension that potentially divides the elite) for political transitions. Indeed, it is due to intra-elite conflict, that autocracies could placate a popular uprising with a reallocation of political power inside the regime. Analogously, it is also due to intra-elite conflict that the non-elite group could prefer a coup controlled by one elite group rather than a democracy that is forced to make substantial concessions to the other elite group.

Section II titled "**The Political Economy of the Media Industry**" investigates mass media institutions. In one sense the media that a society has is the outcome of a political game. However, it also possible to study how a society should organize and regulate its media industry given these political constraints. The essay in this section explores the positive as well as the normative side of media institutions, with a focus on the later.

Chapter 3 titled "**Optimal Regulation of the Media Industry**" presents a simple

politico-economic model of the media industry in which more competition makes media capture more difficult. Then, a constitutional stage is considered and the optimal regulation of the industry is deduced. The essay shows that the normative conclusions we obtain when we disregard the political process dramatically differ from the ones we obtain when we take into account political restrictions. Even if the media operates under increasing returns to scale, a media monopoly is not justified. As media productivity is above some threshold, the optimal regulation is either to encourage entry with subsidies or to impose just a moderate entry limitation. It is worthwhile to pay the extra costs associated with several media companies obtaining and reporting the same news because competition avoids media capture and the corresponding dissipation of resources in the political system.

Another interesting contribution of this essay is to combine in a single model the two most relevant sources of media capture. Some models of media capture emphasize the role of politicians and assume a population with homogenous preferences, while other models emphasize the role of special interests groups with a privilege access to the media and assume a population with heterogeneous preferences. An extension of the baseline model in chapter 3 combines both sources. Moreover, the normative analysis of this extended model brings novel results. Special interests groups have an ambiguous effect on aggregate welfare. They push the media to misinform about particular policies that affect their interests but at the same time they make media capture by the politicians more difficult. Thus, introducing restrictions to the involvement of some groups in the media industry (for example restrictions to the formation of conglomerates) could be a good idea for a society that has other ways to control the dissipation of resources in the political system but it will be a very bad idea for a society that relies on the media to check politicians.

Section III titled "**Commitment and Political Institutions**" investigates how commitment devices can help support better social outcomes. An important idea developed

in this section is that political institutions that implement commitment devices are not exogenous but rather endogenous outcomes of the political process. Another crucial idea is that sometimes a reallocation of political power is required before society takes advantage of commitment opportunities. The section is integrated by two chapters. Chapter 4 focuses on the credibility of fiscal rules in the context of political budget cycles. Chapter 5 explores how commitment problems undermine the validity of the Political Coase Theorem.

Chapter 4 titled "**Making Rules Credible: Divided Government and Political Budget Cycles**" develops a politico-economic model in order to study the institutional arrangements behind political budget cycles (PBCs). In particular, since borrowing is a necessary condition for aggregate PBCs, the essay explores the role of fiscal rules that limit public debt. The main result of the model is that divided government can make fiscal rules credible, while commitment is undermined by either unified government or imperfect compliance with the budget law. However, if divided government affects efficiency, voters must trade off electoral distortions and government competence.

Standard models of PBCs implicitly or explicitly assume that the executive has full discretion over fiscal policy. However, in most of the countries the budget is the outcome of a bargaining that involves the executive power as well as the parliament. In standard models, aggregate PBCs can be completely eradicated with a simple ex-ante fiscal rule that limit public debt. However, an ex-ante fiscal rule is not credible because the executive always has an incentive to deviate from it in an electoral period. The essay contributes to the theoretical literature on aggregate PBCs introducing in the model a legislative branch and a fiscal rule that limit public debt. The model also helps explain why PBCs are stronger in developing countries and in new democracies, usually characterized by weak legislative checks and balances, unified government, and imperfect compliance with the budget law.

From the narrow perspective of the PBCs literature, the essay has very interesting

conclusions. Legislative checks and balances are probably the best way to moderate PBCs. But, in order to be effective, the executive must be forced to comply with the budget law and voters must select divided government. Complain with the budget law could be improved through institutional innovations, such as the U.S. Congress Budget Office, that increase the ability of the parliament to control the execution of the budget. Divided government; however, is an endogenous outcome of the political process. Indeed, the model shows that voters could prefer a unified government because the efficiency costs of a divided government are larger than the cost of PBCs. Thus, the normative message of the essay is: do not blindly try to eliminate PBCs, empower the parliament and/or limit the discretional powers of the executive and voters will have the chance to decide if it is worthy to eliminate PBCs.

The essay also has consequences beyond PBCs. First, it is critical to consider the institutional arrangements that make any rule credible. Second, it is possible that the institutional arrangements that work as commitment devices are not exogenous but rather endogenous outcomes of the political process. Third, the crucial issue is that commitment devices are available, which changes the focus from the rule itself to the political process that allows empowering the agents that can enforce the rule.

Chapter 5 titled "**The Political Coase Theorem: Experimental Evidence**" tests whether commitment problems undermine the validity of the Political Coase Theorem (PCT) using data from a laboratory experiment. The results support the key theoretical prediction that social outcomes should improve as commitment opportunities expand. Furthermore, a significant proportion of subjects understood that sometimes a reallocation of political power was required in order to take advantage of those opportunities. However, at low levels of commitment there is more cooperation than strictly predicted by the model while the opposite is true at high levels of commitment, and only large improvements

in commitment opportunities have a significant effect on the social surplus, while small changes do not.

The findings in chapter 5 confirm that commitment problems are one of the key transaction costs in political transactions and, hence, one of the major barriers to efficient political institutions. Since only large improvements in commitment opportunities have a significant effect on the social surplus, the essay also suggests a reconsideration of the old debate between gradual versus radical reforms.

SECTION I

FACTOR ENDOWMENTS, POLITICAL POWER AND INSTITUTIONS

Chapter 1: Factor Endowments, Democracy and Trade Policy Divergence[1]

Abstract

This essay develops a stochastic model of electoral competition in order to study the economic and political determinants of trade policy. Ideal policies of the different socioeconomic groups in society (landlords, industrialists, labor and skilled workers) are explicitly derived from a small open economy model. Then those ideal policies (trade policy and local public goods) are used to model the individual probabilistic voting behavior of the members of each of these socioeconomic groups. The model sheds light on how differences in the comparative advantages of countries explain trade policy divergence between countries as well as trade policy instability within countries. Specifically, in natural resource (land) abundant economies with very little capital, or in economies that specialize in the production of manufactures, parties tend to converge to the same policy platform, and trade policy is likely to be stable and relatively close to free trade. In contrast, in a natural resource abundant economy with an important domestic industry that competes with imports, parties tend to diverge, and trade policy is likely to be more protectionist and unstable.

1.1 Introduction

Many developing countries adopted trade protectionist measures during the second part of the twentieth century. Most of these countries, if not all of them, did not have a comparative advantage in the manufacturing sector and they did not industrialize in

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[1]This essay is a joint work with Sebastian Galiani and Norman Schofield. A version of the essay is accepted for publication in the Journal of Public Economic Theory.

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a sustainable way as a result. Instead, they had a comparative advantage within the primary sector. In contrast, countries with comparative advantage in the manufacturing sector tended to remain much more open to trade. Additionally, the countries that adopted import substitution policies tended to show substantial volatility over time in their trade policies. In this paper we develop a stochastic model of electoral competition to study the economic and political determinants of trade policy. Our goal is to provide an explanation of the variability of trade policy both across countries and within a country over time, rather than across industrial sectors.

Many models of political choice emphasize political convergence to an electoral mean or median. Although extremely useful to study important questions in the field of political economy, such models appear to be of limited use in explaining the oscillations that can occur as a result of divergent political choices by parties. Schofield (2007) suggests, however, that political parties will not converge if there is sufficient difference in the *valences* of political leaders, where the valence of a candidate captures all the characteristics of the candidate and the party that affect voting decisions and are not related with policy platforms. Furthermore, in this version of the stochastic model, there is convergence or divergence depending on pure political factors, such as the difference in the valances of the candidates, as well as on the distribution of voters policy preferences, which ultimately depends on structural characteristics of the economy.

We model a small open economy with two tradable goods, each of which is produced using a sector specific factor (land and capital) and a third factor (e.g., labor) which is mobile between these tradable sectors. There is also one non-tradable good, which is produced using a specific factor (skilled labor). The political model has an elected government with the mandate to fix an ad valorem import tax rate. The tax revenue is used to provide two local public goods. One public good is targeted at the specific

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factors of production while the other is targeted at the mobile factor of production. We use this general equilibrium model to derive the ideal policies of the different socioeconomic groups in society (landlords, industrialists, workers and service workers). We then use those derived ideal policies to model the individual probabilistic voting behavior of the members of each of these socioeconomic groups. The combined model is thus based on micro-political economy foundations of citizens preferences. We believe this paper is the first to employ this methodology in order to study how differences in the factor endowments of countries explain trade policy divergence between countries as well as trade policy instability within countries.

Just as in Grossman and Helpman (1994, 1996) we consider two interconnected sources of political influence: electoral competition and interest groups. In their study of the political economy of protection Grossman and Helpman proposed a model of protection in which economic interests organize along sectoral lines, so that interest groups form to represent industries. Their model predicts a cross-sectional structure of protection, depending on political and economic characteristics, and provides an excellent model of within country cross-section variability of trade policy. In contrast, we focus on the variability of trade policy both across countries and within a country over time, rather than across sectors.

Our work is related to the analysis of Rogowski (1987, 1989) on the effects of international trade on political alignments (see also Baldwin, 1989). Rogowski (1987) elaborates a lucid explanation of political cleavages, as well as changes in those cleavages over time as a consequence of exogenous shocks in the risk and cost of foreign trade. Rogowski (1987) classifies economies according to their factor endowments of capital, land and labor, and uses his classification to deduce two main types of political cleavages: a class cleavage and a urban-rural cleavage. The model that we present includes non-tradable goods and this allows for a richer characterization of political alignments. In particular, in natural resource

(land) abundant economies, without the inclusion of non-tradable goods, landlords favor free trade, and industrialists and workers are protectionist, inducing a urban-rural cleavage. However, once non-tradable goods are introduced in the model, distributive conflict among urban groups will also be present. Industrialists and unskilled workers may favor protectionist policies while skilled workers favor free trade policies (see Galiani, Heymann, and Magud, 2009). Furthermore, we show that the presence of a distributive conflict between urban groups can have interesting political effects in the determination of trade policy.

Employing our international trade model we construct a taxonomy to classify different economies given their economic structures:

1. *Specialized natural resource-rich economies.* This set comprises countries that are highly abundant in the factor specific to the less labor-intensive tradable industry (land). They specialize in the production of primary goods.

2. *Diversified natural resource-rich economies.* They comprise countries that are moderately abundant in the factor specific to the less labor intensive tradable industry (land), but they display an important activity in the production of the two tradable goods.

3. *Industrial economies.* They comprise countries relatively scarcely endowed with natural resources that are either relatively abundant in the factor specific to the more labor-intensive tradeable industry (capital) or are highly endowed with the mobile factor of production (labor).

We show that in a specialized natural resource abundant economy, or in an industrial economy, political parties tend to converge to the same policy platform and, hence, trade policy is likely to be stable and relatively close to free trade. In contrast, in a natural resource abundant economy with an important domestic industry which competes with

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imports, parties tend to diverge and, hence, trade policy is likely to be more protectionist and unstable.[2] The intuition behind this result is that in a diversified natural resource-rich economy the underlying trade policy constituencies are more balanced and therefore it is more likely that the party with the lowest valence will find optimal to leave the electoral center and propose a platform that targets some specific socioeconomic groups rather than stay at the center and obtain a vote share proportional to the difference in electoral valences.

In summary, we first link the trade policy preferences of each group in society with the country's underlying economic structure. We then show that when there exists a strong political constituency in favor of free trade, a stable liberal trade policy regime emerges. On the other hand, when the underlying trade policy constituencies are more balanced, political parties may diverge in their policy platforms, and the resulting political outcome may be unstable in the sense that very different policy regimes can arise depending on which party wins the election. Finally, we also show that when policy platforms diverge the economic structure influences the pattern of divergence. In particular, in specialized natural resource-rich and industrial economies, parties tend to propose very similar trade policies, but they differ in their budget allocation proposal. Thus, distributional conflict mainly occurs in the budget allocation, which, in our model, does not affect the efficiency of the economy. On the other hand, in diversified natural resource-rich economies parties tend to diverge in both dimensions. Thus, party rotation induces significant changes in the efficiency of the economy since each party implements a different trade policy.

The rest of the paper is organized as follows. Section 1.2 presents our simple general equilibrium model of a small open economy. We find and characterize the competitive

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[2]This is consistent with the empirical evidence in O'Rourke and Taylor (2006) who show that, in the late nineteenth century, democratization led to more liberal trade policies in countries where workers stood to gain from free trade. Using more recent evidence, Mayda and Rodrik (2005) show that individuals in sectors with a revealed comparative disadvantage tend to be more protectionist than individuals in sectors with a revealed comparative advantage. They also show that individuals in non-tradable sectors tend to be the most pro-trade of all workers.

equilibrium of the model, as well as the ideal policies of each group of agents. In section 1.3 we introduce the stochastic spatial electoral model with exogenous valence, and we use it to study the political economy of trade policy. Section 1.3 presents the conditions for convergence to a weighted political mean. In section 1.3.2 we emphasize that political convergence depends both on political parameters, such as heterogeneity of political perceptions, and on economic structure, namely the electoral covariance matrix of economic preferences. In section 1.3.3 we show how the structure of the economy affects policy choices, in particular the equilibrium trade policy. In section 1.4 we extend the model to incorporate interest groups. In section 1.5 we discuss some historical examples drawn from the United States and Argentina. Finally, section 1.6 offers brief concluding remarks.

1.2 The Economy

In this section we develop a static model of a small open economy and characterize the ideal policies of the different groups in society. Consider an augmented Ricardo-Viner specific factor model of an open economy with two tradable goods, labeled X and Y, and a non-tradable good, labeled N. Good X (Y) is produced employing a factor specific to industry X (Y), denoted F_X (F_Y), and labor, denoted L, which can move between tradable industries without friction. Let L_X (L_Y) be the amount of L employed in industry X (Y).[3] Production functions are assumed to be Cobb Douglas with different factor intensities:

$$Q_X = A_X \left(F_X \right)^{\alpha_X} \left(L_X \right)^{1-\alpha_X},$$

$$Q_Y = A_Y \left(F_Y \right)^{\alpha_Y} \left(L_Y \right)^{1-\alpha_Y}.$$

We assume, without lost of generality, that $\alpha_X > \alpha_Y$. The non-tradable good is produced

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[3]It is not difficult to extend the model to any finite number of tradable goods, each produced with a specific factor and factor L. However, the political equilibrium would be more complicated and the fundamental message of our analysis would remain the same.

employing labor specific to industry N, denoted F_N, with the linear production function:

$$Q_N = A_N F_N.$$

Here Q_s $(s = X, Y, N)$ is the total output of good s. The aggregate vector endowment of factors is $\mathbf{e} = \left(\bar{F}_X, \bar{F}_Y, \bar{F}_N, \bar{L} \right)$.

We focus on the functional distribution of income. Therefore, we only consider four socioeconomic groups associated with the resources they control: for example, natural resources, capital, labor and skilled labor. The society we have in mind is one composed by landlords, industrialists (owning sector specific capital), workers (mobile factor between tradable industries) and service workers. We identify the later with skilled workers.[4] A household of type k owns $\frac{\bar{k}}{n_k}$ units of factor k, and zero units of all other factors, where n_k represents the fraction of the population belonging to group k. All individuals have the same utility function, which is Cobb Douglas in private goods and separable in a local public good:

$$u^{i,k}\left(c_X^{i,k}, c_Y^{i,k}, c_N^{i,k}, G_k \right) = \left(c_X^{i,k} \right)^{\beta_X} \left(c_Y^{i,k} \right)^{\beta_Y} \left(c_N^{i,k} \right)^{\beta_N} + H\left(G_k \right).$$

Here $c_s^{i,k}$ is the consumption of the private good $s = X, Y, N$ by individual i of type k $(0 < \beta_s < 1$, with $\beta_X + \beta_Y + \beta_N = 1)$; G_k is the consumption of a local public good by the households of type k, and H is an strictly increasing and strictly concave sub-utility function. These local public goods are just a convenient way of handling transfers in kind to different groups in society.[5] In particular, in the rest of the paper we assume that the

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[4]This is clearly a simplification. The service sector tends to comprise both unskilled workers, such as domestic workers, and highly skilled workers, such as financial sector workers, medical doctors, etc. Thus, for the sake of simplicity, we are abstracting from modeling the unskilled segment of the service sector. Nevertheless, including this sub-sector in the model would not change the qualitative results of our analysis.

[5]This formulation has one methodological advantage over an alternative setup with lump sum transfers.

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government provides two local public goods: one that benefits specific factors, denoted G_F, and the other that benefits the mobile factor, denoted G_L. These are associated, respectively, with the upper and middle-class groups and the low-income group.

In order to avoid distorting the private good markets merely due to the public sector utilization of private goods as its inputs of production we assume that the government also has a Cobb Douglas production function with the same coefficients of the utility function.[6] Even though we do not need this assumption to obtain our results, it simplifies the analysis below.

Finally, we assume that the economy is small in the sense that it cannot affect the international prices of tradable goods $\mathbf{p}^* = (p_X^*, p_Y^*)$. Since the government can tax exports and impose import tariffs, domestic prices may differ from international prices. Let $\mathbf{p} = (p_X, p_Y, p_N)$ be the vector of domestic good prices, $CPI = (p_X)^{\beta_X} (p_Y)^{\beta_Y} (p_N)^{\beta_N}$ the consumer price index and $\mathbf{w} = (w_{F_X}, w_{F_Y}, w_{F_N}, w_L)$ the vector of factor prices, where w_k is the rental rate of factor k. Due to Lerner's theorem export taxes are equivalent to import tariffs. Thus, without lost of generality, we assume that the government only impose import taxes at the rate $\tau \geq 0$.

In the appendix 1.1 we summarize three results that characterize the competitive equilibrium of this open economy. These results suggest the following taxonomy of *economic structures*. Let $\Psi = \dfrac{A_Y (\bar{F}_Y)^{\alpha_Y} (\bar{L})^{(\alpha_X - \alpha_Y)}}{A_X (\bar{F}_X)^{\alpha_X}}$ be the degree of comparative advantage in industry Y:

1. *Specialized natural resource-rich economies*: $\Psi = 0$;

As we shown in lemma 1, with a mild condition in H, each socioeconomic group ideal trade policy is interior.

[6]Formally, the government production function is given by $Q_G = A_G (C_X^g)^{\beta_X} (C_Y^g)^{\beta_Y} (C_N^g)^{\beta_N}$, where C_s^g is the amount of good $s = X, Y, N$ used as inputs by the public sector, and $A_G = \left[(\beta_X)^{\beta_X} (\beta_Y)^{\beta_Y} (\beta_N)^{\beta_N} \right]^{-1}$. This specification does not imply that the presence of the public sector does not change the competitive equilibrium of the economy, neither that it does not affect welfare. It merely implies that the public sector, as it is our desire, only affects the economy through tax collection and the assignment of the local public goods.

2. *Diversified natural resource-rich economies*: $\left(\frac{\alpha_Y}{1-\alpha_Y}\right)^{\alpha_Y}\left(\frac{1-\alpha_X}{\alpha_X}\right)^{\alpha_X}\Omega\left(\frac{p_X^*}{p_Y^*}\right) < \Psi < \Omega\,\frac{p_X^*}{p_Y^*}$;

3. *Industrial economies*: $\Omega\frac{p_X^*}{p_Y^*} < \Psi \leq (1+\bar{\tau}_{aut})\,\Omega\frac{p_X^*}{p_Y^*}$;

where Ω is a constant that depends on α_X, α_Y, β_X and β_Y and $\bar{\tau}_{aut}$ is the import tax tariff that sends the economy to autarky.[7]

Many economies can be accommodated within this taxonomy. Economies highly endowed with natural resources (relative to capital and labor), such as, for example, Argentina before the 1930 crisis, or most OPEC countries, can be regarded as having a type 1 economic structure. However, Argentina, after the War World II, is better classified as having a type 2 economic structure (see Galiani and Somaini, 2010). Actually, several economies well endowed with natural resources and which adopted import substitution policies moved from a type 1 to a type 2 economic structure. Many backward economies, such as those of Africa, can also be seen to have a type 2 economic structure, even though they might not have an important industrial sector. In this case, the agricultural sector acts as the sector intensive in the use of labor (L), while the exporting sector exploits the endowment of a specific natural resource (e.g., diamonds in Bostwana). Finally, type 3 economies consist of two types. First are those that are highly endowed with capital (relative to natural resources and labor) such as all developed countries. Second are those highly endowed with labor (L) that export labor intensive manufactured goods such as it is the case of China today.[8] Note, however, that this taxonomy is a static one. An economy with a given endowment vector **e** could be classified, for example, either under the category 1 or

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[7]Formally, $\Omega = \frac{(\beta_Y)^{\alpha_Y}(1-\alpha_X)^{1-\alpha_X}}{(\beta_X)^{\alpha_X}(1-\alpha_Y)^{1-\alpha_Y}}\left[\beta_Y\left(1-\alpha_Y\right)+\beta_X\left(1-\alpha_X\right)\right]^{\alpha_X-\alpha_Y}$. We also assume that: $\alpha_X \geq \max\left\{\frac{\beta_X(1-2\alpha_Y)}{\beta_X(1-2\alpha_Y)+\beta_Y(1-\alpha_Y)},\frac{(\beta_Y+\beta_N)\alpha_Y}{\beta_Y+\beta_N\alpha_Y}\right\}$. However, this is not a very restrictive assumption, since industry X is relatively intensive in the specific factor F_X.

[8]Note that in the case of developed economies highly abundant in capital, all our results will still hold even if it were the case that the workers in the tradable exporting sector are skilled and can move without friction between this industry and the (skilled) service sector.

2 depending on, among other things, the international relative price of the tradable goods (see Galiani and Somaini, 2010). Additionally, the vector endowment **e** could evolve over time.

The relevance of this taxonomy will become clear as soon as we derive the ideal policies of each socioeconomic group. In order to do so, we now define the policy space and the indirect utility function of each group.

Real government revenue is given by

$$\frac{R(\tau)}{CPI(\tau)} = \frac{\tau p_l^* [C_l(\tau) - Q_l(\tau)]}{CPI(\tau)}, \tag{1}$$

where $Q_l(\tau)$ and $C_l(\tau)$ measure, respectively, the equilibrium production and consumption of the imported good. $\frac{R(\tau)}{CPI(\tau)}$ has the typical inverted U shape with zeros at $\tau = 0$ and $\tau = \tau_{aut}$ and a maximum at $\tau_{\max}$ given by

$$\frac{1 - \tau_{\max}}{\tau_{\max}} = \eta_{(C_l - Q_l), p_l} - \beta_N \eta_{p_N, p_l} - \beta_l, \tag{2}$$

where η indicates elasticity. In equilibrium, government production equals government real revenue. Suppose, however, that a fraction of the public goods vanishes in the process of distributing it, possibly due to corruption or any other form of rent dissipation prevalent in the operation of the public sector. Then,

$$G_L = A(\gamma) \frac{R(\tau)}{CPI(\tau)}, G_F = A(1 - \gamma) \frac{R(\tau)}{CPI(\tau)}, \tag{3}$$

where $\gamma \in [0, 1]$ is the fraction of government revenue allocated to the provision of G_L $(1 - \gamma$ is the fraction allocated to G_F), and $A(.)$ is an strictly increasing and strictly concave function such that: $A(x) \leq x$, $A(0) = 0$, and $A'(1) = 0$.[9]

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[9]The methodological advantage of this formulation is, as we shown in lemma 1, that the ideal budget

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From equations (1) and (3) we see that public decisions are restricted to a two dimensional space: the government must set the import tax rate and the fraction of revenue assigned to the provision of each local public good. Thus, the **policy space** of an economy with endowment vector $\mathbf{e}$ and international prices $\mathbf{p}^*$ is given by

$$Z = \{z = (\tau, \gamma) : 0 \leq \tau \leq \tau_{aut}, 0 \leq \gamma \leq 1\} \subset \Re_+^2. \tag{4}$$

Here τ is the tax rate on imports and γ is the fraction of government revenue allocated to the provision of G_L. Clearly, Z is a convex and compact subset of the semi-positive quadrant $\Re_+^2$.

Since preferences over private and public goods are separable and preferences over bundles of private goods are represented by a Cobb Douglas utility function, the indirect utility function of each individual is given by his real income (using the consumer price index as deflator) plus the utility derived from the consumption of the local public good. Formally, the **indirect utility function of an individual belonging to group** $k = (F_X, F_Y, F_N, L)$ is given by

$$v^k (\tau, \gamma) = \frac{w_k (\tau)}{CPI (\tau)} \frac{\bar{k}}{n_k} + H \left(A (\gamma_k) \frac{R (\tau)}{CPI (\tau)} \right) \tag{5}$$

where $\gamma_L = \gamma$ and $\gamma_k = 1 - \gamma$ for $k = F_X, F_Y, F_N$.

For each group in society, its ideal policy is the point in the policy space Z that maximizes its indirect utility function (5).

Lemma 1.1: Ideal Policies. *Let* $z^k = \left(\tau^k, \gamma^k \right)$ *denote the ideal policy for an individual from group* k. *Then* $\gamma^L = 1$ *and* $\gamma^k = 0$ *for* $k = F_X, F_Y, F_N$. *Moreover, assume that* $\lim_{G \to 0} H' (G) = \infty$ *and* $\max \left\{ \frac{w_{F_X} \bar{F}_X}{n_{F_X}}, \frac{w_{F_Y} \bar{F}_Y}{n_{F_Y}} \right\} \geq \frac{w_{F_N} \bar{F}_N}{n_{F_N}} \geq \frac{w_L \bar{L}}{n_L}$. *Then, for economies*

allocation of each socioeconomic group is interior.

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characterized by structure 1, $\tau^{F_X} < \tau^{F_N} < \tau^L < \tau_{\max}$. For economies characterized by structure 2, $\tau^{F_X} < \tau^{F_N} < \tau_{\max} < \tau^L < \tau^{F_Y}$. For economies characterized by structure 3, $\tau^{F_Y} < \tau^{F_N} < \tau^L < \tau_{\max} < \tau^{F_X}$. **Proof**: see appendix 1.1. ∎

The ideal policy for each socioeconomic group is the key economic input of the political game that we develop in the next section. Note, in particular, how these ideal policies vary with different economic structures. In an specialized natural rich economy (structure 1), there is no protectionist demand, and in an industrial economy (structure 3), the only protectionist group is the one that owns the factor specific to the import competing industry. However, in a diversified natural resource rich economy, there are two protectionist groups, those owning F_Y or L, while the groups owning F_X or F_N lose from protection.

1.3 The Polity

In this section we introduce the stochastic spatial model of electoral competition. We begin with a formal definition of the stochastic spatial model as a game in normal form. We define and discuss an equilibrium concept for this game, and study the conditions under which parties converge to a weighted electoral mean. We then use the model to study the political determination of trade policies using the bliss points derived in lemma 1.1.

1.3.1 The Stochastic Spatial Model with Exogenous Valence

The timing of events is as follows (Person and Tabellini, 2000):

1. Party leaders simultaneously announce their electoral platforms.

2. Each voter receives a private signal about candidates' valence.

3. Elections are held.

4. The elected candidate implements the announced platform.

Let $P = \{1, ..., p\}$ be the set of all political parties. Each party $j \in P$ selects a platform $z_j = (\tau_j, \gamma_j)$ from the policy space Z. We let $\mathbf{Z} = \times_{j \in P} Z$. A profile of party platforms is denoted $\mathbf{z} \in \mathbf{Z}$. When necessary we use the notation $\mathbf{z}_{-j}$ to represent the profile of platforms of all parties except party j. The preferences of party $j \in P$ is given by its expected vote share function $S_j : \mathbf{Z} \rightarrow [0, 1]$:

$$S_j(\mathbf{z}) = \sum_{k \in V} n_k \rho_j^k(\mathbf{z}). \tag{6}$$

Here $\rho_j^k(z)$ is the probability that a voter in group k votes for party j, while $V = \{F_X, F_Y, F_N, L\}$ is the set of all groups of voters, and n_k is the proportion of the population in group k.

The utility associated with a given voter in group k when party j implements platform z_j is given by

$$\begin{aligned}
v^k(z_j) &= v_{pol}^k(z_j) + \lambda_j + \varepsilon_j^k \\
&= -\phi_\tau^k \left(\tau_j - \tau^k \right)^2 - \phi_\gamma^k \left(\gamma_j - \gamma^k \right)^2 + \lambda_j + \varepsilon_j^k, \tag{7}
\end{aligned}$$

where (a) $z^k = \left(\tau^k, \gamma^k \right) \in Z$ is the ideal policy for the voters in group k; (b) $\phi_\tau^k > 0$ ($\phi_\gamma^k > 0$) measures the importance that voters in group k assign to the import tax rate (the local public good); and (c) $\lambda_j + \varepsilon_j^k$ is the private signal received by a voter in group k about party $j's$ valence. We shall assume that the expected value of this signal is λ_j, and is common to all groups, and the error vector $\varepsilon^k = (\varepsilon_1^k, .., \varepsilon_p^k)$ has a cumulative stochastic distribution denoted F^k. We assume that F^k is the Type 1 extreme value distribution, which is the same for all k.

Given a profile of platforms $\mathbf{z} \in \mathbf{Z}$, let $v^k(\mathbf{z}) = \left(v^k(z_1), ..., v^k(z_p) \right)$. Candidates do not

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know the private signal received by each individual voter, but the probability distribution of these signals in each group of the electorate is common knowledge. Let F^k be the cumulative distribution function of $\left(\varepsilon_1^k, ..., \varepsilon_p^k\right)$. Then the probability that a voter in group k selects party j is given by

$$\rho_j^k\left(\mathbf{z}\right) = \Pr\left[v^k\left(z_j\right) > v^k\left(z_l\right) \text{ for all } l \neq j\right].\qquad(8)$$

Finally, we order parties according to their expected valence: $\lambda_p \geq ... \geq \lambda_1$.

Definition 1.1: *The stochastic spatial model with exogenous valence is the game in normal form $\Gamma_{exo} = \langle P, \mathbf{Z}, \mathbf{S}\rangle$, where:*

1. **Players**: $P = \{1, ..., p\}$ is the set of political parties.

2. **Set of strategies**: Z is the policy space defined in section 2 and $\mathbf{Z} = \times_{j \in P} Z$ is the space of all strategy profiles.

3. **Utility functions**: $S_j : \mathbf{Z} \to [0, 1]$ is the expected vote share function of party $j \in P$ deduced from (7) and (8) and $\mathbf{S} = \times_{j \in P} S_j$.

We solve this game by finding its local Nash equilibrium.

Definition 1.2: *A strict (weak) local Nash equilibrium of the stochastic spatial model $\Gamma_{exo} = \langle P, \mathbf{Z}, \mathbf{S}\rangle$ is a vector of party positions z^* such that for each party $j \in P$, there exists an ϵ-neighborhood $B_\epsilon(z_j^*) \subset Z$ of z_j^* such that*

$$S_j\left(z_j^*, \mathbf{z}_{-j}^*\right) > (\geq)\ S_j\left(z_j', \mathbf{z}_{-j}^*\right) \text{ for all } z_j' \in B_\epsilon(z_j^*) - \left\{z_j^*\right\}.$$

Remark 1.1: A local Nash equilibrium is a pure strategy Nash equilibrium (PNE) if we can substitute Z for $B_\epsilon(z_j^*)$ in the above definition.

Remark 1.2: It is usual in general equilibrium theory to use first order conditions, based on calculus techniques, to determine the nature of the critical equilibrium. Because production sets and consumer preferred sets are usually assumed to be convex, the Brower's fixed point theorem can then be used to assert that the critical equilibrium is a Walrasian equilibrium. However, in political models, the critical equilibrium may be characterized by positive eigenvalues for the Hessian of one of the political parties. As a consequence the utility function (expected vote share function) of such a party fails pseudo-concavity. Therefore, none of the usual fixed point arguments can be used to assert existence of a "global" pure strategy Nash equilibrium (PNE). For this reason we use the concept of a "critical Nash equilibrium" (CNE), namely a vector of strategies which satisfies the first order condition for a local maximum of the utility functions of the parties. Standard arguments based on the index, together with transversality arguments can be used to show that a CNE will exist and that, generically, it will be isolated.[10] A "Local Nash Equilibrium" (LNE) satisfies the first order condition, together with the second order condition that the Hessians of all parties are negative (semi-) definite at the CNE. Clearly, the set of LNE will contain the PNE, so once the LNE are determined, then simulation can be used to determine if one of them is a PNE.

Let $(\phi_\tau, \phi_\gamma) = \sum_{k \in V} n_k \left(\phi_\tau^k, \phi_\gamma^k\right)$ be the average importance that voters give to the tax rate and the local public goods, respectively. Then, define the *weighted mean of the*

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[10]As we show below, the weighted electoral mean is a CNE. A more general proof of existence of CNE can also be obtained using the Fan (1961) theorem, as in Schofield (1984).

electoral ideal policies, or *weighted electoral mean* $z_m = (\tau_m, \gamma_m)$ by

$$(\tau_m, \gamma_m) = \sum\nolimits_{k \in V} n_k \left(\frac{\phi_\tau^k}{\phi_\tau} \tau^k, \frac{\phi_\gamma^k}{\phi_\gamma} \gamma^k \right). \tag{9}$$

Note that z_m is just a weighted average of the ideal policies of each group, where the weights take into account the fraction of voters in each group (n_k) and the importance that each group gives to each policy dimension relative to the average importance in the population $(\phi_\tau^k/\phi_\tau$ and $\phi_\gamma^k/\phi_\gamma)$.[11] We call $\mathbf{z}_m = \times_{j \in P} z_m \in \mathbf{Z}$ the *joint weighted electoral mean* of the stochastic spatial model.

Under the assumption of a *Type 1 extreme value distribution*, the probability that a voter in group k votes for party j at a profile $\mathbf{z} \in \mathbf{Z}$ can be shown to be:

$$\rho_j^k(\mathbf{z}) = \left[1 + \sum\nolimits_{l \neq j} \exp\left(v_{pol.}^k(z_l) - v_{pol.}^k(z_j) + \lambda_l - \lambda_j \right) \right]^{-1}.$$

The objective of party j is to maximize its expected vote share $S_j(\mathbf{z}) = \sum\nolimits_{k \in V} n_k \rho_j^k(\mathbf{z})$. Since $S_j(\mathbf{z})$ is continuously differentiable we can use calculus to solve this problem. The first order necessary condition for the maximization of $S_j(\mathbf{z})$ is given by:

$$\mathbf{D}S_j(\mathbf{z}) = -2\sum\nolimits_{k \in V} n_k \rho_j^k(\mathbf{z}) \left(1 - \rho_j^k(\mathbf{z}) \right) \begin{pmatrix} \phi_\tau^k \left(\tau_j - \tau^k \right) \\ \phi_\gamma^k \left(\gamma_j - \gamma^k \right) \end{pmatrix} = \mathbf{0}, \tag{10}$$

If all candidates adopt the same policy position, so $\mathbf{z}_0 = \times_{j \in P} z_0$, say, then $\rho_j^k(\mathbf{z}_0)$ is independent of k and may be written $\rho_j(\mathbf{z}_0)$. Assuming that $\rho_j(\mathbf{z}_0) \neq 0$, the first order condition becomes $(\tau_j, \gamma_j) = (\tau_m, \gamma_m)$ for all j. Therefore, if each party proposes $z_m = (\tau_m, \gamma_m)$, the first order condition of all parties is satisfied. We say that the *joint weighted*

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[11]If for all groups $\phi_\tau^k = \phi_\tau$ and $\phi_\gamma^k = \phi_\gamma$, then $z_m = (\tau_m, \gamma_m) = \sum\nolimits_k n_k \left(\tau^k, \gamma^k \right)$ is a weighted average of the ideal points of each group of voters, where the weights are the sizes of the groups.

electoral mean $\mathbf{z}_m$ satisfies the first order condition of a LNE.

The second order sufficient (necessary) condition for an equilibrium at $\mathbf{z}$ is that the matrix $\mathbf{D}^2 S_j(\mathbf{z})$ evaluated at $\mathbf{z}$ be negative definite (semi-definite). Earlier results in Schofield (2007) can be generalized to show that

$$\mathbf{D}^2 S_j(\mathbf{z}) = 2\sum_{k \in V} n_k \rho_j^k(\mathbf{z}) \left(1 - \rho_j^k(\mathbf{z})\right) \left[2\left(1 - 2\rho_j^k(\mathbf{z})\right) \mathbf{W}^k \mathbf{B}_{z_j}^k \mathbf{W}^k - \mathbf{W}^k\right], \quad (11)$$

where

$$\mathbf{W}^k = \begin{bmatrix} \phi_\tau^k & 0 \\ 0 & \phi_\gamma^k \end{bmatrix}, \quad \mathbf{B}_{z_j}^k = \begin{bmatrix} (\tau_j - \tau^k)^2 & (\tau_j - \tau^k)(\gamma_j - \gamma^k) \\ (\tau_j - \tau^k)(\gamma_j - \gamma^k) & (\gamma_j - \gamma^k)^2 \end{bmatrix}.$$

Definition 1.3: *Considering the model* $\Gamma_{exo} = \langle P, \mathbf{Z}, \mathbf{S} \rangle$ *when* F^k *is the Type 1 extreme value distribution for all* k, *we define:*

1. *The probability* $\rho_j(\mathbf{z}_m)$ *that a voter in group* k *votes for party* j *at the profile* z_m *is* $\rho_j(\mathbf{z}_m) = \left[1 + \sum_{l \neq j} \exp(\lambda_l - \lambda_j)\right]^{-1}$ *(Note that* $\rho_j(\mathbf{z}_m)$ *only depends on the valence terms, and not on the party platforms.)*

2. *The coefficient* A_j *of party* j *is* $A_j = 2(1 - 2\rho_j(\mathbf{z}_m))$.

3. *The matrix* $\sum_{k \in V} n_k \left(\mathbf{W}^k \mathbf{B}_{z_m}^k \mathbf{W}^k\right)$ *is termed the weighted electoral variance-covariance matrix about the joint electoral mean,* z_m.

4. *The characteristic matrix of party* j *at* z_m *is* $H_j(\mathbf{z}_m) = \sum_{k \in V} n_k \left(A_j \mathbf{W}^k \mathbf{B}_{z_m}^k \mathbf{W}^k - \mathbf{W}^k\right)$.

5. *The matrix* Φ *is 2 by 2 diagonal with elements* ϕ_τ *and* ϕ_γ *in the main diagonal.*

6. *The convergence coefficients of the model are:*

$$c\left(\Gamma_{exo.}\right) = A_1 \sum\nolimits_{k \in V} n_k \text{Tr}\left(\Phi^{-1}\mathbf{W}^k\mathbf{B}^k_{z_m}\mathbf{W}^k\right),$$

$$d\left(\Gamma_{exo.}\right) = \frac{A_1 \sum\nolimits_{k \in V} n_k \text{Tr}\left(\mathbf{W}^k\mathbf{B}^k_{z_m}\mathbf{W}^k\right)}{\text{Tr}\left(\Phi\right)}.$$

Here Tr(M) means the trace of the matrix M.

A result in Schofield (2007) can be generalized to the case here, of multiple groups in the economy, to show that the Hessian, $\mathbf{D}^2 S_j\left(\mathbf{z}_m\right)$ of party j at $\mathbf{z}_m$ can be expressed in terms of the characteristic matrix. Thus

$$\mathbf{D}^2 S_j\left(\mathbf{z}_m\right) = 2\rho_j\left(\mathbf{z}_m\right)\left(1 - \rho_j\left(\mathbf{z}_m\right)\right)\mathbf{H}_j\left(\mathbf{z}_m\right).$$

The following proposition establishes necessary and sufficient conditions for the joint weighted electoral mean to be an equilibrium of the electoral game.

Proposition 1.1: *Assume that F^k is the Type 1 extreme value distribution for all k. The condition $c\left(\Gamma_{exo}\right) < 1$ is sufficient for the joint weighted electoral mean, z_m, to be a strict local Nash equilibrium of the stochastic spatial model $\Gamma_{exo} = \langle P, \mathbf{Z}, \mathbf{S}\rangle$. The condition $d\left(\Gamma_{exo}\right) \leq 1$ is necessary for z_m to be a local Nash equilibrium.* **Proof**: see appendix 1.2.
■

If the sufficient convergence condition holds, then the equilibrium prediction of the outcome of the electoral game is the weighted electoral mean of the ideal points $z_m = (\tau_m, \gamma_m)$. There can be two or more parties and the expected vote share of each party may differ, but the policy outcome will not be affected, since all parties implement z_m. Thus, different policies can only be the consequence of differences in the economic and political

parameters that determine z_m. On the other hand, if the necessary convergence condition fails, then different policies have a positive probability of being implemented either because there is a non-convergent PNE in which parties propose different policies or because there is a mixed strategy Nash equilibrium (due to Glicksberg (1952) a mixed strategy Nash equilibria will always exist). Furthermore, simulations of a number of these models not only confirm but also strengthen these results. For instance, although it does not follow directly from Proposition 1, when $c(\Gamma_{exo}) < 1$, simulations show that $\mathbf{z}_m$ is not only an LNE but also the *unique* PNE; and when $d(\Gamma_{exo}) > 1$, simulations confirm that $\mathbf{z}_m$ is not an LNE and in many cases it is also possible to compute a non-convergent LNE.[12]

The intuition behind proposition 1.1 can be better understood in a situation with only two parties. Suppose that the expected valence of party 2 is higher than the expected valence of party 1, i.e. $\lambda_2 > \lambda_1$. Then, if both parties propose the same platform z_m, only voters with a valence shock that compensates the expected valence difference prefer to vote party 1. Moreover, given that both parties propose the same platform, the expected vote share of party 1 decreases as the expected valence difference increases. This effect can be interpreted as the cost for party 1 of adopting the platform proposed by party 2 (the term A_1 in the convergence coefficients captures this effect). Party 1 can avoid this cost by proposing a different platform. However, this is also a costly move, particularly if the variance of the voters ideal policies is very low, which implies that departing from the weighted electoral mean causes a significant drop in the expected vote share (the term $\sum_{k \in V} n_k \mathrm{Tr}\left(\Phi^{-1}\mathbf{W}^k \mathbf{B}_{z_m}^k \mathbf{W}^k\right)$ in the convergence coefficients captures this effect). Proposition 1.1 establishes that if the first effect dominates the second one, then in equilibrium, parties converge to the weighted electoral mean.

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[12]In such cases the lowest valence party tends to be located, in equilibrium, on the eigenvector of its characteristic matrix. In one case it was shown that there did exist a mixed strategy Nash equilibrium generated by a limit cycle of the underlying gradient field.

Note also how the parameters of the electoral game affect the convergence coefficients. Again, assume a two party system. Since $A_1 = 2\left(1 - 2\rho_1\left(\mathbf{z}_m\right)\right)$, if $\lambda_2 \approx \lambda_1$, then $\rho_1\left(\mathbf{z}_m\right) \approx \frac{1}{2}$ and $A_1 \approx 0$, so the convergence coefficients ≈ 0. Thus in a two party system, if $\lambda_2 \approx \lambda_1$, then the model predicts policy convergence. On the other hand, in a fragmented polity, with many parties, then some parties will have low valence, thus $\rho_1\left(\mathbf{z}_m\right)$ can be very small, implying that $A_1 \approx 2$. In particular, if the electoral covariance matrix has sufficiently large terms (i.e. $\sum_{k \in V} n_k \mathrm{Tr}\left(\Phi^{-1} \mathbf{W}^k \mathbf{B}_{z_m}^k \mathbf{W}^k\right)$ is relatively high) then one expects policy divergence. Moreover, empirical analysis of electoral games in a number of countries support these results.[13]

1.3.2 Trade Policy under Convergence

We now study how the economic structure affects z_m and the convergence coefficients. We first consider the situation in which the sufficient condition for convergence holds. Then Proposition 1.1 implies that the outcome of the electoral game is the weighted electoral mean $z_m = (\tau_m, \gamma_m)$. We now characterize z_m for the three economic structures identified in section 1.2. From Lemma 1.1 , it is always the case that $\gamma^k = 0$ for $k = F_X, F_Y, F_N$ and $\gamma^L = 1$ regardless of the economic structure. Furthermore, $\gamma_m = n_L \phi_\gamma^L / \phi_\gamma$.[14] Thus, *ceteris paribus*, the higher the fraction of workers in the tradable industries in the population (n_L), and the more sensitive they are to changes in the provision of the local public good, measured by $(\phi_\gamma^L / \phi_\gamma)$, the higher the fraction of the government revenue expended in G_L in equilibrium.

Conversely, the ideal import tax rate for each group varies across the different economic structures. From lemma 1.1, we know that for a structure 1 economy, $\tau^{F_N} < \tau_{\max}$ and

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[13]For example, electoral models for recent elections in the U.S. and U.K. found that $c\left(\Gamma_{exo}\right) \leq 1$ (see Schofield et al., 2011a,b). Electoral models for countries with many small and low valence parties found that $d\left(\Gamma_{exo}\right) > 1$ (see Schofield et al., 2011a for Israel and Schofield et al., 2011c for Turkey.)

[14]If $\phi_\gamma^k = \phi_\gamma$ for all k, then $\gamma_m = \frac{n_L}{1 - n_L}$.

$\tau^L < \tau_{\max}$, while for a structure 2 economy we have $\tau^{F_N} < \tau_{\max} < \tau^L$. Therefore, the electoral equilibrium τ_m would be lower in an economy with structure 1 than in one with structure 2. Moreover, it is likely that the magnitude of this difference would be large. To see this note that, in a specialized natural resource-abundant economy, all socioeconomic groups have an ideal import tax rate below $\tau_{\max}$. However, in a diversified natural resource rich economy, workers in the tradable industries have an ideal import tax rate above $\tau_{\max}$, so it can even be the case that in equilibrium $\tau_m > \tau_{\max}$. For example, the workers in the tradable industries may be an important fraction of the population as well as being highly responsive to trade policies.

An economy with structure 3 is analogous to an economy with structure 1, since all socioeconomic groups have an ideal import tax rate below $\tau_{\max}$, except for the owners of factor F_X. Hence, unless the owners of factor F_X are much more responsive to trade policy changes than the rest of the voters, τ_m is strictly less than $\tau_{\max}$. In fact it can be very low. For example, the negative impact of the import tax on real wages in the tradable industries can be large. Therefore, τ_m is also lower for an economy with structure 3 than for an economy with structure 2.

Finally, note that irrespective of the economic structure, *ceteris paribus*, the higher the fraction of service workers in the population (n_{F_N}), or the more sensitive they are to changes in the import tax rate, measured by $(\phi_\tau^{F_N}/\phi_\gamma)$, the lower the equilibrium τ_m is. This is particularly relevant for economies with structure 2. Thus, it is not the case that natural resource abundant economies will necessary have protectionist political equilibria as postulated in Rogowski (1987, 1989).

In summary, if the economy is either specialized in the production of the less labor intensive tradable industry (structure 1), or either abundant in the factor specific to the more labor intensive tradable industry or in labor (structure 3), the electoral equilibrium is

likely to be relatively closer to free trade. In this case, the great majority of the population loses with the adoption of protectionist policies. However, if the economy resembles the characteristics of the economic structure 2, society is split into two groups: owners of factor F_X and service workers who favor a relatively free trade policy, while owners of factor F_Y and workers L in the tradable industries prefer a more protectionist policy. The equilibrium tax rate is higher in this third case than in the first two cases, and so is the level of distortion in the economy. The development of the non-tradable sector plays a key role in political cleavages, however. The reason is that service workers push the political equilibrium toward the ideal position of the relative abundant factor in the economy. Therefore, they act as a moderating force against the protectionist tendency.

1.3.3 Economic Structure and Divergence

As we showed in the previous section, given that the convergence condition holds, we can then explain how trade policy at a given time depends on the prevalent economic structure. Now, we investigate the convergence conditions under the three different economic structures derived in section 1.2 and study how different economic structures affect the *stability* of trade policy.

First of all, however, we need to define what we mean by stability of a policy in our model. We interpret *convergence* of political parties to the same political platform as *stability* of policies. Indeed, if in equilibrium all political parties converge to the same platform, although there can be uncertainty about which party wins the election, there is complete certainty about the policy outcome. If, instead, in equilibrium the political parties do not converge to the same platform, then there are different policies with positive probability of being implemented. This means that we could observe different policies in a given economy over time. In this sense, an economic structure that induces political

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convergence is one that gives rise to stable policy outcomes. These will change smoothly in response to shocks to the distribution of political power, the international terms of trade or technology. An economic structure that induces political divergence is one that generates a more volatile environment, where we can observe (possibly large) changes in policies even without any change in the economic or political fundamentals.

Proposition 1.1 shows that a sufficient condition for convergence to z_m is $c(\Gamma_{exo}) < 1$, while a necessary condition is $d(\Gamma_{exo}) \leq 1$. These convergence coefficients, $c(\Gamma_{exo})$ and $d(\Gamma_{exo})$, depend on the stochastic distribution of the valence signals as well as the distribution of the ideal policies in the population. We now compare the convergent coefficients for different economic structures. Since the key difference among economic structures is the ideal trade policy for the workers of the tradable industries, we consider $d(\Gamma_{exo})$ as a function of τ^L, keeping constant all the other variables that determine it. Note that $d(\Gamma_{exo})$ is a quadratic and symmetric function and has a minimum at the value of τ^L that satisfies the following equation

$$\frac{\partial d(\Gamma_{exo})}{\partial \tau^L} = 2A_1 n_L \phi_\tau^L \left[-\phi_\tau^L (\tau_m - \tau^L) + \left(\frac{1}{\phi_\tau} \right) \sum_{k \in V} n_k \left(\phi_\tau^k \right)^2 \left(\tau_m - \tau^k \right) \right] = 0.$$

The second term in the squared brackets is very small in absolute value (in fact, it equals zero if ϕ_τ^k is the same for all groups). Hence, $\frac{\partial d(\Gamma_{exo})}{\partial \tau^L}$ depends primarily on $\tau_m - \tau^L$. If the economy has structure 3, then $\tau^{F_X} < \tau^{F_N} < \tau^L < \tau_{\max} < \tau^{F_Y}$, which implies that unless $n_{F_X} >> n_{F_Y}$, $\left(\tau_m - \tau^L \right)$ is positive but very small. Therefore, for an economy with structure 3, $\frac{\partial d(\Gamma_{exo})}{\partial \tau^L} \approx 0$ and hence $d(\Gamma_{exo})$ is very close to its minimum. This is also the case for economies with structure 1. On the other hand, for an economy with structure 2, $\tau^{F_X} < \tau^{F_N} < \tau_{\max} < \tau^L < \tau^{F_Y}$, which implies that unless $n_{F_X} << n_{F_Y}$, $\left(\tau_m - \tau^L \right)$ is negative and large in absolute value, we have that $d(\Gamma_{exo})$ is far from its minimum. Since $\frac{\partial c(\Gamma_{exo})}{\partial \tau^L} = \frac{\partial d(\Gamma_{exo})}{\partial \tau^L} / \phi_\tau$, the same argument also apply to the coefficient $c(\Gamma_{exo})$.

Thus, convergence coefficients tend to be larger than their minimum values for diversified natural resource-rich economies (structure 2) but very close to their minimum values for specialized natural resource-rich economies (structure 1) and industrial economies (structure 2). If the convergence coefficients for a particular polity are large, then we can say, informally, that the likelihood of convergence is lower. This allows us to infer that policy stability is more likely in economies with structures 1 or 3 than in economies with structure 2.

The above argument has focused on the dependence of the convergence coefficients on the weighted electoral variance-covariance matrix. As we noted above, the convergence coefficients also depend on the parameters of the electoral game. In particular, in a two party system, if $\lambda_2 \approx \lambda_1$ then the model predicts policy convergence. On the other hand, in a fragmented polity, with many parties, then some must have low valence, and with a large enough covariance matrix, one can expect policy divergence.

Thus, political divergence is a consequence of both political and economic forces. Policy divergence is a pure political issue related to electoral competition. Voters have different perceptions of the average quality of the political parties, and these are independent of the platform they propose. These perceptions affect voting probabilities in such a way that candidates or party leaders need not locate at the center of the policy space. However, differences in valences alone are not enough to induce political divergence. As proposition 1.1 clearly shows, the convergence coefficients depend on the electoral variance-covariance matrix. If the trace of this matrix is large, then convergence is less likely. Politics makes policy divergence possible, but economic forces are needed to induce it, since it is heterogeneity in policy preferences that fundamentally determines the convergence coefficients.

1.4 Extension: Parties and Organizations

In this section we extend the stochastic spatial model of electoral competition presented in section 1.3 by including organizations that try to influence political outcomes through campaign contributions. We formally define this extension as a two stage dynamic game and define an equilibrium concept for this dynamic game. We then study the convergence conditions and characterize the equilibrium outcome of the political game when there is no convergence. There are three motivations for introducing organizations into the basic political model developed in section 1.3. First, without their inclusion, when the convergence conditions do not hold, we can say little about the electoral outcome beyond the fact that there is divergence. Second, even in the best democracies, the political power of groups differs from the power conveyed merely by share of the group in the total population. Third, with the introduction of organizations parties can behave as if they had policy preferences. Furthermore, organizations can be seen as a formal way to endogenously generate parties with policy preferences.

1.4.1 The Stochastic Spatial Model with Exogenous and Endogenous Valence

We now assume that there exist political organizations other than political parties. These organizations are independent, with their own agenda, but may be linked to parties in various ways. An example is that of unions, which try to influence political outcomes through campaign contributions. Contributions are valuable for politicians because they can be used to increase the electorate's perceived quality of a candidate or to discredit political rivals. Thus, valence becomes an endogenous variable that depends on campaign contributions. Grossman and Helpman (1996) consider two distinct motives for interest groups: "Contributors with an *electoral motive* intend to promote the electoral prospects of preferred candidates. Those with an *influence motive* aim to influence the politicians' policy pronouncements."[15] In the proposition presented below we consider a case that captures

[15]See Schofield (2006) and Schofield and Miller (2007) for a model that captures both motives.

only the electoral motive, but not the influence motive. Except for the introduction of these organizations, the stochastic spatial model remains fundamentally the same as the model with exogenous valence presented in the previous section.

The timing of the events is as follows:

1. Organizations simultaneously announce their campaign contribution functions, specifying the contributions they will make in response to the party electoral platforms.

2. Political parties simultaneously announce their electoral platforms.

3. Organizations observe these platforms and simultaneously implement their campaign contributions.

4. Each voter receives a private signal about candidates' quality.

5. Elections are held.

6. The elected party implements the announced platform.

Suppose that each group of voters has an organization that can make contributions to political campaigns, and assume that due to institutional constraints, political parties cannot transfer money or resources to organizations, so contributions must be nonnegative. Let $c_k : \mathbf{Z} \to \times_{j \in P} \Re_+ = \mathbf{C}$ denote a contribution function made by organization k, and let C^* denote the space of all feasible contribution functions. Let $\mathbf{C}^* = \times_{k \in V} C^*$. A profile of contribution functions is denoted by $\mathbf{c}^* = \times_{k \in V} c_k$. When necessary we use the notation $\mathbf{c}^*_{-k}$ to denote the profile of contribution functions of all organizations except organization k.

The utility of a voter belonging to group k when party j implements platform z_j is now

$$
\begin{aligned}
v^k(z_j, \mathbf{c}) &= v_{pol}^k(z_j) + \lambda_j + \varepsilon_j^k + \mu_j(\mathbf{c}), \\
&= -\phi_\tau^k \left(\tau_j - \tau^k\right)^2 - \phi_\gamma^k \left(\gamma_j - \gamma^k\right)^2 + \lambda_j + \varepsilon_j^k + \mu_j(\mathbf{c}).
\end{aligned}
\tag{12}
$$

The last term is the *endogenous valence function* $\mu_j : \mathbf{C} \to \Re_+$, which captures the impact of contributions on valence values.[16]

As before, the probability that a voter from group k votes for party j is given by:

$$
\rho_j^k(\mathbf{z}, \mathbf{c}) = \Pr\left[v^k(z_j, \mathbf{c}) > v^k(z_l, \mathbf{c}) \text{ for all } l \neq j\right].
\tag{13}
$$

We assume that each organization has a leader, who collects contributions from its members and uses them to support political parties in their electoral campaigns. Each leader receives a "payment" that depends linearly on the policy preferences of the members of the organization, and must pay the cost of collecting the contributions among its members. Following Persson and Tabellini (2000) we assume that these costs are a quadratic function in the per member contribution since the free rider problem in collective action is more severe in large groups. The leader maximizes his expected payment net of the costs of collecting contributions. Thus, the preference of leader k is given by the function $L_k : \mathbf{Z} \times \mathbf{C} \to \Re$

$$
L_k(\mathbf{z}, \mathbf{c}) = \sum_{j \in P} S_j(\mathbf{z}, \mathbf{c}) \left(a_{k,j} v_{pol.}^k(z_j) + b_{k,j}\right) - \sum_{j \in P} \frac{1}{2} \left(\frac{c_{k,j}}{n_k}\right)^2.
\tag{14}
$$

Here $c_{k,j}$ denotes the contribution made by organization k to party j. We assume that $a_{k,j} \geq 0$ and $b_{k,j} \geq 0$. This specification is flexible enough to capture very different

---

[16]We usually assume that μ_j depends only on the contributions made to party j, but in principle, μ_j could also be lowered by contributions made to other parties.

situations. If group k does not have an organization then we set $a_{k,j} = b_{k,j} = 0$ for all $j \in P$. If the leader of organization k has party preferences for party j then $a_{k,j} > a_{k,l}$ and/or $b_{k,j} > b_{k,l}$.[17] If leader k is twice more effective collecting contributions than leader h, then $a_{k,j} = 2a_{h,j}$ and $b_{k,j} = 2b_{h,j}$. For the purposes of this paper the crucial distinction is between partisan organizations and non-partisan organizations. Since each organization "represents" the interest of a socioeconomic group, if each organization is attached to a party (i.e. the leader has a strong predilection for a particular party), then the party must indirectly adopt the policy preferences of this organization as the party preferences, at least to some extent.[18]

Definition 1.4: *The stochastic spatial model with exogenous and endogenous valence is the two stage dynamic game* $\Gamma_{end} = \langle P, V, \mathbf{Z}, \mathbf{C}, \mathbf{S}, \mathbf{L} \rangle$, *where:*

1. **Players**: $P = \{1, ..., p\}$ *is the set of all political parties, and* $V = \{F_X, F_Y, F_N, L\}$ *is the set of all groups of voters, which is also the set of all organization leaders.*

2. **Utility functions**:

   (a) $S_j : Z \times C \to [0,1]$ *is the expected vote share function of party* $j \in P$, *obtained from (12) and (13). Let*

   $$\mathbf{S} = \times_{j \in P} S_j : \mathbf{Z} \times \mathbf{C} \to \times_{j \in P} [0,1].$$

   (b) $L_k : Z \times C \to \Re$ *is the utility function of leader* $k \in V$ *given by (14). Let* $L = \times_{k \in V} L_k : Z \times C \to \times_{j \in V} \Re.$

---

[17]Schofield (2007) considers a reduced form version of the organization contribution game, in which μ_j is assumed a C^2, concave function with a maximum at the ideal point of the organizations that support party j . For the two candidates case (14) provides microfoundations for μ_j. The key is to assume organizations with partisan preferences.

[18]Roemer (2001) argues that "there is not, in general, free entry of representatives of classes into parties."

3. **Sequence of play**: *First all organization leaders announce their campaign contribution functions. The parties then respond and simultaneously select platforms from the policy space Z. Then, organization leaders observe the profile of platforms and simultaneously implement their campaign contributions. Voters receive their signals and the election is held.*

As Grossman and Helpman (1996) note, there are two equilibrium notions appropriate to this game. One involves a commitment mechanism on the activists, having the effect that their offers, intended to influence the party leaders, are credible. Reputation, for example in a repeated play game, may suffice. Under the other, once the party leaders have made their policy pronouncements, then without a commitment device, only the electoral effect will be relevant (because of the preferences of the activists for one party over another).[19] In both cases, the solution concept is local subgame perfect Nash equilibrium.

Definition 1.5: *A strict (weak) local subgame perfect Nash equilibrium of the stochastic spatial model $\Gamma_{end.} = \langle P, V, \mathbf{Z}, \mathbf{C}, \mathbf{S}, \mathbf{L}, \rangle$ is a profile of party positions $z^* \in Z$ and a profile of contribution functions $c^* \in C^*$ such that:*

1. *For each political party $j \in P$ there exists an ϵ-neighborhood $B_\epsilon(z_j^*) \subset Z$ around z_j^* such that*

$$S_j\left(\mathbf{z}^*, \mathbf{c}^*\left(\mathbf{z}^*\right)\right) > (\geq)\ S_j\left((\tilde{z}_j, \mathbf{z}_{-j}^*), \mathbf{c}^*(\tilde{z}_j, \mathbf{z}_{-j}^*)\right)\ \text{for all}\ \tilde{z}_j \in B_\epsilon(z_j^*) - \left\{z_j^*\right\}.$$

---

[19]Schofield (2006) avoids some of these difficulties by using a reduced form of the activist functions. The solution to this reduced form game is identical to one where the party leaders themselves have induced policy preferences, but still maximize vote shares. (See the policy preference models by Duggan and Fey, 2005 and Peress, 2010).

2.a *Under commitment. For each leader $k \in V$ there is no feasible contribution function* $c'_k \in C^*$ *such that*

$$L_k \left(\mathbf{z}', c'_k \left(\mathbf{z}' \right), \mathbf{c}^*_{-k} \left(\mathbf{z}' \right) \right) > L_k \left(\mathbf{z}^*, \mathbf{c}^* \left(\mathbf{z}^* \right) \right)$$

where z' is such that for all $j \in P$ there exists an ϵ-neighborhood $B_\epsilon(z'_j) \subset Z$ around z'_j such that

$$S_j \left(\mathbf{z}', c'_k \left(\mathbf{z}' \right), \mathbf{c}^*_{-k} \left(\mathbf{z}' \right) \right) > (\geq) \ S_j \left((\hat{z}_j, \mathbf{z}'_{-j}), c'_k \left(\hat{z}_j, \mathbf{z}'_{-j} \right), \mathbf{c}^*_{-k}(\hat{z}_j, \mathbf{z}'_{-j}) \right)$$

for all $\hat{z}_j \in B_\epsilon(\hat{z}_j) - \{\hat{z}_j\}$.

2.b *Under no commitment. For each leader $k \in V$ and each profile of party positions z there is no feasible contribution function $c'_k \in C$ such that*

$$L_k \left(\mathbf{z}, c'_k \left(\mathbf{z} \right), \mathbf{c}^*_{-k} \left(\mathbf{z} \right) \right) > L_k \left(\mathbf{z}, \mathbf{c}^* \left(\mathbf{z} \right) \right).$$

Remark 1.3: If $B_\epsilon(\mathbf{z}^*_j) = B_\epsilon(z'_j) = Z$ and we consider only the weak inequality, then the definition above is just the usual one for a subgame perfect Nash equilibrium.

Remark 1.4: A general proof of existence of Nash equilibrium, and hence subgame perfect Nash equilibrium, can be obtained using Brouwer's fixed point theorem applied to the function space $\mathbf{C}^*$ if we assume that the vote share functions are pseudo-concave and $\mathbf{C}^*$ consists of equicontinuous functions (Pugh, 2002).

Let ω^k be a measure of the power of organization k. Let $\left(\bar{\phi}^k_\tau, \bar{\phi}^k_\gamma \right) = \left(1 + \omega^k \right) \left(\phi^k_\tau, \phi^k_\gamma \right)$ be a power adjusted measure of the importance that group k gives to each policy dimension, and $\left(\bar{\phi}_\tau, \bar{\phi}_\gamma \right) = \sum_{h \in V} n_k \left(\bar{\phi}^k_\tau, \bar{\phi}^k_\gamma \right)$ the corresponding population averages. Define the

adjusted weighted mean of the ideal policies $\bar{z}_m = (\bar{\tau}_m, \bar{\gamma}_m)$ by:

$$(\bar{\tau}_m, \bar{\gamma}_m) = \sum_{k \in V} n_k \left(\frac{\bar{\phi}_\tau^k}{\bar{\phi}_\tau} \tau^k, \frac{\bar{\phi}_\gamma^k}{\bar{\phi}_\gamma} \gamma^k \right). \tag{15}$$

Note that $\bar{z}_m$ is an adjusted version of the weighted mean z_m defined in section 3.1 (in fact if $\omega^k = \omega$ for all k, then $\bar{z}_m = z_m$). The difference is that now better organized groups have a larger weight. Denote $\bar{\mathbf{z}}_m = \times_{j \in P} \bar{z}_m$ the *joint adjusted weighted electoral mean* of the stochastic spatial model.

As we noted above, there are two motives for organizations to provide contributions: an *influence motive* and an *electoral motive*. Once the parties have made their policy choices, then the electoral motive persists, but the influence motive does not. Unless there is a commitment mechanism, activists need only consider the electoral motive in determining the contribution vector. So, let us assume that there is no commitment mechanism. For purposes of exposition, suppose that there are only two parties and that the endogenous valence functions are linear in the contributions and the same for both parties, so that $\mu_j = \mu \sum_{k \in V} c_{k,j}$.

In the appendix 1.2 we show that, under these assumptions, the first order necessary condition for the maximization of $S_j(\mathbf{z})$ is given by:

$$\mathbf{D}S_j(\mathbf{z}) = -2 \sum_{k \in V} n_k \rho_j^k(\mathbf{z}) \left(1 - \rho_j^k(\mathbf{z}) \right) \left(\begin{array}{c} \phi_\tau^k \left(\tau_j - \tau^k \right) - \frac{\mu}{2} \frac{\partial C_{j-l}^*(\mathbf{z})}{\partial \tau_j} \\ \phi_\gamma^k \left(\gamma_j - \gamma^k \right) - \frac{\mu}{2} \frac{\partial C_{j-l}^*(\mathbf{z})}{\partial \gamma_j} \end{array} \right) = \mathbf{0}. \tag{16}$$

Here $\rho_j^k(\mathbf{z}) = \left[1 + \exp \left(v_{pol.}^k(z_l) - v_{pol.}^k(z_j) - \mu C_{j-l}^*(\mathbf{z}) + \lambda_l - \lambda_j \right) \right]^{-1}$ and $C_{j-l}^*(\mathbf{z}) = \sum_{k \in V} \left(c_{k,j}^*(\mathbf{z}) - c_{k,l}^*(\mathbf{z}) \right)$ is the difference in contributions received by part j when the platforms are $\mathbf{z}$. In the appendix 1.2 we also prove that the second order sufficient (nec-

essary) condition is that the matrix $\mathbf{D}^2 S_j(\mathbf{z})$ evaluated at a profile that satisfies the first order condition be negative definite (semi-definite)

$$\mathbf{D}^2 S_j(\mathbf{z}) = 2\sum_{k \in V} n_k \rho_j^k(\mathbf{z}) \left(1 - \rho_j^k(\mathbf{z})\right) \left[2\left(1 - 2\rho_j^k(\mathbf{z})\right) \mathbf{W}^k \mathbf{B}_{\tilde{z}_j}^k \mathbf{W}^k - \tilde{\mathbf{W}}^k\right], \quad (17)$$

$$\text{where } \tilde{z}_j = z_j - \frac{\mu}{2}\left(\mathbf{W}^k\right)^{-1} \mathbf{D} C_{j-l}^*(\mathbf{z}), \tilde{\mathbf{W}}^k = \mathbf{W}^k - \frac{\mu}{2}\mathbf{D}^2 C_{j-l}^*(\mathbf{z})$$

$$\text{and } \mathbf{W}^k = \begin{bmatrix} \phi_\tau^k & 0 \\ 0 & \phi_\gamma^k \end{bmatrix}; \ \mathbf{B}_{\tilde{z}_j}^k = \begin{bmatrix} \left(\tilde{\tau}_j - \tau^k\right)^2 & \left(\tilde{\gamma}_j - \gamma^k\right)\left(\tilde{\tau}_j - \tau^k\right) \\ \left(\tilde{\gamma}_j - \gamma^k\right)\left(\tilde{\tau}_j - \tau^k\right) & \left(\tilde{\gamma}_j - \gamma^k\right)^2 \end{bmatrix}.$$

The following proposition characterizes the equilibrium platforms in this no commitment and two parties case.

Proposition 1.2: *Consider the no commitment stochastic spatial model* $\Gamma_{end.} = \langle P, V, \mathbf{Z}, \mathbf{C}, \mathbf{S}, \mathbf{L} \rangle$, *with exogenous and endogenous valence. Suppose that there are only two parties,* F^k *is the extreme value distribution for all* k, *and the utility functions* L_k *are all concave functions of* c_k. *Suppose further that* $\mu_j = \mu \sum_{k \in V} c_{k,j}$. *There are two cases to consider:*

1. *Suppose that the leaders of the organizations do not have partisan preferences, but they may vary in their influence ability, that is* $a_{k,j} = a_k$ *and* $b_{k,j} = b_k$ *for all* $j = 1, 2$. *Then* $\omega^k = \bar{\mu}^2 n_k a_k$ *for all* k, *where* $\bar{\mu} = \mu \rho_1(\bar{\mathbf{z}}_m)(1 - \rho_1(\bar{\mathbf{z}}_m))$. *The joint adjusted weighted electoral mean* $\bar{z}_m$ *is the unique profile that simultaneously satisfies the first order condition (16) with both parties proposing the same platform. A sufficient (necessary) condition for* $\bar{z}_m$ *to induce a strict (weak) local subgame perfect Nash equilibrium is that the Hessian matrices,* $D^2 S_j(\bar{\mathbf{z}}_m)$, *of both parties evaluated at* $\bar{z}_m$, *be negative definite (semi-definite).*

2. *On the other hand, assume that the leaders of the organizations have strong partisan*

preferences, in the following sense: There is a partition $\{V_1, V_2\}$ of V such that for all $k \in V_1$, $a_{k,1} > a_{k,2}$ and $b_{k,1} > b_{k,2}$, while for all $k \in V_2$, $a_{k,2} > a_{k,1}$ and $b_{k,2} > b_{k,1}$. Then, a profile z^* that satisfies the first order condition requires that each party be located between the electoral joint mean and the ideal policies of the organizations that support the party. A sufficient (necessary) condition for this profile to induce a strict (weak) local subgame perfect Nash equilibrium is that the Hessian matrices, $D^2 S_j(\mathbf{z}^*)$, of both parties evaluated at z^*, be negative definite (semi-definite).

Proof: see appendix 1.2. ∎

Note, from the second part of this proposition, that the equilibrium position of each party must involve a balance between the centripetal attraction of the electoral center and the centrifugal force of contributions.

1.4.2 Trade Policy under Convergence

In section 1.3.2 we studied the determination of trade policy under the assumptions that political competition is purely electoral and parties' platforms converge. The idea behind this model is a situation in which the electoral franchise is extended to the whole population and groups do not have any extra power to influence policy besides elections. In general, this would not be an accurate representation for at least some countries and some periods of history. Introducing organizations other than political parties allows us to capture an additional source of political power created by how willing each group of voters is to provide contributions to support their preferred policies.

Consider a situation with only two parties, in which all activist leaders do not have partisan preferences, and the Hessian matrices of both parties evaluated at $\bar{\mathbf{z}}_m$ are negative definite. Then Proposition 1.2 (case 1) implies that the political equilibrium outcome is

given by the adjusted weighted electoral mean $\bar{z}_m = (\bar{\tau}_m, \bar{\gamma}_m)$. This means that the more organized a group is, as measured by ω^k, the higher impact the group has on the equilibrium outcome. Therefore, organizations can either moderate or reinforce the conclusions from the model without organizations. For instance, a land rich economy (with structure 1) can be even closer to free trade if the landowner elite has relatively more lobby power than workers and the nascent industrial capitalists. Alternatively, the landed elite in a moderately land abundant economy, but with a relatively important manufacturing industry (as in an economy with structure 2), can oppose the protectionist propensity of capitalists and workers, using its lobby power. It will be able to do this until the capitalists and workers build their own organizations and lobby power.

Thus the model suggests a very rich structure of institutional and economic path dependence. For example, a powerful landowner elite can maintain the economy very close to free trade, discouraging the growth of the secondary sector, and hence avoiding the emergence of a major protectionist force formed by capitalists and workers. It is also possible that an exogenous decrease in the international terms of trade leads to a sufficient growth in the secondary sector, which turns workers in the tradable sector into a protectionist force. The lobby power of landowners and service workers can offset this protectionist impulse for some time. Eventually capitalists and "tradable" workers counterbalance this force by building their own lobby power and creating a more protectionist equilibrium.

Once the economy is in a protectionist equilibrium, landlords and service workers may try to respond by defranchising workers in the tradable sector and suppressing their organizations. Eventually workers in tradable industries will switch to become supporters of free trade. Hence, it is very natural to imagine exogenous and endogenous switches between structures 1 and 2. It is much more complicated to picture this kind of switch in a capital abundant economy, since all groups, except landlords, prefer either free trade or

a very moderate protectionism.

In summary, if the introduction of organizations increases the power of the owners of the factor specific to the exporting industry and/or service workers, then the equilibrium trade policy comes closer to free trade. If instead it increases the power of the owners of the factor specific to the industry that competes with the imports or of its workers, then the equilibrium trade policy becomes more protectionist.

1.4.3 Economic Structure, Political Power and Convergence

The way activists influence the convergence coefficients is subtle. Again, assume that there are only two parties and activist leaders do not have partisan preferences (case 1 in proposition 1.2), then it is possible that convergence is more or less likely with activists than without them. The reason is that the endogenous components of valence have an ambiguous effect on the Hessian matrices of both parties evaluated at $\bar{\mathbf{z}}_m$. On the other hand, if activist leaders have partisan preferences (case 2 in proposition 1.2), campaign contributions constitute an unambiguous centrifugal force, inducing each party to trade off the electoral mean and the ideal position of the organizations that support the party.

1.4.4 Trade Policy under Divergence

Consider a situation with two political parties. Party 1 receives contributions from organizations $k = F_X, F_Y, F_N$ while party 2 receives contributions from organization L. Let $z_j^* = (\tau_j^*, \gamma_j^*)$ be the equilibrium platform of party $j = 1, 2$. Regardless of the structure of the economy, in equilibrium, party 1 offers a lower fraction of government revenue allocated to G_F than the electoral mean, and party 2 offers a higher fraction of government revenue allocated to G_L than the electoral mean. That is $\gamma_2^* > \gamma_m > \gamma_1^*$ (proposition 1.2, case 2). The reason is fairly intuitive. When party 1 is choosing a platform, then in order to

maximize campaign contributions it must balance a centrifugal force that pushes it to the electoral center γ_m, and a centripetal force that pushes it to $\gamma^k = 0$, the ideal policy of the organizations that support the party.

The same logic applies to party 2 with $\gamma^L = 1$. The importance of each of these forces varies with the political parameters. All else equal, the more effective activists leaders are and the more effective contributions are, the more intense is the centripetal force, and thus the further apart γ_2^* and γ_1^* will be. Furthermore, *ceteris paribus*, the higher is the exogenous valence of a party, the closer it is to the electoral mean.

The structure of the economy has, however, an important effect on τ_j^*. If the economy has either structure 1 or 3, the ideal import tax rate for workers in the tradable industries τ^L tends to be very close to the electoral mean τ_m. If the influence ability of the organizations $k = F_X, F_Y, F_N$ does not vary too much, it is also the case that the weighted ideal import tax rate of these groups is also very close to τ_m. Therefore, $\tau_1^* \approx \tau_2^* \approx \tau_m$, and parties' platforms do not have a significant variation in terms of the proposed trade policy. On the other hand, if the economy has structure 2, and the fraction of the owners of factor F_Y in the population is not very high, then $\tau^L > \tau_m$, which implies that $\tau_2^* > \tau_m$. Moreover, if the influence ability of organizations $k = F_X, F_Y, F_N$ does not vary too much, it is also the case that the weighted ideal import tax rate of these groups must be lower than τ_m, which implies that $\tau_1^* < \tau_m$. Therefore, $\tau_2^* > \tau_m > \tau_1^*$, and parties' platform differ significantly in terms of the proposed trade policy. Recall also that τ_m is higher for an economy with structure 2 than for an economy with structures 1 or 3. Hence, party 2 offers a highly protectionist policy, while party 1 proposes a relatively moderate one.

In Summary, for an economy with structures 1 or 3, both parties tend to propose very similar and moderate trade policies, while sharply differing in their budget proposals. Party 1 offers a higher level of G_F and party 2 offers instead a higher level of G_L. Political conflict

is mainly about the budget allocation dimension. On the other hand, for an economy with structure 2, parties tend to differ in both dimensions. Party 1 offers a moderate trade policy and a higher level of G_F, while party 2 offers a highly protectionist trade policy and a higher level of G_L. There is political conflict in both dimensions of policy. Finally, note that for an economy with structures 1 and 3, the efficiency of the economy does not significantly vary when there is a change in the party that wins the election, since both parties propose similar trade policies. Distributional conflict mainly occurs in the budget allocation, which, in our model, does not affect the efficiency of the economy. However, for an economy with structure 2, party rotation induces significant changes in the efficiency of the economy since each party implements a very different trade policy.

1.5 Historical Cases

The results on convergence and divergence can be used to explain historical patterns in trade policy. We now exemplify our model with the cases of the United States and Argentina, because they offer two interesting, albeit very different illustrations of our model. While the United States is a case in which the economic structure changed from a diversified natural resource rich economy to an industrial economy, Argentina is a case in which the economic structure changed from a specialized natural resource rich economy to a diversified natural resource rich economy. As a consequence, trade policies in these two countries followed the basic patterns predicted by our model. Thus, these case studies indicate how the economic structure affects the stability and degree of trade protectionism.

1.5.1 The United States

In the 1790s import tariffs in the U.S. were not very high and the main purpose of them was to finance the government rather than to protect domestic industries. In the

period from 1790 to 1820 tariffs were increased, but mainly to obtain more revenue and to finance the War of 1812 (see Irwin, 2003). Early industrialization in the U.S. and the demand of raw materials from the industrialization of the U.K. radically changed this situation in the 1820s. The North produced manufactures that competed with British imports and favored protectionist measures. The South exported cotton and preferred free trade. From 1820 to 1830 tariffs were significantly raised with the crucial purpose of protecting domestic industries from foreign competition. The North obtained the necessary votes in Congress to increase tariffs, by offering the West financial resources for internal improvements. However, from 1830 to the Civil War, tariffs were decreased. This time the West voted with the South. Two circumstances contributed to this switch. First, President Andrew Jackson vetoed the internal improvements bills, which undermined the North-West coalition. Second, the West began exporting grain, making them more supportive of free trade. As a result, the Compromise Tariff of 1833 established a progressive reduction of tariffs that undid almost all the increase that took place during the 1820s (see Irwin, 2006a).

During the Civil War, the Tariff Acts of 1862 and 1864 were proposed as means to raise capital for the effort against the south. It is likely this was not the only reason. Indeed, Lincoln's economic advisor, Henry Carey argued in his book of 1896, that the "American system" involving tariffs, was the only way to maintain equality, in contrast to the free trade British system of imperialism. After the Civil War, the Republicans became even more closely associated with pro-capital protectionism, while the Democrats, associated with the agrarian interest in the South and the West, called for a reduction of import duties. In 1887, President Cleveland, a Democrat, made tariffs the key focus of his State of the Union Address, arguing that duties should be reduced, or even abolished, for raw materials. In the 1888 presidential election, Harrison, a Republican, was elected, and the

Republicans obtained majorities in both the Senate and the House. They immediately began to work on a new bill to raise tariffs. In fact, in 1890, the Congress, dominated by Republicans, passed the McKinley tariff Act, which significantly increased the average duty. However, in 1890 midterm election the Republican party suffered a defeat and McKinley, the author and main defender of the 1890 tariff Act, lost his seat. In the 1892 presidential election, the Democrats took control of the Presidency, the Senate and the House and in 1894 they passed the Wilson-Gorman Tariff, which lowered tariffs again undoing some of the changes introduced by the McKinley Act. The conflict between protectionist interests of the north-east and the agrarian interests of the west and south came to a head in the presidential contest of 1896 between the Republican William McKinley and the Democrat William Jennings Bryan, which was won by McKinley with 51% of the popular vote but 60% of the electoral college. McKinley, who was known as the Napoleon of Protection, while he was president, stated in an speech to the Republican Party: "Under free trade the trader is the master and the producer the slave. Protection is but the law of nature, the law of self-preservation, of self-development, of securing the highest and best destiny of the race of man."[20]

In terms of our model, during the nineteenth century the U.S. was a diversified natural resource rich economy with a comparative advantage in the primary sector, but with an important and growing manufacturing sector that competed with imports. We believe that this period illustrates a divergent political equilibrium, in which trade policy is unstable. Either a party with a protectionist platform (the Republicans) or a party with a free trade platform (the Democrats) could win the elections.

In the twentieth century, the economic structure of the U.S. suffered an extraordinary change. As Irwin (2006b) has put it:

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[20]William McKinley speech, Oct. 4, 1892 in Boston, MA: *William McKinley Papers*, Library of Congress.

At the end of the nineteenth century, though, the pattern of U.S. trade changed dramatically. For most of the century, the United States had a strong comparative advantage in agricultural goods and exported mainly raw cotton, grains, and meat products in exchange for imports of manufactured goods. But in the mid-1890s, America's exports of manufactures began to surge. Manufactured goods jumped from 20 percent of U.S. exports in 1890 to 35 percent by 1900 and nearly 50 percent by 1913. In about two decades, the United States reversed a century-old trade pattern and became a large net exporter of manufactured goods.

This reversal in the comparative advantage in the U.S. had a crucial effect on its political equilibrium. Once the U.S. became an industrial economy, industrial capitalists and workers gradually converted to free trade and the country moved to a convergent equilibrium with low tariffs. Moreover, except in very extraordinary circumstances, like the Great Depression, tariffs ceased to be an important source of political conflict and was no longer a key issue for political polarization and party differentiation.

1.5.2 Argentina

We now consider the case of Argentina. This country is relatively well endowed with highly productive land, and its comparative advantage has always been in the production of primary goods.[21] Up to the 1930s, Argentina was well integrated to the world economy, while some protectionism naturally developed during the world recession of the 1930s. After World War II, in 1946, workers voted en masse in a presidential election[22], and the country closed itself off in large degree from world markets until the mid-1970s. Since then,

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[21]See Brambilla, Galiani and Porto (2010).
[22]See Cantón (1968).

though the country tended to reintegrate with the world economy, trade policies have been highly volatile.[23]

At the beginning of the 20th century Argentina's factor endowment resembled what we denoted here as a specialized natural resource-rich economy. However, during the interwar period; trade opportunities and the terms of trade worsened and these triggered an industrialization process. This accelerated with the world depression during the 1930s and the Second World War. As a result, Argentina started the second half of the 20th century with a very different economic configuration. Industrialization had developed apace, bringing about what we have called a diversified natural resource-rich economy (see Galiani and Somaini, 2010). These new economic conditions also changed the political equilibrium; urban workers employed in the manufacturing sector and industrialists were the major social actors and they demanded a deepening of the industrialization process. This took the economy close to autarky.

Indeed, the pre 1930 Argentine society remained, on the whole, flexible, and social mobility was about as high as in other countries of recent settlement. The majority of the elite, although wealthy and powerful, were attached to a liberal ideology until at least the 1920s, as witnessed by the educational system (see Galiani et. al., 2008). It is likely that a few more decades of an expanding world economy would have induced an acceleration in the growth of urban leadership. This could have reconciled the aspirations of urban workers, entrepreneurs, and rural masses with a gradual decline in rural exportable commodities. Yet such a balancing act, even under prosperous conditions, was difficult in Argentina. The main problem that arose was that policies which were best from the viewpoint of economic efficiency (e.g., free, or nearly free trade) generated an income distribution favorable to the owners of the relatively most abundant factor of production (land). This strengthened the

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[23]Hopenhayn and Neumeyer (2005) argue that this uncertainty about trade policy significantly hampered capital accumulation during this period.

position of the traditional elite. In Argentina, contrary to what occurred in the United States or Britain, by the end of Second World War, what was efficient was not popular (Diaz Alejandro, 1970). Once workers voted on a large scale for the first time in 1946, an urban-rural cleavage developed under the leadership of Peron. This coalition not only shifted trade policy but it also significantly modified the distribution of public expenditures towards the low-income class. In the 21st century, although Argentina still has a diversified natural resource-rich economic structure, the rise of the service economy has debilitated the supremacy of the 'populist' coalition and its policy can no longer be viewed in terms of an urban-rural cleavage.

1.6. Concluding Remarks

In this paper we have explored the political and economic consequences of the theoretical model of political economy that we developed. We have focused our attention on three main issues. First, we have assumed that the sufficient conditions for policy convergence are satisfied and we have characterized the equilibrium outcome. We have stressed the role of the economic structure in the determination of the political equilibrium.

Second, we have studied how likely it is that an economic structure induces policy convergence. Here the emphasis has been on policy stability, rather than on comparing the equilibrium levels of protection induced by different economic and political structures. This is a question that has not been emphasized in the traditional literature of the political economy of international trade. However, we think it is a relevant issue because high volatility and sudden changes in trade policies have been considered important impediments to growth in many developing countries.

Third, we have considered and interpreted the political equilibrium under divergence. In particular, we have shown that there can exist a political equilibrium in which there

is a positive probability of a "populist" outcome with a high level of protection and more public goods for unskilled workers. In addition there can exist a "middle class" outcome with a relatively lower level of protection and more public goods for specific factors. We interpret this result to mean that, in equilibrium, society can switch from one of these outcomes to the other.

Finally, globalization has recently been a powerful force in bringing about economic convergence across many countries (see O'Rourke and Williamson, 1999). When there was a backlash against globalization after the 1930 crisis, the result was economic divergence. For many developing countries, this backlash lasted for almost 50 years. Today, there is a persistent fear of a repeat of the past, that the current economic crisis will again induce a backlash against world market integration. Though this is possible, our analysis suggest that the risk of it is less likely than it was eighty years ago. The main reason is the growth of the service economy through the world. As we have shown, the development of the non-tradeable sector in the economy plays a key role in political alignments, since the skilled service workers push the political equilibrium toward the ideal position of the relative abundant factor in the economy. Therefore, they act as a moderating force against the protectionist tendency.

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Appendix 1.1: The Economy

In this appendix we characterize the competitive equilibrium of the economic model. The final goal is to prove Lemma 1.1 in section 1.2.

Let $\bar{Q}_X$ $(\bar{Q}_Y)$ be the maximum output of industry X (Y) given the aggregate endowment $\mathbf{e}$, so $\bar{Q}_X = A_X \left(\bar{F}_X\right)^{\alpha_X} \left(\bar{L}\right)^{1-\alpha_X}$, $\bar{Q}_Y = A_Y \left(\bar{F}_Y\right)^{\alpha_Y} \left(\bar{L}\right)^{1-\alpha_Y}$. Let l_s be the fraction of factor L employed in industry $s = X, Y$. From profit maximization in industries X and Y, we obtain the equilibrium allocation of labor between the tradable industries

$$(1 - \alpha_X) p_X \bar{Q}_X (l_Y)^{\alpha_Y} = (1 - \alpha_Y) p_Y \bar{Q}_Y (1 - l_Y)^{\alpha_X}. \tag{18}$$

Under the Cobb Douglas utility assumption, expenditure shares are constant, so $\frac{p_X C_X}{\beta_X} = \frac{p_Y C_Y}{\beta_Y} = \frac{p_N C_N}{\beta_N}$, where C_s is the aggregate consumption of good $s = X, Y, N$. Since we do not allow international factor mobility the trade balance must be balanced, that is $p_X^* (Q_X - C_X) + p_Y^* (Q_Y - C_Y) = 0$. From these two expressions, we obtain the equilibrium price of the non-tradable good

$$p_N = \left(\frac{\beta_N}{\beta_X \frac{p_X^*}{p_X} + \beta_Y \frac{p_Y^*}{p_Y}}\right) \left[\frac{p_X^* \bar{Q}_X (1 - l_Y)^{1-\alpha_X} + p_Y^* \bar{Q}_Y (l_Y)^{1-\alpha_Y}}{\bar{Q}_N}\right]. \tag{19}$$

It is not difficult to see that there exists a unique l_Y that solves equation (18).[24] Once l_Y is determined, equation (19) determines a unique p_N. Hence, given a vector of international prices $\mathbf{p}^*$, a vector of factor endowments $\mathbf{e}$, and an import tax rate τ, equations (18) and (19) determine a unique equilibrium. Denote by $l_Y(\tau)$ and $p_N(\tau)$ the functions that give

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[24]Rearranging terms in equation (18) we have:

$$\frac{(l_Y)^{\alpha_Y}}{(1 - l_Y)^{\alpha_X}} = \frac{(1 - \alpha_Y) p_Y \bar{Q}_Y}{(1 - \alpha_X) p_X \bar{Q}_X}$$

The right hand side of this expression is a positive constant while the left hand side is an strictly increasing function of l_Y, with $\lim_{l_Y \to 0} = 0$ and $\lim_{l_Y \to 1} = \infty$.

the equilibrium values of l_Y and p_N for each τ, given $\mathbf{p}^*$ and $\mathbf{e}$. A direct application of the implicit function theorem implies that these functions are continuously differentiable. Analogously, let $w_k(\tau)$ denotes the equilibrium nominal rental price of factor k, and define the equilibrium consumer price index as the following geometric average of the prices of consumption goods $CPI(\tau) = (p_X)^{\beta_X}(p_Y)^{\beta_Y}(p_N)^{\beta_N}$. Then, the real rental price of factor k is w_k/CPI. We are interested in characterizing how rental factor prices change when the import tax rate changes, which may depend on the comparative advantage of the economy.

Result 1.1 (Comparative Advantage): *Define the economy degree of comparative advantage in industry Y by $\Psi = \frac{A_Y(\bar{F}_Y)^{\alpha_Y}(\bar{L})^{(\alpha_X-\alpha_Y)}}{A_X(\bar{F}_X)^{\alpha_X}}$. Then, the economy has a comparative advantage in industry X (respectively Y) if and only if $\Psi < \Omega \frac{p_X^*}{p_Y^*}$ (respectively $\Psi > \Omega \frac{p_X^*}{p_Y^*}$), where $\Omega = \frac{(\beta_Y)^{\alpha_Y}(1-\alpha_X)^{1-\alpha_X}}{(\beta_X)^{\alpha_X}(1-\alpha_Y)^{1-\alpha_Y}}[\beta_Y(1-\alpha_Y)+\beta_X(1-\alpha_X)]^{\alpha_X-\alpha_Y}$.* **Proof**: *see extended appendix in Galiani et. al. (2011).* ∎

Next, we focus on the rental factor prices. We begin with specific factors.

Result 1.2 (Specific-Factors Rental Prices): *Let τ_{aut} be the tax rate on imports that pushes the economy into autarky. The real rental factor prices of the factor specific to the exporting industry and the non-tradable industry are decreasing in the import tax rate for all $\tau \in [0, \tau_{aut}]$; while the real rental factor price of the factor specific to the import competing industry is increasing in the import tax rate for all $\tau \in [0, \tau_{aut}]$.* **Proof**: *see extended appendix in Galiani et. al. (2011).* ∎

Next, we consider the mobile factor.

Result 1.3 (Mobile-Factor Rental Price): *Suppose that the economy has a comparative advantage in the less labor intensive industry X, that is $\Psi < \Omega \frac{p_X^*}{p_Y^*}$. Then, if $\Psi = 0$, the real wage is decreasing in the import tax rate for all $\tau \geq 0$, while if*

$\Psi > \left(\frac{\alpha_Y}{1-\alpha_Y}\right)^{\alpha_Y} \left(\frac{1-\alpha_X}{\alpha_X}\right)^{\alpha_X} \Omega\left(\frac{p_X^*}{p_Y^*}\right)$, *the real wage is increasing in the import tax rate for all* $\tau \in [0, \tau_{aut}]$. *On the other hand, suppose that the economy has a comparative advantage in the more labor intensive industry* Y, *that is* $\Psi > \Omega \frac{p_X^*}{p_Y^*}$. *Then, if the following two conditions hold, the real wage is decreasing in the import tax rate for all* $\tau \in [0, \tau_{aut}]$:

1. $\alpha_X \geq \max\left\{\frac{\beta_X(1-2\alpha_Y)}{\beta_X(1-2\alpha_Y)+\beta_Y(1-\alpha_Y)}, \frac{(\beta_Y+\beta_N)\alpha_Y}{\beta_Y+\beta_N\alpha_Y}\right\}$

2. $\Omega\frac{p_X^*}{p_Y^*} < \Psi \leq (1+\bar{\tau}_{aut.})\,\Omega\frac{p_X^*}{p_Y^*}$, *where* $\bar{\tau}_{aut} = \frac{1}{2}\left[\sqrt{\left(1+\frac{\beta_Y}{\beta_X}\right)^2 + 4\frac{\beta_Y}{\beta_X}} - \left(1+\frac{\beta_Y}{\beta_X}\right)\right]$.

   Proof: *see extended appendix in Galiani et. al. (2011).* ∎

Results 1.2 and 1.3 are very useful to prove lemma 1.1, which is our final goal in this appendix.

Proof of Lemma 1.1: Since $v^k(\tau, \gamma)$ is a continuous function and the policy space Z is a compact set, a global maximum (τ^k, γ^k) exists. Since $v^k(\tau, \gamma)$ is strictly increasing in γ for $k = L$ and strictly decreasing in γ for $k = F_X, F_Y, F_N$ we have $\gamma^k = 0$ for $k = F_X, F_Y, F_N$, and $\gamma^L = 1$. The ideal import tax rate τ^k must be interior because for $\tau = 0$ and $\tau = \tau_{aut}$ government revenue is zero and $H'(0) \to \infty$. Therefore, the derivative of $v^k(\tau, \gamma)$ with respect to τ evaluated at (τ^k, γ^k) must be equal to zero, or which is equivalent, τ^k must satisfies:

$$\eta_{w_k/CPI,\tau} \frac{w_k\bar{k}}{n_k} + RH'\left(\frac{R}{CPI}\right)\eta_{R/CPI,\tau} = 0$$

Consider an economy with structure 1. It is not difficult to verify from the proves of results 2 and 3 that $\eta_{w_{F_X}/CPI,p_Y} < \eta_{w_{F_N}/CPI,p_Y} < \eta_{w_L/CPI,p_Y} < 0$. Since $H'(0) \to \infty$ and $\frac{w_{F_X}\bar{F}_X}{n_{F_X}} \geq \frac{w_{F_N}\bar{F}_N}{n_{F_N}} \geq \frac{w_L\bar{L}}{n_L}$, the previous expression implies that $\tau^{F_X} < \tau^{F_N} < \tau^L < \tau_{\max}$. For an economy with structure 2, again it is not difficult to verify that $\eta_{w_{F_Y}/CPI,p_Y} > \eta_{w_L/CPI,p_Y} > 0$, and $\eta_{w_{F_X}/CPI,p_Y} < \eta_{w_{F_N}/CPI,p_Y} < 0$. Since

$H'(0) \rightarrow \infty$ and $\max \left\{ \frac{w_{F_X} \bar{F}_X}{n_{F_X}}, \frac{w_{F_Y} \bar{F}_Y}{n_{F_Y}} \right\} \geq \frac{w_{F_N} \bar{F}_N}{n_{F_N}} \geq \frac{w_L \bar{L}}{n_L}$, the previous expression implies that $\tau^{F_X} < \tau^{F_N} < \tau_{\max} < \tau^L < \tau^{F_Y}$. Finally, for an economy with structure 3, we have $\eta_{w_{F_Y}/CPI, p_X} < \eta_{w_{F_N}/CPI, p_X} < \eta_{w_L/CPI, p_X} < 0$ and $\eta_{w_{F_X}/CPI, p_X} > 0$. Since $H'(0) \rightarrow \infty$ and $\max \left\{ \frac{w_{F_X} \bar{F}_X}{n_{F_X}}, \frac{w_{F_Y} \bar{F}_Y}{n_{F_Y}} \right\} \geq \frac{w_{F_N} \bar{F}_N}{n_{F_N}} \geq \frac{w_L \bar{L}}{n_L}$, the previous expression implies that $\tau^{F_Y} < \tau^{F_N} < \tau^L < \tau_{\max} < \tau^{F_X}$. ∎

Appendix 1.2: The Polity

In this appendix we prove propositions 1.1 and 1.2.

Proof of Proposition 1.1: As we have already shown, the *joint weighted electoral mean* $\mathbf{z}_m$ satisfies the first order condition for a local equilibrium for all parties (10). Hence, in order to verify that $\mathbf{z}_m$ is a strict local Nash equilibrium, we only need to check whether the Hessian matrix of each party evaluated at $\mathbf{z}_m$ is negative definite. To prove that $c\left(\Gamma_{exo.}\right) < 1$, it is sufficient for $\mathbf{D}^2 S_j\left(\mathbf{z}_m\right)$ to be negative definite for all $j \in P$. We proceed as follows: We have defined the characteristic matrix as $\mathbf{H}_j\left(\mathbf{z}_m\right) = \sum_{k \in V} n_k \left(A_j \mathbf{W}^k \mathbf{B}_{z_m}^k \mathbf{W}^k - \mathbf{W}^k\right)$. Then, the Hessian matrix of party j evaluated at $\mathbf{z}_m$ is given by:

$$\mathbf{D}^2 S_j\left(\mathbf{z}_m\right) = 2\rho_j\left(\mathbf{z}_m\right)\left(1 - \rho_j\left(\mathbf{z}_m\right)\right)\mathbf{H}_j\left(\mathbf{z}_m\right).$$

Since $2\rho_j\left(\mathbf{z}_m\right)\left(1 - \rho_j\left(\mathbf{z}_m\right)\right)$ is a positive constant, $\mathbf{D}^2 S_j\left(\mathbf{z}_m\right)$ is negative definite (semi-definite) if and only if $\mathbf{H}_j\left(\mathbf{z}_m\right)$ is negative definite (semi-definite). The trace of $\mathbf{H}_j\left(\mathbf{z}_m\right)$ is given by

$$\begin{aligned}
\mathrm{Tr}\left(\mathbf{H}_j\left(\mathbf{z}_m\right)\right) &= \sum_{k \in V} n_k \mathrm{Tr}\left(A_j \mathbf{W}^k \mathbf{B}_{z_m}^k \mathbf{W}^k - \mathbf{W}^k\right) \\
&= A_j \sum_{k \in V} n_k \mathrm{Tr}\left(\mathbf{W}^k \mathbf{B}_{z_m}^k \mathbf{W}^k\right) - \sum_{k \in V} n_k \mathrm{Tr}\left(\mathbf{W}^k\right) \\
&= \left[\frac{A_j}{A_1} d\left(\Gamma_{exo}\right) - 1\right] \sum_{k \in V} n_k \left(\phi_\tau^k + \phi_\gamma^k\right)
\end{aligned}$$

Since parties are ordered according to their valences $A_1 \geq \dots \geq A_j \geq \dots \geq A_p$, this implies

$$\mathrm{Tr}\left(\mathbf{H}_1\left(\mathbf{z}_m\right)\right) \geq \dots \geq \mathrm{Tr}\left(\mathbf{H}_j\left(\mathbf{z}_m\right)\right) \geq \dots \geq \mathrm{Tr}\left(\mathbf{H}_p\left(\mathbf{z}_m\right)\right).$$

Therefore, if $d\left(\Gamma_{exo}\right) < 1$, then $\mathrm{Tr}(\mathbf{H}_j\left(\mathbf{z}_m\right)) < 0$ for all $j \in P$.

The determinant of $\mathbf{H}_j\left(\mathbf{z}_m\right)$ is given by

$$
\begin{aligned}
\det\left(\mathbf{H}_j\left(\mathbf{z}_m\right)\right) = {} & \left(A_j\right)^2 \sum\nolimits_{k \in V} n_k \left(\mathbf{W}^k \mathbf{B}_{z_m}^k \mathbf{W}^k\right)_{11} \sum\nolimits_{k \in V} n_k \left(\mathbf{W}^k \mathbf{B}_{z_m}^k \mathbf{W}^k\right)_{22} \\
& - \left(A_j\right)^2 \left[\sum\nolimits_{k \in V} \left(\mathbf{W}^k \mathbf{B}_{z_m}^k \mathbf{W}^k\right)_{21}\right]^2 \\
& + \left(\sum\nolimits_{k \in V} n_k \phi_\tau^k\right) \left(\sum\nolimits_{k \in V} n_k \phi_\gamma^k\right) \left[1 - \frac{A_j}{A_1} c\left(\Gamma_{exo}\right)\right]
\end{aligned}
$$

By the triangle inequality, the sum of the first two terms in this expression for $\det\left(\mathbf{H}_j\left(\mathbf{z}_m\right)\right)$ must be non-negative. Moreover, $A_1 \geq \ \ldots \ \geq A_j \ \geq \ldots \ \geq A_p$ implies

$$
\left[1 - \frac{A_p}{A_1} c\left(\Gamma_{exo}\right)\right] \geq \ \ldots \ \geq \left[1 - \frac{A_j}{A_1} c\left(\Gamma_{exo}\right)\right] \geq \ \ldots \ \geq \left[1 - c\left(\Gamma_{exo}\right)\right].
$$

Therefore, if $c\left(\Gamma_{exo}\right) < 1$, then $\det\left(\mathbf{H}_j\left(\mathbf{z}_m\right)\right) > 0$ for all $j \in P$.

Since $d\left(\Gamma_{exo}\right) < c\left(\Gamma_{exo}\right)$, then $c\left(\Gamma_{exo}\right) < 1$ implies that $\mathrm{Tr}(\mathbf{H}_j\left(\mathbf{z}_m\right)) < 0$, and $\det\left(\mathbf{H}_j\left(\mathbf{z}_m\right)\right) > 0$ for all $j \in P$. Thus $c\left(\Gamma_{exo}\right) < 1$ is a sufficient condition for $\mathbf{D}^2 S_j\left(\mathbf{z}_m\right)$ to be negative definite for all $j \in P$. This completes the proof of sufficiency

For the necessary part, assume that $\mathbf{z}_m$ is a weak local Nash equilibrium. Then the Hessian matrix of each party evaluated at $\mathbf{z}_m$ must be negative semi-definite. This implies $\det\left(\mathbf{D}^2 S_j\left(\mathbf{z}_m\right)\right) \geq 0$ and $\mathrm{Tr}\left(\mathbf{D}^2 S_j\left(\mathbf{z}_m\right)\right) \leq 0$ for all $j \in P$. This is true if and only if $\det\left(\mathbf{H}_j^2\left(\mathbf{z}_m\right)\right) \geq 0$ and $\mathrm{Tr}\left(\mathbf{H}_j^2\left(\mathbf{z}_m\right)\right) \leq 0$ for all $j \in P$. $\mathrm{Tr}(\mathbf{H}_1\left(\mathbf{z}_m\right)) \leq 0$ if and only if $d\left(\Gamma_{exo}\right) \leq 1$. If $d\left(\Gamma_{exo}\right) > 1$, then $\mathrm{Tr}(\mathbf{H}_1\left(\mathbf{z}_m\right))$ must be strictly positive, and so one of the eigenvalues of $\mathbf{H}_1\left(\mathbf{z}_m\right)$ must be strictly positive, violating the weak Nash equilibrium condition. This completes the proof. $\blacksquare$

Proof of Proposition 1.2: Let us suppose that there are only two parties and that the endogenous valence functions are linear in the contributions and the same for both parties, so that $\mu_j = \mu \sum\nolimits_{k \in V} c_{k,j}$. Then, the probability that a voter in group k votes for

party j rather than for party $l \neq j$, for $j = 1, 2$, is:

$$\rho_j^k (\mathbf{z}, \mathbf{c}) = \left[1 + \exp \left(v_{pol}^k (z_l) - v_{pol}^k (z_j) + \lambda_l - \lambda_j + \mu \sum_{k \in V} (c_{k,j} - c_{k,l}) \right) \right]^{-1}.$$

Since we are assuming that there is no commitment mechanism, in order to determine optimal contributions after the platform profile $\mathbf{z} = (z_1, z_2)$ is announced, each organization leader maximizes (14) taking $\mathbf{z} = (z_1, z_2)$ as given. The first order solution of this problem is[25]:

$$c_{k,j} = \bar{\mu} (\mathbf{z}, \mathbf{c}) \max \left\{ 0, (n_k)^2 \left[a_{k,j} v_{pol}^k (z_j) + b_{k,j} - a_{k,l} v_{pol}^k (z_l) - b_{k,l} \right] \right\}. \tag{20}$$

In this case $\bar{\mu} (\mathbf{z}, \mathbf{c}) = \mu \sum_{h \in V} n_h \rho_1^h (\mathbf{z}, \mathbf{c}) \left(1 - \rho_1^h (\mathbf{z}, \mathbf{c}) \right)$. Thus (20) implies that if $a_{k,j} v_{pol}^k (z_j) + b_{k,j} \neq a_{k,l} v_{pol.}^k (z_l) + b_{k,l}$ then each leader contributes at most to one party. If $a_{k,j} v_{pol}^k (z_j) + b_{k,j} = a_{k,l} v_{pol.}^k (z_l) + b_{k,l}$, then the leader does not contribute to any party. Adding up the first order conditions of all leaders we obtain the following expression:

$$\frac{\sum_{k \in V} (c_{k,j} - c_{k,l})}{\bar{\mu} (\mathbf{z}, \mathbf{c})} = \sum_{k \in V} (n_k)^2 \left[a_{k,j} v_{pol}^k (z_j) + b_{k,j} - a_{k,l} v_{pol}^k (z_l) - b_{k,l} \right]. \tag{21}$$

Since, given $\mathbf{z}$, $\bar{\mu} (\mathbf{z}, \mathbf{c})$ only depends on $\sum_{k \in V} (c_{k,j} - c_{k,l})$, this expression implicitly gives the equilibrium value of $\sum_{k \in V} (c_{k,j} - c_{k,l})$ as a function of $\mathbf{z}$ and other parameters. Then, (20) determines the equilibrium contribution functions. Let $c_k^* : \mathbf{Z} \to \Re_+^p$ be the no commitment equilibrium contribution function of organization k, and let $\mathbf{c}^* = \times_{k \in V} c_k^*$. Define

$$C_{j-l}^* (\mathbf{z}) = \sum_{k \in V} \left(c_{k,j}^* (\mathbf{z}) - c_{k,l}^* (\mathbf{z}) \right).$$

Parties determine their optimal policy positions with respect to such a profile of no-

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[25]The first order condition gives a unique maximum since, given $\mathbf{z}$, we can make L_k an strictly concave function of c_k. The reason is that we can always find values of $a_{k,j}$ and $b_{k,j}$ small enough such that the quadratic cost of collecting the contributions prevails and L_k becomes an strictly concave function of c_k.

commitment contribution functions. The problem for party j is to maximize $S_j(\mathbf{z}) = S_j(\mathbf{z}, \mathbf{c}^*(\mathbf{z}))$. Since $S_j(\mathbf{z})$ only involves $C^*_{j-l}(\mathbf{z})$ and C^*_{j-l} is a differentiable function of $\mathbf{z}$, S_j is also a differentiable function of $\mathbf{z}$. Hence we can again use calculus to solve each party problem.

The first order necessary condition for party j is given by

$$\mathbf{D}S_j(\mathbf{z}) = -2\sum_{k \in V} n_k \rho_j^k(\mathbf{z}) \left(1 - \rho_j^k(\mathbf{z})\right) \begin{pmatrix} \phi_\tau^k\left(\tau_j - \tau^k\right) - \frac{\mu}{2}\frac{\partial C^*_{j-l}(\mathbf{z})}{\partial \tau_j} \\ \phi_\gamma^k\left(\gamma_j - \gamma^k\right) - \frac{\mu}{2}\frac{\partial C^*_{j-l}(\mathbf{z})}{\partial \gamma_j} \end{pmatrix} = \mathbf{0}.$$

Here $\rho_j^k(\mathbf{z}) = \left[1 + \exp\left(v_{pol}^k(z_l) - v_{pol}^k(z_j) - \mu\left(C^*_{j-l}(\mathbf{z})\right) + \lambda_l - \lambda_j\right)\right]^{-1}$. This is expression (16) in the section 4.

The second order sufficient (necessary) condition is that the matrix $\mathbf{D}^2 S_j(\mathbf{z})$ evaluated at a profile that satisfies the first order condition be negative definite (semi-definite), where

$$\mathbf{D}^2 S_j(\mathbf{z}) = 2\sum_{k \in V} n_k \rho_j^k(\mathbf{z}) \left(1 - \rho_j^k(\mathbf{z})\right) \left[2\left(1 - 2\rho_j^k(\mathbf{z})\right) \mathbf{W}^k \mathbf{B}_{\tilde{z}_j}^k \mathbf{W}^k - \tilde{\mathbf{W}}^k\right],$$

$$\text{where } \tilde{z}_j = z_j - \frac{\mu}{2}\left(\mathbf{W}^k\right)^{-1} \mathbf{D}C^*_{j-l}(\mathbf{z}), \tilde{\mathbf{W}}^k = \mathbf{W}^k - \frac{\mu}{2}\mathbf{D}^2 C^*_{j-l}(\mathbf{z})$$

$$\text{and } \mathbf{W}^k = \begin{bmatrix} \phi_\tau^k & 0 \\ 0 & \phi_\gamma^k \end{bmatrix}; \mathbf{B}_{\tilde{z}_j}^k = \begin{bmatrix} \left(\tilde{\tau}_j - \tau^k\right)^2 & \left(\tilde{\gamma}_j - \gamma^k\right)\left(\tilde{\tau}_j - \tau^k\right) \\ \left(\tilde{\gamma}_j - \gamma^k\right)\left(\tilde{\tau}_j - \tau^k\right) & \left(\tilde{\gamma}_j - \gamma^k\right)^2 \end{bmatrix}.$$

This is expression (17) in section 4.

Part 1 (Non Partisan Organizations): Suppose the organizations are non partisan and that the influence ability of each organization is the same for both parties. Then, from (21) is not difficult to verify that if we consider a profile $\mathbf{z}$ such that $z_1 = z_2 = (\tau, \gamma)$ then: (i) $C_j^*(\mathbf{z}) = C_l^*(\mathbf{z}) = 0$, (ii) $\rho_1(\mathbf{z}) = \left[1 + \exp\left(\lambda_2 - \lambda_1\right)\right]^{-1}$,

and (iii) $\frac{\mu}{2}\mathbf{D}C^*_{j-l}(\mathbf{z}) = \rho_1(\mathbf{z})(1-\rho_1(\mathbf{z}))\sum_{k\in V}(n_k)^2 a_k \begin{pmatrix} \phi^k_\tau(\tau-\tau^k) \\ \phi^k_\gamma(\gamma-\gamma^k) \end{pmatrix}$. Introducing (i)-(iii) into the first order condition (16), and rearranging terms we obtain a system of equations, whose unique solution is the profile $\bar{\mathbf{z}}_m$. Therefore, $\bar{\mathbf{z}}_m$ is the unique profile that simultaneously satisfies the first order condition and predicts parties convergence. A sufficient (necessary) condition for $\bar{\mathbf{z}}_m$ to induce a strict (weak) local maximum for each party is that the Hessian matrices of both parties evaluated at $\bar{\mathbf{z}}_m$, denoted $\mathbf{D}^2 S_j(\bar{\mathbf{z}}_m)$, be negative definite (semi-definite). Finally, if $\bar{\mathbf{z}}_m$ induces a strict (weak) local maximum for both parties, then $\bar{\mathbf{z}}_m$ is a strict (weak) local Nash equilibrium of the game Γ_{end}. Hence, the parties platforms $\bar{\mathbf{z}}_m$ and the contribution functions $c^*_{k,j}(\mathbf{z})$ form a strict (weak) local sub-game perfect Nash Equilibrium, which completes the proof of the first part of the proposition.

Part 2 (Partisan Organizations): Now, suppose that each organization is attached to only one specific party. Rearranging terms in the first order condition (16) we obtain a system of equations:

$$\tau_j = \sum_{k\in V}\left[\frac{\rho^k_j(\mathbf{z})\left(1-\rho^k_j(\mathbf{z})\right)n_k\phi^k_\tau}{\sum_{h\in V}\rho^h_j(\mathbf{z})\left(1-\rho^h_j(\mathbf{z})\right)n_h\phi^h_\tau}\right]\tau^k + \frac{\mu}{2}\frac{\partial C^*_{j-l}(\mathbf{z})}{\partial\tau_j}, \qquad (22)$$

$$\gamma_j = \sum_{k\in V}\left[\frac{\rho^k_j(\mathbf{z})\left(1-\rho^k_j(\mathbf{z})\right)n_k\phi^k_\gamma}{\sum_{h\in V}\rho^h_j(\mathbf{z})\left(1-\rho^h_j(\mathbf{z})\right)n_h\phi^h_\gamma}\right]\gamma^k + \frac{\mu}{2}\frac{\partial C^*_{j-l}(\mathbf{z})}{\partial\gamma_j}, \qquad (23)$$

We now show that $z_1 = z_2$ cannot be a solution of this system. Assume for a moment that $z_1 = z_2 = (\tau,\gamma)$ is a solution of the system of balance equations, then from (21) $\frac{\mu}{2}\mathbf{D}C^*_{j-l}(\mathbf{z}) = \rho_1(\mathbf{z})(1-\rho_1(\mathbf{z}))\sum_{k\in V}(n_k)^2 a_{k,j}\begin{pmatrix}\phi^k_\tau(\tau-\tau^k) \\ \phi^k_\gamma(\gamma-\gamma^k)\end{pmatrix}$. Hence $\mathbf{D}C^*_{j-l}(\mathbf{z}) \neq$ $\mathbf{D}C^*_{l-j}(\mathbf{z})$, which due to (22) and (23) implies that $\tau_1 \neq \tau_2$ and $\gamma_1 \neq \gamma_2$, which is a

contradiction. Therefore there is no profile that at the same time satisfies $z_1 = z_2$ and the first order condition (16). From the balance conditions (22)-(23) we observe that the equilibrium position of each party, denoted z_j^*, must be a trade off between the centrifugal force of electoral center, captured by the first terms of the right hand side of (22) and (23), and the centripetal force of contributions, captured by the second terms of the right hand side of (22) and (23). Following the same arguments of the first part of the proof a sufficient (necessary) condition for this profile to induce a strict (weak) local sub-game perfect Nash equilibrium is that the Hessian matrices of both parties evaluated at this profile $\mathbf{D}^2 S_j(\mathbf{z}^*)$ be negative definite (semi-definite). ■

Chapter 2: Autocracy, Democracy and Trade Policy[26]

Abstract

This essay develops a political economy model in order study the role of intra-elite conflict in the simultaneous determination of the political regime, trade policy and a re-distribution scheme based on income taxation. There are three socioeconomic groups: two elite factions and the workers), whose preferences over trade policy and income taxation are derived from a simple open economy model. The critical point is that income taxation induces a rich-poor/elite-workers political cleavage, while trade policy opens the door to intra-elite conflict. In this model, when there is no intra?elite conflict, changes in trade policy are associated with political transitions. Coups (democratizations) open up the economy if and only if both elite factions are pro-free trade (protectionist). However, in the presence of intra-elite conflict, autocracies respond to popular revolts by changing trade policy and reallocating political power within the elite (toward the elite faction with the same trade policy preference as the workers) rather than offering democratization. The change in trade policy is credible because the elite faction with the same trade policy preference as the workers controls the autocracy. Moreover, in the presence of intra-elite conflict, coups tend to maintain the trade policy, unless popular demands are extremely radical and/or the elite faction with the same trade policy preference as the workers is exceptionally weak.

2.1 Introduction

The question as to what factors determine the institutional framework of collective decision-making is central to political science and political economy and has received considerable attention in the literature (see, in addition to more modern works, the classic contributions of Lipset, 1959; Moore, 1966; Luebbert, 1991; Rustow, 1970; Linz and Stepan, 1978; O'Donnell, 1973; O'Donnell and Schmitter, 1986; Dahl, 1971; and Olson, 1993). In a very important recent work, Acemoglu and Robinson (2000, 2006) make a significant contribution to this literature by developing an economic model of autocracy and democracy in which the income-distribution conflict, mediated by different political institutions, emerges as the main determinant of the political regime.

The kinds of elite-controlled political transitions from autocracy to democracy and from democracy to military regimes studied by Acemoglu and Robinson (2006) are central to our understanding of the process of development. In fact, many of those transitions occur in conjunction with radical changes in economic policies dealing with such issues as trade barriers. This should not, after all, be surprising, since trade policy is a key determinant of income distribution (see, for example, Stolper and Samuelson, 1941).[27]

An illustrative example is found in the history of Argentina in the twentieth century (see Galiani and Somaini, 2010). At the beginning of that century, Argentina's factor endowment resembled that of a specialized, natural-resource-rich economy. Both the elite and the general populace supported free trade. However, during the inter-war period, trade opportunities were scarce and the terms of trade worsened, which triggered an industrialization process that then gathered momentum during the Great Depression of the 1930s and the Second World War. As a result, Argentina embarked on the second half of the twentieth century with a very different economic configuration. In addition, after workers

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[27]Trade policy has been portrayed as an important determinant of political cleavages throughout history (see, among others, Rogowski, 1987 and 1989; Gourevitch, 1986; Findlay and O'Rourke, 2007; Galiani, Schofield and Torrens (2010); and Acemoglu and Yared, 2010).

had voted on a large scale for the first time in 1946, an urban-rural cleavage developed under the leadership of Perón which lasted until the advent of the dictatorship in 1976. This new political equilibrium brought the economy to the verge of autarky. Democracy did not take hold, and a series of transitions to autocracy and back to a constrained form of democracy took place during this period. However, none of the autocratic governments that ruled the country until the coup of 1976, which deposed a highly populist Peronist government, was controlled by the agricultural free-trade elite, nor did any of them open up the economy significantly. By contrast, the military government that took power in 1976 was mainly controlled by the agricultural elite and brought the economy back from the edge of autarky (see Brambilla, Galiani and Porto, 2010).[28]

Another more subtle, but very telling, example is that of the repeal of the Corn Laws in England. Britain's bold move to free trade in 1846 was both unprecedented and unilateral; moreover, it ran counter to the core protectionist ideology of the Conservative Party while simultaneously undercutting the economic interests of the ruling landed aristocracy. After the repeal of the Corn Laws, Prime Minister Peel himself said that he had sought repeal in order to satisfy the wishes of the industrialists. He indicated that a "narrow representation of Parliament" –control of Parliament by the landed aristocracy– required that concessions be made to satisfy interest groups that were clamoring for reform. Otherwise, he implied, pressures for reform might have become overwhelming, as they had at the time of the French Revolution (see Schonhard-Bailey, 2006). Thus, the repeal of the Corn Laws was an attempt to moderate the mounting pressures for parliamentary reform: if the industrialists were satisfied by this move, then the drive to gain control of parliamentary seats would ebb and, even more importantly, the working-class Chartist movement (which was seeking a

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[28] As explained by O'Donnell (1977), at least until 1976, the alliance of the industrialists and landlords in Argentina lasted only for short periods; "dissolving rapidly in situations which repeatedly put these two dominants fractions of the Argentine bourgeoisie in different political camps" (see, also, Mallon and Sourrouille, 1975).

more radical reform of Parliament) would lose momentum (see Searle, 1993; and Schonhard-Bailey, 2006).[29]

These two examples suggest that endogenizing the choice of trade policy, with the consequent possibility of intra-elite conflict that this ushers in, makes a valuable contribution to a broader understanding of political transitions. This is what we will do in this paper.

The model we have developed in this paper provides a good explanation for the experiences of Great Britain in the nineteenth century and Argentina in the twentieth century. The key components of that explanation are a politically determined trade policy and intra-elite conflict over trade policy. The intuition is relatively simple. When there is intra-elite conflict over trade policy, one of the elite factions has the same trade policy preference as the populace, while the other elite faction has the opposite trade policy preference. In other words, when there is intra-elite conflict over trade policy, the political cleavages that exist in relation to trade policy do not match those that exist in connection with income taxation. This lack of alignment in political cleavages has two important political implications. First, an autocracy controlled by the elite faction that has the same trade policy preference as the populace can placate the supporters of a popular revolt more easily than one that is controlled by the elite faction that has the opposite trade policy preference. This is because an elite faction that has the same trade policy preference as the people can credibly commit to implementing the people's preferred trade policy even after the threat of a revolt has died down. Second, the elite faction that has the same trade policy preference as the populace will have ambiguous feelings about autocratic governments controlled by

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[29]Other more recent notable examples are the move made in the 1990s to embrace both democracy and free trade by the countries of Eastern Europe and the descent into dictatorship and autarchy of much of Africa following independence in the 1950s and 1960s. Using systematic panel data on tariffs, democracy and factor endowments for the period 1870-1914, O'Rourke and Taylor (2006) show that an increase in democratization raises tariffs in countries with high land-labor ratios and lowers tariffs in countries with high capital-labor ratios, though this latter effect is smaller and not always significant (see Table 2 in O'Rourke and Taylor, 2002).

the other faction of the elite, since such governments will, on the one hand, reduce income taxation and redistribution but, on the other hand, may implement a detrimental trade policy.

The first political implication outlined above accounts for the first Reform Act as well as the repeal of the Corn Laws in nineteenth-century Great Britain. The protectionist, landed aristocracy, fearing a revolution, conceded a significant portion of its political power to the pro-free-trade commercial and industrial elite. This political reform averted democratization and paved the way for a switch in trade policy. The second political implication accounts for the coups that resulted in the continuance of import-substitution policies and for the coup that was followed by the opening of the economy in Argentina in the second half of the twentieth century. While democracy was not extremely populist, industrialists supported only those dictatorships that advocated industrial protection, but when radical tendencies threatened to dominate democratic institutions, they tacitly accepted the opening of the economy (see O'Donnell, 1977).

It is easy to see that the introduction of a politically determined trade policy will necessarily affect the equilibrium trade policy. The crucial issue, however, is that this also has a powerful impact on the political regime. In fact, as we will show in this paper, even in the absence of intra-elite conflict, if the elite is protectionist (pro-free-trade) and the populace is pro-free-trade (protectionist), democratization is more likely when trade policy is endogenous than when there is an exogenous free-trade (protectionist) policy, but democratization is less likely when trade policy is endogenous than when there is an exogenous protectionist (free-trade) policy. The consolidation of democracy is always less likely when trade policy is endogenous than when it is exogenous, regardless of the nature of the exogenous trade policy. More importantly, if trade policy is exogenous, then none of our key results under intra-elite conflict will hold, and we will have to revert to the

one-dimensional Acemoglu and Robinson (2006) model, which does not allow us to explain certain features of the experiences of Great Britain in the nineteenth century and Argentina in the twentieth century. The critical point is that trade policy opens the door to a type of political cleavage that differs from the rich-poor/elite-populace cleavage. Indeed, though we stress the role of trade policy in this paper, our model is more general and applies to any policy variable that could potentially divide the elite.[30]

There are several other papers that relate to our work on this subject. First, there are other papers that draw attention to the significance of intra-elite conflict in different contexts. Caselli and Gennaioli (2008) develop a model with heterogeneity in managerial talent in which the existence of a market for control rights over incumbent firms facilitates some reforms (particularly financial reform) by dividing the preferences of the elite (talented groups oppose the reform, but untalented incumbents might favor it). Therefore, albeit in a difference context, they point out to the import role of intra-elite divisions in shaping economic and political outcomes. Lizzeri and Persico (2004) have developed a model of democratization in which "the elites willingly extend the franchise because elections with a broader franchise can give better incentives to politicians ... [and cause] a shift away from special-interest politicking toward ... more public-oriented legislative activity." Moreover, in their model, only the majority of the elite needs to support the extension of the franchise, while there can be a minority of the elite that loses ground with the reform. Acemoglu (2010) develops a model of State capacity in which the effectiveness of intra-elite conflict in controlling the State intensifies as the State's capacity grows and as more efficient forms of taxation and redistribution therefore become available. The key finding is that the destructive effect of more intra-elite conflict can offset the beneficial effect of increased State capacity. Ghosal and Proto (2008) build a model of democratization in which intra-

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[30]Another obvious example is the development of a no-fee school system, which might be opposed by landlord elites but supported by industrialist elites (see Galor, Moav, and Vollrath, 2009).

elite conflict plays a crucial role. They develop a coalition formation game with two elite groups that are uncertain about their relative future level of political power and a non-elite group that cannot act collectively. Under dictatorship, the stronger elite obtains all the surplus, while, under democracy, the weaker elite group forms a coalition with the non-elite group, which induces a more balanced division between the elites. Democratization occurs when the elites are sufficiently risk-averse. Our model shares the same general idea as put forward by Ghosal and Proto (2008), i.e., that an elite group may be willing to form a coalition with the non-elite group in order to improve its bargaining power with the other elite group. Beyond this, however, there are several differences. Our model is a non-cooperative one with no explicit coalition formation. In Ghosal and Proto (2008), there is only one policy variable –the division of a unit of surplus– while, in our model, there are two: income taxation and trade policy. Thus, in our model, there can be two different political cleavages: one based on income taxation and the other based on trade policy. In other words, in our model there is one elite group that can be tempted by the other elite group with low taxation and also by the non-elite group with a favorable trade policy. Another important difference is that we use the Acemoglu and Robinson (2006) framework, in which democratization has nothing to do with risk aversion; rather, it is the institutional change that the elites accept as a credible means of transferring political power in order to avoid a revolt. The novel aspects of our model are: that democracy may now be more costly for one elite group (the one with opposite trade policy preferences to those of the non-elite group) than for the other; that the elite groups must somehow bargain to reach a decision as to which one will control the dictatorship and, hence, which trade policy the dictatorship will implement; and, finally, that the non-elite group is not indifferent as to which group controls the dictatorship and that it may be able to influence this decision.

Second, there is an extensive body of literature that studies how international trade affects domestic political alignments (see, among others, Rogowski, 1987 and 1989). In most cases, this literature informally assumes a political economy model. We, on the other hand, use a formal model of policy determination. More importantly, this literature often considers only the political cleavages that result from the effects of international trade on different social groups and pays little attention to other potential political cleavages that might interact with the ones induced by the effects of international trade. Thus, the underlying model of policy determination is one-dimensional. In contrast, we consider a two-dimensional policy space in which political cleavages in respect of trade policy may or may not coincide with political cleavages in other areas, such as income redistribution through taxation. In other words, protectionist and pro-free-trade coalitions may differ from poor and rich coalitions. The main message of this paper is that this situation may have important implications for both the political regime and trade policy.

The rest of the paper is organized as follows. In section 2.2, we introduce a model of a society integrated by two elite groups and one non-elite group that must make two collective decisions. In section 2.3, we incorporate this model into a simple static coup game, while in section 2.4 we do the same with a simple static democratization game. In both sections we illustrate the results with historical examples of intra-elite conflict: Argentina during the twentieth century and Great Britain during the nineteenth century, respectively. In section 2.5 we develop a fully dynamic model that integrates the coup and the democratization game. In Section 2.6, we present our conclusions.

2.2 The Model

In this section we build a model of a society composed of two elite groups and one non-elite group that must make two collective decisions: one about income taxation and

one about trade policy. We first describe the economic environment. Then we explain the political institutions involved.

2.2.1 The Economy

Consider a society formed by three groups: two elite factions, denoted by L and K (for example, landlords and industrialists), and a non-elite group called "the people" or "the populace" and denoted P (for example, workers). Let n_i be the proportion of the population that belongs to group $i = L, K, P$; and let y_i be the gross income (before the redistribution scheme) of a member of group i. The government runs a balanced budget redistribution scheme that taxes the income of all citizens at a rate $\tau \in [0, 1]$ and redistributes the proceeds through a lump-sum transfer. Income taxation is costly, as the government must incur a cost of $C(\tau)$ units of output in order to collect τ units of output in taxes, where the cost function C is strictly increasing and strictly convex, and $C(0) = 0$ and $C'(0) < 1 - \frac{y_P}{\bar{y}} < C'(1)$ (for example, $C(\tau) = \frac{\tau^{1+\eta}}{1+\eta}$, with $\eta \geq 0$). The government also selects a trade policy $\lambda \in \{A, F\}$, where A denotes autarky and F free trade. Thus, the utility of a member of group i is given by:

$$v_i(\tau, \lambda) = (1 - \tau) y_i(\lambda) + [\tau - C(\tau)] \bar{y}(\lambda),$$

where $y_i(\lambda)$ denotes the real income of a member of group i when trade policy is λ and $\bar{y}(\lambda) = \sum_i n_i y_i(\lambda)$ is the average income of society.[31]

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[31]It is possible to replace the redistribution scheme with a public good financed with income taxation. In order to see this, suppose that the utility of a member of group i is $v_i = (1 - \tau) y_i(\lambda) + H(g)$, where g is the level of the public good. Assume that H is strictly increasing and strictly concave, $H(0) = 0$ and $H'(\bar{y}) < \frac{y_P}{\bar{y}} < 1 < H'(0) < \min_i \frac{y_i}{\bar{y}}$. Since, the government budget constraint is $\tau\bar{y} = g$, then the utility of a member of group i is given by $v_i(\tau, \lambda) = (1 - \tau) y_i(\lambda) + H(\tau\bar{y}(\lambda))$, which can be easily obtained in our model if we set $C(\tau) = \tau - \frac{H(\tau\bar{y})}{\bar{y}}$. Moreover, it is not difficult to prove that this cost function satisfies all the proper assumptions. For example, $C(0) = 0 - \frac{H(0)}{\bar{y}} = 0$.

Several trade models are compatible with this specification. For example, consider an economy with one final and non-tradeable good, denoted Y_T, which is produced employing three perfectly tradeable intermediate goods, each intensive in one factor of production and denoted Y_L, Y_K and Y_N. The production of the final good is $Y_T = F(Y_L, Y_K, Y_N)$, where F is a quasi-concave constant return to scale production function (for example $Y_T = [(Y_K)^\rho + \sigma(Y_L)^\rho]^{\frac{1-\alpha_N}{\rho}} (Y_N)^{\alpha_N})$, while each of the intermediate inputs uses a simple linear technology, i.e., $Y_K = K$, $Y_L = L$, $Y_N = N$, where $E = (K, L, N)$ is the endowment of capital, land and labor, respectively. Under autarky, aggregate output is $\bar{y}(A) = F(K, L, N)$ and the income of a member of group i is $y_i(A) = F_i(K, L, N)\frac{E_i}{n_i}$, where $F_i(K, L, N)$ is the marginal product of input i evaluated at the endowment vector E. Under free trade, aggregate output is $\bar{y}(\lambda) = \sum_i p_i E_i$, and the income of a member of group i is $y_i(F) = \frac{p_i E_i}{n_i}$, where p_i is the price of input Y_i in the international markets. Another alternative model of international trade, which emphasizes the role of the terms of trade, is an economy with one final and non-tradeable good which is produced employing two perfectly tradeable intermediate goods, one land-intensive and the other capital- and labor-intensive, i.e., $Y_T = F(Y_L, Y_{KN})$, $Y_L = L$, and $Y_{KN} = K^\alpha N^{1-\alpha}$. Then, under autarky, $y_L(A) = \frac{F_1(L, K^\alpha N^{1-\alpha})L}{n_L}$, $y_K(A) = \frac{\alpha F_2(L, K^\alpha N^{1-\alpha})K^\alpha N^{1-\alpha}}{n_K}$, $y_N(A) = \frac{(1-\alpha)F_2(L, K^\alpha N^{1-\alpha})K^\alpha N^{1-\alpha}}{n_N}$, and $\bar{y}(A) = F(L, K^\alpha N^{1-\alpha})$. Under free trade, $y_L(F) = \frac{p_L L}{n_L}$, $y_K(F) = \frac{\alpha K^\alpha N^{1-\alpha}}{n_K}$, $y_N(F) = \frac{(1-\alpha)K^\alpha N^{1-\alpha}}{n_N}$, and $\bar{y}(\lambda) = p_L L + K^\alpha N^{1-\alpha}$, where p_L denotes the terms of trade (the relative price of the land-intensive input in terms of the capital- and labor-intensive input). Note that, in this model, $y_K(F) = \frac{(1-\alpha)n_K}{\alpha n_N} y_N(F)$ and, hence, capitalists and workers want the same trade policy. Further variations of this model include the well-known Ricardo-Viner factor-specific model (for example if $Y_T = F(Y_L, Y_K)$, $Y_K = K^{\alpha_K} N_K^{1-\alpha_K}$, $Y_L = L^{\alpha_L} N_L^{1-\alpha_L}$) or, in general, a Heckscher-Ohlin model with three goods and three factors of production.

Each group in society can either lose or win with different trade policies, depending on the particular trade model that we have in mind. We say that group i is *protectionist* (*pro-free-trade*) if and only if $y_i(A) > y_i(F)$ ($y_i(A) < y_i(F)$). We can even conceive of cases in which all groups win or all groups lose with the opening of the economy, but the political economy of trade policy in such cases is not very interesting; we can simple ignore trade policy as a relevant policy variable. Hence, we focus on economies for which protectionism is costly in the sense that $\bar{y}(F) > \bar{y}(A)$ and in which at least one group loses with a change in trade policy. This does not mean that we completely ignore these other cases. In fact, some of them have played an important role in the historical examples we discuss in sections 3 and 4.

We impose some structure on income distribution and the effect that international trade has on it.

Assumption 1: The elite groups have above-average incomes, while the non-elite populace has below-average incomes, regardless of the type of trade policy that is in effect, i.e., $\min_{i \in \{K,L\}} y_i(\lambda) > \bar{y}(\lambda) > y_P(\lambda)$.

Note that assumption 1 not only says that the elite groups are richer than the general population, but also means that international trade does not change this situation.

Trade policy and income taxation may seem to be two independent mechanisms of income redistribution, but this is actually not the case, since trade policy influences income distribution and, hence, affects the trade-off between redistribution and the cost of income taxation. In order to see this interaction and the structure that we impose on it, we can deduce what the policy implemented by group i would be if the government were wholly controlled by group i. In such a context, group i would choose:

$$(\tau_i, \lambda_i) = \arg\max_{(\tau,\lambda)} \left\{ (1 - \tau) y_i(\lambda) + [\tau - C(\tau)] \bar{y}(\lambda) \right\}$$

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Due to assumption 1, for an elite group it is always the case that $y_i(\lambda) > \bar{y}(\lambda)$. Therefore, for $i = K, L$, $\tau_i = 0$ and $\lambda_i = \arg\max_\lambda y_i(\lambda)$. That is, an elite group prefers no income taxation and a trade policy that maximizes its gross income. Also due to assumption 1, it is the case that, for the populace, $y_i(\lambda) < \bar{y}(\lambda)$. Then, the populace's decision reduces to the comparison of a pair of policies. Specifically, let $\tau_P(\lambda)$ be the income tax rate that maximizes people's utility when trade policy is λ; in other words, $\tau_P(\lambda)$ is the unique solution of the following equation:

$$C'(\tau_P(\lambda)) = 1 - \frac{y_P(\lambda)}{\bar{y}(\lambda)}.^{32}$$

Then, $\lambda_P = \arg\max_\lambda v_P(\tau_P(\lambda), \lambda)$ and $\tau_P = \tau_P(\lambda_P)$. Note that τ_P clearly depends on how trade policy affects income distribution and particularly on how it affects the income share of the populace $(n_P y_P(\lambda)/\bar{y}(\lambda))$. Due to this interdependence, it is possible that, even if the populace is protectionist, it could prefer the combination of a free-trade policy and the tax rate $\tau_P(F)$ to a protectionist trade policy and $\tau_P(A)$. The following assumption rules out such a situation, however.

Assumption 2: If the people are *pro-free-trade*, they prefer $(\tau_P(F), F)$ to $(\tau_P(A), A)$, while if they are *protectionist*, they prefer $(\tau_P(A), A)$ to $(\tau_P(F), F)$. Formally,

$$y_P(F) > y_P(A) \Longrightarrow v_P(\tau_P(F), F) > v_P(\tau_P(A), A),$$
$$y_P(A) > y_P(F) \Longrightarrow v_P(\tau_P(A), A) > v_P(\tau_P(F), F).$$

Assumption 2 simply says that income taxation is not enough to change people's stance on trade policy. The key question is, of course, how strong this assumption is. On

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[32]The solution is unique because $C'(0) < 1 - \frac{y_P}{\bar{y}} < C'(1)$ and the second order condition always hold since C is strictly convex.

the one hand, when the populace is pro-free-trade, assumption 2 is, in fact, very mild. In order to see this more clearly, we must distinguish between two possible situations. First, it may be the case that, although the populace's gross income is higher under free trade, people's income share is in fact lower under free trade, i.e., $y_P(F) > y_P(A)$, but $(n_P y_P(F)/\bar{y}(F)) < (n_P y_P(A)/\bar{y}(A))$. Then, $\tau_P(F) > \tau_P(A)$, which implies that, under free trade, the populace does not only have a higher gross income, but it also receives higher transfers (net of taxes). Thus, it is always the case that $v_P(\tau_P(F), F) > v_P(\tau_P(A), A)$. Second, it may be the case that the populace's gross income and income share are both higher under free trade, i.e., $y_P(F) > y_P(A)$ and $(n_P y_P(F)/\bar{y}(F)) > (n_P y_P(A)/\bar{y}(A))$. Then $\tau_P(F) < \tau_P(A)$ and, therefore, $(1 - \tau_P(F)) y_P(F) > (1 - \tau_P(A)) y_P(A)$, which implies that the only situation in which the populace prefers $(\tau_P(A), A)$ to $(\tau_P(F), F)$ is if $\tau_P(A)$ is sufficiently higher than $\tau_P(F)$ so that transfers under protectionism are much higher than under free trade. This is very unlikely and, in fact, is impossible for some specifications of the cost function C. On the other hand, when the populace is protectionist, it must be the case that $(n_P y_P(A)/\bar{y}(A)) > (n_P y_P(F)/\bar{y}(F))$, which implies that $\tau_P(F) > \tau_P(A)$. Then, assumption 2 is somewhat more robust, since it is always possible to conceive of a cost function C that induces low enough costs of income taxation so that the populace would rather prefer to have a higher tax rate levied on a bigger tax base under free trade than to have a lower tax rate levied on a smaller tax base under protectionism. Conversely, if the costs of income taxation are relatively high, then the opposite is true, and the populace prefers $(\tau_P(A), A)$ to $(\tau_P(F), F)$. In the rest of this paper, we assume that assumptions 1 and 2 hold.

The above discussion also explains what types of redistributions can be induced by trade policy that are not possible under a redistribution scheme only based on income tax. If there is no intra-elite conflict over trade policy (say, for instance, that both elite factions

are protectionists and the populace is pro-free-trade), then trade policy allows the elite to "transfer" income from the people to the elite (by closing the economy). It also gives the people an extra opportunity to "transfer" income from the elite (by opening the economy). If there is intra-elite conflict -the setting we emphasizes through the paper, then trade policy becomes a more interesting instrument, since it allows redistributions from one elite faction to the other elite faction and to the people, and vice versa. This is something that cannot be accomplished through income taxation and is a key feature that opens the door to a number of very interesting political interactions. We hope that this discussion will also give the reader a clearer perspective on the claim made in the introduction of this paper to the effect that, although trade policy is relevant in and of itself, all that is needed is a second policy dimension that can potentially divide the elites.

2.2.2 The Polity

The choice as to who makes these collective decisions and under what restrictions depends on the distribution of political power in society. We assume that there are two sources of political power: *de jure* power, which emanates from legal institutions, and *de facto* power, which emanates from the ability to change legal institutions. Political regimes allocate *de jure* political power to different groups in society. We consider two alternative political regimes: dictatorship or autocracy and democracy. In a dictatorship, the elites have *de jure* political power and, hence, the government maximizes the elites' utility. However, dictatorships face a threat of revolution, which gives *de facto* political power to the people. In a democracy, the populace has the *de jure* political power and, hence, the government maximizes people's utility. However, democracies face the threat of a coup, which gives *de facto* political power to the elites. Revolutions and coups are

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costly events. A simple way of modeling this is to assume that a fraction $\mu\left(\varphi\right)$ of the gross income of every group is destroyed in a revolution (coup).

In general, it is very difficult to maintain a revolt or a coup threat for a long time. Perhaps this is because collective-action problems can be solved only in very special circumstances; or it might be the case that, with enough time, the legal authorities can always mobilize the required resources to repress the insurgents. Thus, for whatever reason, the de facto political power conferred by the threat of a revolution or a coup tends to be short-lived. A simple way of modeling this is to assume that any concession obtained under a revolt or a coup threat will be honored only to the extent of some positive probability. Equivalently, we can say that political promises between the elite and the populace are only partially credible. This probability can then be interpreted in several ways: for example, as the likelihood that the revolt or the coup threat can be sustained in the future or as the duration of the threat.[33]

In the following section, we begin studying a simple static coup game, while in section 4, we present a simple static model of democratization.[34] In section 5 we build a fully dynamic model of democratization and consolidation of democracy that integrates both static models into the same framework.

2.3 A Static Model of a Coup

In this section we assume that the status quo is democracy, but that the elite has the possibility of organizing a coup. The timing of events is as follows:

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[33]In the dynamic model that we present in section 5, concessions under the threat of a revolt or a coup are only partially credible because there are shocks to the cost of changing the political regime, and it may be the case that these costs become prohibitive.

[34]These models are static, although there are sequential moves, and we use a game perfect equilibrium as the solution concept, in the sense that they are played only once.

1. **People's Proposal**: The people propose a trade policy $\lambda \in \{F, A\}$ and an income tax rate $\tau \in [0, 1]$.

2. **Elite Bargaining**: Landlords and industrialists assess the people's proposal and then choose to mount a coup or not. The coup costs a fraction $\varphi \in (0, 1)$ of the income of every group. If the elite decides to mount a coup, its members must also bargaining over which elite faction will control the new dictatorship. In case of disagreement the coup fails.

3. **Implementation**: If the there is a coup, the new dictatorship sets a policy. If there is no coup, two things can happen. First, it may be the case that the populace is forced to hold to what it originally promised (an event that occur with probability r). Second, it may be the case that the populace has the opportunity to reset policy (an event that occur with probability $1-r$). In the latter situation, people can implement a new trade policy $\lambda \in \{F, A\}$ and a new income tax rate $\tau \in [0, 1]$.

The intuition behind this timing is the following. As in Acemoglu and Robinson (2006), we model a coup as a game between the elites and the people and we assume that promises are only partially credible. This is a simple way of capturing a more complex dynamic game in which the coup threat is only temporary (perhaps due to the collective action problem) and the people do not have any incentive to keep their promises in the future once the threat of a coup has passed. The new issue that we introduce is a second dimension of potential conflict: trade policy. In particular, although all members of the elite (both landlords and industrialists) prefer the lowest income tax, they may disagree about trade policy. In addition, the people may be more or less inclined to implement protectionist policies, which means that democracy may be more costly for one elite group and more attractive for another. A direct consequence of introducing a second policy dimension and

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two elite factions is that the coup must be the outcome of a bargaining between the elite factions. Moreover, we just assume that in case of disagreement the coup fails.

We use backward induction to deduce the sub-game perfect equilibrium of the coup game.

The implementation stage. In the implementation stage, the distribution of political power is completely determined, and therefore all that we need to do is to solve a single decision problem. If there was no coup, then the people control government. Thus, when the government has the opportunity to set a new policy, it implements the people's preferred policy, i.e., (τ_P, λ_P), while, when the government does not have this option, it simply implements the original promise, which we denote as (λ_D, τ_D). If the coup ushers in a dictatorship that is controlled by the elite faction j, then the policy that will be implemented is j's preferred policy, i.e., $(0, \lambda_j)$.

The elite bargaining stage. In principle, the two elite factions bargain over three issues: they must decide if they are going to mount a coup or not and, if so, they must decide what trade policy and what tax rate the new elite government will implement. The elite factions do not, however, have conflicting interests in terms of the tax rate. If they agree to mount a coup, then landlords and industrialists prefer to set $\tau = 0$. Hence, the only two potential sources of conflict are the coup itself and the trade policy that the new dictatorship will implement. Thus, the elite has three options: no coup, a coup and free trade, and a coup and protectionism. Alternatively we can say that the elite factions bargain over three alternatives: no coup, a coup that gives rise to a dictatorship controlled by L, which implements $(0, \lambda_L)$, and a coup that gives rise to a dictatorship controlled by K, which implements $(0, \lambda_K)$.

Suppose the people have promised (λ_D, τ_D) at the beginning of the game. If the elite does not mount a coup, then the expected payoff for a member of group i is

$rv_i\left(\tau_D, \lambda_D\right) + \left(1 - r\right) v_i\left(\tau_P, \lambda_P\right)$ (with probability r the people must keep their promise, while with probability $\left(1 - r\right)$ they can reset policy and they choose $\left(\lambda_P, \tau_P\right)$). If the elite mounts a coup that gives rise to a dictatorship controlled by the elite faction j, the expected payoff for a member of group i is $\left(1 - \varphi\right) v_i\left(0, \lambda_j\right)$. Thus, we can identify four possible regions:

1. Both dictatorships are acceptable for both elite factions. Formally:

$$\left(1 - \varphi\right) v_L\left(0, \lambda_K\right) > rv_L\left(\tau_D, \lambda_D\right) + \left(1 - r\right) v_L\left(\tau_P, \lambda_P\right), \tag{24}$$

   and

$$\left(1 - \varphi\right) v_K\left(0, \lambda_L\right) > rv_K\left(\tau_D, \lambda_D\right) + \left(1 - r\right) v_K\left(\tau_P, \lambda_P\right). \tag{25}$$

Expression (24) simply says that landlords prefer a coup that gives rise to a dictatorship controlled by industrialists rather than having a democracy, while expression (25) means that industrialists prefer a coup that gives rise to a dictatorship controlled by landlords rather than a democracy. In other words, for both elite factions, democracy is so bad that they are willing to accept the worst possible dictatorship, i.e., a dictatorship controlled by the other elite faction.

2. Only a dictatorship controlled by L is acceptable for both elite factions. Formally:

$$\left(1 - \varphi\right) v_L\left(0, \lambda_L\right) > rv_L\left(\tau_D, \lambda_D\right) + \left(1 - r\right) v_L\left(\tau_P, \lambda_P\right) \geq \left(1 - \varphi\right) v_L\left(0, \lambda_K\right), \tag{26}$$

   and

$$\left(1 - \varphi\right) v_K\left(0, \lambda_L\right) > rv_K\left(\tau_D, \lambda_D\right) + \left(1 - r\right) v_K\left(\tau_P, \lambda_P\right). \tag{27}$$

Expression (26) says that landlords prefer a coup that gives rise to a dictatorship

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controlled by the landlords rather than having a democracy, but they prefer a democracy to a coup that gives rise to a dictatorship controlled by the industrialists. Expression (27) means that industrialists prefer a coup that gives rise to a dictatorship controlled by the landlords rather than having a democracy. Thus, landlords are willing to support a coup only if they get complete control of the dictatorship.

3. Only a dictatorship controlled by K is acceptable for both elite factions. Formally:

$$(1 - \varphi) \, v_K \, (0, \lambda_K) > r v_K \, (\tau_D, \lambda_D) + (1 - r) \, v_K \, (\tau_P, \lambda_P) \geq (1 - \varphi) \, v_K \, (0, \lambda_L) , \quad (28)$$

and

$$(1 - \varphi) \, v_L \, (0, \lambda_K) > r v_L \, (\tau_D, \lambda_D) + (1 - r) \, v_L \, (\tau_P, \lambda_P) . \quad (29)$$

This is just the mirror-image of the situation in region 2. Now, industrialists are willing to mount a coup only if they get complete control of the dictatorship.

4. No dictatorship is acceptable to both elite faction at the same time. Formally:

$$(1 - \varphi) \, v_L \, (0, \lambda_L) \leq r v_L \, (\tau_D, \lambda_D) + (1 - r) \, v_L \, (\tau_P, \lambda_P) , \quad (30)$$

or

$$(1 - \varphi) \, v_K \, (0, \lambda_L) \leq r v_K \, (\tau_D, \lambda_D) + (1 - r) \, v_K \, (\tau_P, \lambda_P) , \quad (31)$$

and

$$(1 - \varphi) \, v_L \, (0, \lambda_K) \leq r v_L \, (\tau_D, \lambda_D) + (1 - r) \, v_L \, (\tau_P, \lambda_P) , \quad (32)$$

or

$$(1 - \varphi) \, v_K \, (0, \lambda_K) \leq r v_K \, (\tau_D, \lambda_D) + (1 - r) \, v_K \, (\tau_P, \lambda_P) . \quad (33)$$

Expressions (30) and (31) say that at least one of the elite factions prefers democracy to a coup that would give rise to a dictatorship controlled by the landlords, while expressions (32) and (33) say that at least one of the elite factions prefers democracy to a coup that would give rise to a dictatorship controlled by the industrialists.

The previous analysis covers the cases in which there is no intra-elite conflict (i.e., $\lambda_L = \lambda_K$), as well as the cases in which there is intra-elite conflict (i.e., $\lambda_L \neq \lambda_K$), although, in the case of no intra-elite conflict, regions 2 and 3 disappear and the analysis is much more simple.

Regions 1 to 4 describe the options open to the elite given the people's proposal, but the elite factions still need to select one of the options. It is easy to see that, in region 2, the elite mounts a coup that gives rise to a dictatorship controlled by L, while, in region 3, the elite mounts a coup that gives rise to dictatorship controlled by K. After all, in each of these regions there is only one dictatorship that is preferred to democracy by both elite factions. The elite's decision in region 4 is also simple: the elite does not mount a coup. The reason is that there is no possible agreement between the elite factions, since at least one of the factions always prefer democracy to a coup. The real action occurs in region 1, since both dictatorships are acceptable for both elite factions.[35] A simple solution is to assume that the bargaining power of the elite faction L is $\chi_L \in [0,1]$ and the outcome of the bargaining process is:

$$\max_j \left\{ \chi_L v_L \left(0, \lambda_j\right) + \left(1 - \chi_L\right) v_K \left(0, \lambda_j\right) \right\}.$$

Under this assumption, we can easily solve the bargaining problem in region 1. If there is no intra-elite conflict, regardless of the value of χ_L, the elite mounts a coup that gives

[35]This is not a real issue under no intra-elite conflict because both elite factions prefer the same trade policy.

rise to a dictatorship that implements $(0, \lambda_E)$, where $\lambda_E = \lambda_L = \lambda_K$. On the other hand, if there is intra-elite conflict, then the dictatorship is controlled by L and implements $(0, \lambda_L)$, when $\chi_L \geq \bar{\chi}_L$, and it is controlled by K and implements $(0, \lambda_K)$, when $\chi_L < \bar{\chi}_L$, where $\bar{\chi}_L = \frac{v_K(0, \lambda_K) - v_K(0, \lambda_L)}{v_K(0, \lambda_K) - v_K(0, \lambda_L) + v_L(0, \lambda_L) - v_L(0, \lambda_K)}$.

The people's proposal stage. The last step in the backward induction procedure is to determine the people's decision at the beginning of the coup game. To do so, it helps to define $\bar{\varphi}_i(\tau, \lambda, \lambda_j)$, i.e., the fraction of its income that the elite faction i is willing to sacrifice in order to switch policy from (τ, λ) to $(0, \lambda_j)$. Formally:

$$\bar{\varphi}_i(\tau, \lambda, \lambda_j) = 1 - \frac{v_i(\tau, \lambda)}{v_i(0, \lambda_j)}.$$

It is also easier to distinguish between a case with no intra-elite conflict and one with intra-elite conflict and study each case separately.

2.3.1 Coups and Trade Policy in the Absence of Intra-elite Conflict

As we have already seen, when there is no intra-elite conflict, regions 2 and 3 disappear and we only have to consider regions 1 and 4. Technically speaking, when $\lambda_L = \lambda_K$, conditions (26) and (27) are mutually incompatible, which implies that region 1 is empty. Similarly, when $\lambda_L = \lambda_K$, conditions (28) and (29) are mutually incompatible and, hence, region 2 is also empty. Furthermore, when $\lambda_L = \lambda_K$, (30) is identical to (32) and (31) is identical to (33), which greatly simplifies region 4. Intuitively, since both elite factions prefer the same trade policy it doesn't really matter which elite faction controls the dictatorship. The only relevant decision for the elite is whether to mount a coup that implements $(0, \lambda_E)$, where $\lambda_E = \lambda_L = \lambda_K$, or implicitly accept the partially credible people's proposal.

Suppose that the people propose their preferred policy, i.e., $(\lambda_D, \tau_D) = (\tau_P, \lambda_P)$. Then, from (30) and (31) the elite does not mount a coup if and only if $(1 - \varphi) v_L (0, \lambda_E) < v_L (\tau_P, \lambda_P)$ or $(1 - \varphi) v_K (0, \lambda_E) < v_K (\tau_P, \lambda_P)$, that is, whenever at least one of the elite faction finds the coup too costly. Thus, if $\varphi \geq \min_i \bar{\varphi}_i (\tau_P, \lambda_P, \lambda_E)$, the people do not need to make any concession in order to avert a coup. Under this condition, we say that democracy is *consolidated*.

On the other hand, if this condition does not hold, then the people must offer some sort of concession if they want to avert a coup. The people are always willing to promise to make a concession, since the advent of a dictatorship would completely eliminate the possibilities of redistribution through the income tax and transfer system and would pave the way for the implementation of a harmful trade policy. Moreover, a coup has a very real cost in terms of resources. Be this as it may, the people's promises are only partially credible, which means that even the most generous promise could not be enough to convince the elite to refrain from mounting a coup. The most generous promise that the people can make is $(\tau_D, \lambda_D) = (0, \lambda_E)$. Then, from (30) and (31) the elite does not mount a coup if and only if $(1 - \varphi) v_L (0, \lambda_E) < r v_L (0, \lambda_E) + (1 - r) v_L (\tau_P, \lambda_P)$ or $(1 - \varphi) v_K (0, \lambda_E) < r v_K (0, \lambda_E) + (1 - r) v_K (\tau_P, \lambda_P)$. Thus, if $(1 - r) \min_i \bar{\varphi}_i (\tau_P, \lambda_P, \lambda_E) \leq \varphi < \min_i \bar{\varphi}_i (\tau_P, \lambda_P, \lambda_E)$, there is no coup, but the people make some concession in order to avert one. Under this condition, we say that democracy is *semi-consolidated*. Given that democracy can be defended, the people choose to defend it in the cheapest possible way. Thus, they promise $(\tau_D, \lambda_D) = \arg\max_{(\tau, \lambda) \in \bar{S}_C (\varphi, \lambda_E)} v_P (\tau, \lambda)$, where:

$$
\bar{S}_C (\varphi, \lambda_E) = \left\{ \begin{array}{l} (\tau, \lambda) \in S : \text{there is } i \in \{L, K\} \text{ such that} \\ \varphi \geq r \bar{\varphi}_i (\tau, \lambda, \lambda_E) + (1 - r) \bar{\varphi}_i (\tau_P, \lambda_P, \lambda_E) \end{array} \right\} .
$$

Intuitively, from all the possible promises that would give one elite faction enough expected

utility to make it prefer democracy to a coup (formally, the set $\bar{S}(\varphi, \lambda_E)$), the one that will maximize the people's utility in the event that they are forced to keep their promise will be chosen. Furthermore, note that the fundamental trade-off that the people face is between a relatively high income tax rate and their preferred trade policy versus a lower income tax rate and the elite's preferred trade policy.

Finally, if $\varphi < (1-r)\min_i \bar{\varphi}_i(\tau_P, \lambda_P, \lambda_E)$, there is nothing that the people can do in order to avert a coup. In this case, we say that democracy is *unconsolidated*.

The following proposition summarizes the results.

Proposition 2.1: *Consider a society with no intra-elite conflict over trade policy, i.e.,* $\lambda_L = \lambda_K = \lambda_E \neq \lambda_P$. *Let* $\bar{\varphi}_i(\lambda_j, \tau, \lambda) = 1 - \frac{v_i(\tau,\lambda)}{v_i(0,\lambda_j)}$ *be the fraction of its income that the elite faction i is willing to sacrifice in order to switch policy from (τ, λ) to $(0, \lambda_j)$. Then, the coup game has a unique subgame perfect equilibrium. In this equilibrium:*

1. *If $\varphi \geq \min_i \bar{\varphi}_i(\tau_P, \lambda_P, \lambda_E)$, then we are in a fully consolidated democracy and the policy that is implemented is (τ_P, λ_P).*

2. *If $(1-r)\min_i \bar{\varphi}_i(\tau_P, \lambda_P, \lambda_E) \leq \varphi < \min_i \bar{\varphi}_i(\tau_P, \lambda_P, \lambda_E)$, then we are in a semi-consolidated democracy and the policy that is implemented is $(\tau_D, \lambda_D) = \arg\max_{(\tau,\lambda) \in \bar{S}_C(\varphi, \lambda_E)} v_P(\tau, \lambda)$ with probability r and (τ_P, λ_P) with probability $(1-r)$, where:*

$$\bar{S}_C(\varphi, \lambda_E) = \left\{ \begin{array}{l} (\tau, \lambda) \in S : \text{there is } i \in \{L, K\} \text{ such that} \\ \varphi \geq r\bar{\varphi}_i(\tau, \lambda, \lambda_E) + (1-r)\bar{\varphi}_i(\tau_P, \lambda_P, \lambda_E) \end{array} \right\}.$$

3. *If $\varphi < (1-r)\min_i \bar{\varphi}_i(\tau_P, \lambda_P, \lambda_E)$, then the elite mount a coup, we are in an unconsolidated democracy and the policy that is implemented is $(0, \lambda_E)$.*

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The interpretation of Proposition 2.1 is simple. If, for at least one elite factions, the fraction of its income that it must give up in order to mount a coup is higher than the fraction of its income that it is willing to sacrifice in order to switch policy from (τ_P, λ_P) to $(0, \lambda_E)$, then democracy is fully consolidated. If this is not the case, but if, for at least one of the elite factions the fraction of its income that it must give up in order to mount a coup is greater than the the fraction of its income that it is willing to sacrifice in order to switch policy from $(0, \lambda_E)$ with probability r and (τ_P, λ_P) with probability $(1 - r)$ to $(0, \lambda_E)$, then we are in the presence of a semi-consolidated democracy. Finally, if, for both elite factions, the fractions of their income that they must give up in order to mount a coup are higher than the fractions of their income that they are willing to sacrifice in order to switch policy from $(0, \lambda_E)$ with probability r and (τ_P, λ_P) with probability $(1 - r)$ to $(0, \lambda_E)$, then there is a coup and democracy is unconsolidated.

Figure 2.1 shows a numerical example that illustrates proposition 1, using the following specification: $Y_T = [(Y_K)^\rho + (Y_L)^\rho]^{\frac{1-\alpha_N}{\rho}} (Y_N)^{\alpha_N}$, $\alpha_N = 0.5$, $\rho = 1$, $K = 1.5$, $L = 1.5$, $N = 1$, $n_L = n_K = 0.10$, $n_N = 80$, $C(\tau) = \frac{\tau^{1+\eta}}{1+\eta}$, with $\eta = 0.75$.

Please see Figure 2.1: Coups and Trade Policy in the Absence of Intra-elite Conflict

2.3.2 Coups and Trade Policy in the Presence of Intra-elite Conflict

When there is intra-elite conflict, the people's decision at the beginning of the game is more complicated.

Suppose that the people promise their preferred policy, i.e., $(\tau_D, \lambda_D) = (\tau_P, \lambda_P)$. Then, from (30)-(33), the elite does not mount a coup if and only if $(1 - \varphi) v_L (0, \lambda_L) \leq v_L (\tau_P, \lambda_P)$ or $(1 - \varphi) v_K (0, \lambda_L) < v_K (\tau_P, \lambda_P)$ (that is, whenever at least one of the elite factions finds the coup that gives rise to a dictatorship controlled by L too costly) and

$(1 - \varphi) v_L (0, \lambda_K) < v_L (\tau_P, \lambda_P)$ or $(1 - \varphi) v_K (0, \lambda_K) < v_K (\tau_P, \lambda_P)$ (that is, whenever at least one of the elite factions finds the coup that gives rise to a dictatorship controlled by K too costly). The key difference between this and a case with no intra-elite conflict is that now a dictatorship controlled by L is not the same as one controlled by K, and the people's promise must be good enough to avert both types of dictatorships. Thus, if $\varphi \geq \min_i \bar{\varphi}_i (\tau_P, \lambda_P, \lambda_L)$ and $\varphi \geq \min_i \bar{\varphi}_i (\tau_P, \lambda_P, \lambda_K)$, then the people does not need to make any concession in order to avert a coup, and democracy is consolidated. Equivalently, if:

$$\varphi \geq \max_j \min_i \bar{\varphi}_i (\tau_P, \lambda_P, \lambda_j),$$

democracy is consolidated.

If this condition does not hold, then democracy cannot be consolidated and the people must evaluate the option of promising some concessions. Suppose that the populace promises $(\tau_D, \lambda_D) = (0, \lambda)$. Then, from (30)-(33), this promise is enough to avert a coup if and only if $(1 - \varphi) v_L (0, \lambda_L) < r v_L (0, \lambda) + (1 - r) v_L (\tau_P, \lambda_P)$ or $(1 - \varphi) v_K (0, \lambda_L) < r v_K (0, \lambda) + (1 - r) v_K (\tau_P, \lambda_P)$ (that is, whenever at least one of the elite factions finds that a coup that would give rise to a dictatorship controlled by L would be too costly) and $(1 - \varphi) v_L (0, \lambda_K) < r v_L (0, \lambda) + (1 - r) v_L (\tau_P, \lambda_P)$ or $(1 - \varphi) v_K (0, \lambda_K) < r v_K (0, \lambda) + (1 - r) v_K (\tau_P, \lambda_P)$ (that is, whenever at least one of the elite factions finds that a coup that would give rise to a dictatorship controlled by K would be too costly). Thus, if $\varphi \geq \min_i r \bar{\varphi}_i (0, \lambda, \lambda_L) + (1 - r) \bar{\varphi}_i (\tau_P, \lambda_P, \lambda_L)$ and $\varphi \geq \min_i r \bar{\varphi}_i (0, \lambda, \lambda_K) + (1 - r) \bar{\varphi}_i (\tau_P, \lambda_P, \lambda_K)$, then the people can avert a coup by promising $(0, \lambda)$. Therefore, the people can always stop a coup if and only if

$$\varphi \geq \min_\lambda \max_{\lambda_j} \min_i r \bar{\varphi}_i (0, \lambda, \lambda_j) + (1 - r) \bar{\varphi}_i (\tau_P, \lambda_P, \lambda_j).$$

But, are the people willing to do so?

If the people can stop a coup by promising $(\tau_D, \lambda_D) = (0, \lambda_P)$, then the answer is "yes" and the reason is straightforward. In the event of a coup, the best scenario for the people is a dictatorship controlled by the elite faction with $\lambda_j = \lambda_P$. But in such scenario the people get $(1 - \varphi) v_P (0, \lambda_P)$, while, if they promise $(0, \lambda_P)$, they get $v_P (0, \lambda_P)$ with probability r and $v_P (\tau_P, \lambda_P)$ with probability $(1 - r)$, which clearly dominates $(1 - \varphi) v_P (0, \lambda_P)$. Thus, if $\varphi \geq \min_i r \bar{\varphi}_i (0, \lambda_P, \lambda_L) + (1 - r) \bar{\varphi}_i (\tau_P, \lambda_P, \lambda_L)$ and $\varphi \geq \min_i r \bar{\varphi}_i (0, \lambda_P, \lambda_K) + (1 - r) \bar{\varphi}_i (\tau_P, \lambda_P, \lambda_K)$, then there is no coup, but the people must make some sort of concession. Equivalently, if:

$$\max_{\lambda_j} \min_i r \bar{\varphi}_i (0, \lambda_P, \lambda_j) + (1 - r) \bar{\varphi}_i (\tau_P, \lambda_P, \lambda_j) < \varphi < \max_j \min_i \bar{\varphi}_i (\tau_P, \lambda_P, \lambda_j),$$

then democracy is semi-consolidated. Given that the people can and are willing to defend the democracy, they choose to defend it in the cheapest possible way. Thus, they promise $(\tau_D, \lambda_D) = \arg\max_{(\tau, \lambda) \in \cap_j \bar{S}(\varphi, \lambda_j)} v_P (\tau, \lambda)$, where:

$$\bar{S}_C (\varphi, \lambda_j) = \left\{ \begin{array}{l} (\tau, \lambda) \in S : \text{there is } i \in \{L, K\} \text{ such that} \\ \varphi \geq r \bar{\varphi}_i (\tau, \lambda, \lambda_j) + (1 - r) \bar{\varphi}_i (\tau_P, \lambda_P, \lambda_j) \end{array} \right\}.$$

If the people cannot avert a coup by promising $(\tau_D, \lambda_D) = (0, \lambda_P)$, but they can do so by promising $(\tau_D, \lambda_D) = (0, \lambda)$, they may not be willing to stop a coup. In order to see this, assume that the people can induce a dictatorship controlled by the elite faction with $\lambda_j = \lambda_P$. Then, if the people defend democracy, they get $v_P (\tau_D, \lambda_D)$ with probability r, where $\lambda_D \neq \lambda_P$ and $v_P (\tau_P, \lambda_P)$ with probability $(1 - r)$, while, if they don not defend democracy, they get $(1 - \varphi) v_P (0, \lambda_P)$. Formally, since $\lambda_D \neq \lambda_P$, it is possible that $(1 - \varphi) v_P (0, \lambda_P) > r v_P (\tau_D, \lambda_D) + (1 - r) v_P (\tau_P, \lambda_P)$. Intuitively, the people may prefer a coup that gives rise

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to a dictatorship controlled by the elite faction that has the same trade policy preference rather than defend democracy by promising a harmful trade policy. Thus, if:

$$\min_{\lambda} \max_{\lambda_j} \min_{i} r\bar{\varphi}_i\left(0, \lambda, \lambda_j\right) + (1-r)\,\bar{\varphi}_i\left(\tau_P, \lambda_P, \lambda_j\right) \leq \varphi < \max_{\lambda_j} \min_{i} r\bar{\varphi}_i\left(0, \lambda_P, \lambda_j\right) + (1-r)\,\bar{\varphi}_i\left(\tau_P, \lambda_P, \lambda_j\right),$$

we are either in a semi-consolidated democracy or there is a coup that gives rise to a dictatorship controlled by the elite faction with $\lambda_j = \lambda_P$.

Finally, if:

$$\varphi < \min_{\lambda} \max_{j} \min_{i} r\bar{\varphi}_i\left(0, \lambda, \lambda_j\right) + (1-r)\,\bar{\varphi}_i\left(\tau_P, \lambda_P, \lambda_j\right),$$

then there is nothing that the people can do in order to stop a coup. However, this does not mean that the people are completely powerless, since they can try to influence the type of dictatorship that emerges after the coup. Here it becomes necessary to distinguish between two possible situations.

First, assume that the elite faction that has the same trade policy preferences as the people is also the one with more bargaining power, i.e., $\lambda_L = \lambda_P \neq \lambda_K$ and $\chi_L \geq \bar{\chi}_L$ or $\lambda_K = \lambda_P \neq \lambda_L$ and $\chi_L < \bar{\chi}_L$. In that case, a coup will occur that gives rise to a dictatorship controlled by the powerful elite faction. The proof is simple. The people cannot avert a coup but, if they promise to embrace a very populist policy, say $\tau_D = 1$, both elite factions will prefer a coup that gives rise to a dictatorship controlled by the powerful elite faction over a democracy. Thus, the people can always induce a coup that gives rise to a dictatorship controlled by the elite faction with $\lambda_j = \lambda_P$.

Second, assume that the elite faction that has the same trade policy preference as the people is the less powerful elite faction, i.e., $\lambda_L \neq \lambda_K = \lambda_P$ and $\chi_L \geq \bar{\chi}_L$ or $\lambda_K \neq \lambda_L = \lambda_P$ and $\chi_L < \bar{\chi}_L$. In this case, if both elite factions prefer a dictatorship controlled by

the more powerful elite faction over a democracy, then a coup will occur that gives rise to a dictatorship controlled by the more powerful elite faction. Formally, when $\lambda_L \neq \lambda_K = \lambda_P$ and $\chi_L \geq \bar{\chi}_L$, from (24)-(27), a coup occurs that gives rise to a dictatorship controlled by L if and only if $(1 - \varphi) v_K (0, \lambda_L) > r v_K (\tau_D, \lambda_D) + (1 - r) v_K (\tau_P, \lambda_P)$ and $(1 - \varphi) v_L (0, \lambda_L) > r v_L (\tau_D, \lambda_D) + (1 - r) v_L (\tau_P, \lambda_P)$. Thus, if these inequalities hold even when $(\tau_D, \lambda_D) = (0, \lambda)$, then the people cannot avert a coup that gives rise to a dictatorship controlled by L. Equivalently, if:

$$\varphi < \min_{i, \lambda} r \bar{\varphi}_i (0, \lambda, \lambda_L) + (1 - r) \bar{\varphi}_i (\tau_P, \lambda_P, \lambda_L)$$

then a coup occurs that gives rise to a dictatorship controlled by L, while, if $\varphi \geq \min_{i, \lambda} r \bar{\varphi}_i (0, \lambda, \lambda_L) + (1 - r) \bar{\varphi}_i (\tau_P, \lambda_P, \lambda_L)$, the people can always induce a coup that gives rise to a dictatorship controlled by K. Similarly, when $\lambda_K \neq \lambda_L = \lambda_P$ and $\chi_L < \bar{\chi}_L$, from (24), (25), (28) and (29), a coup will occur that gives rise to a dictatorship controlled by K if and only if $(1 - \varphi) v_L (0, \lambda_K) > r v_L (\tau_D, \lambda_D) + (1 - r) v_L (\tau_P, \lambda_P)$ and $(1 - \varphi) v_K (0, \lambda_K) > r v_K (\tau_D, \lambda_D) + (1 - r) v_K (\tau_P, \lambda_P)$. Thus, if these inequalities hold even when $(\tau_D, \lambda_D) = (0, \lambda)$, then the people cannot avert a coup that gives rise to a dictatorship controlled by K. Equivalently, if:

$$\varphi < \min_{i, \lambda} r \bar{\varphi}_i (0, \lambda, \lambda_K) + (1 - r) \bar{\varphi}_i (\tau_P, \lambda_P, \lambda_K),$$

then a coup occurs that gives rise to a dictatorship controlled by K, while if $\varphi \geq \min_{i, \lambda} r \bar{\varphi}_i (0, \lambda, \lambda_K) + (1 - r) \bar{\varphi}_i (\tau_P, \lambda_P, \lambda_K)$, the people can always induce a coup that gives rise to a dictatorship controlled by L.

The following proposition summarizes the results.

Proposition 2.2: *Consider a society with intra-elite conflict over trade policy, i.e.,*

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$\lambda_L \neq \lambda_K = \lambda_P$ or $\lambda_K \neq \lambda_L = \lambda_P$. Let $\bar{\varphi}_i(\tau, \lambda, \lambda_j) = 1 - \frac{v_i(\tau, \lambda)}{v_i(0, \lambda_j)}$ be the fraction of its income that the elite faction i is willing to sacrifice in order to switch policy from (τ, λ) to $(0, \lambda_j)$. Then, the coup game has a unique sub-game perfect equilibrium. In this equilibrium:

1. If $\varphi \geq \max_{\lambda_j} \min_i \bar{\varphi}_i(\tau_P, \lambda_P, \lambda_j)$, then we are in a fully consolidated democracy and the policy that is implemented is (τ_P, λ_P).

2. If $\max_{\lambda_j} \min_i r \bar{\varphi}_i(0, \lambda_P, \lambda_j) + (1 - r) \bar{\varphi}_i(\tau_P, \lambda_P, \lambda_j) \leq \varphi < \max_{\lambda_j} \min_i \bar{\varphi}_i(\tau_P, \lambda_P, \lambda_j)$, then we are in a semi-consolidated democracy, and the policy that is implemented is $(\tau_D, \lambda_D) = \arg\max_{(\tau, \lambda) \in \cap_j \bar{S}(\varphi, \lambda_j)} v_P(\tau, \lambda)$ with probability r and (τ_P, λ_P) with probability $(1 - r)$, where:

$$\bar{S}(\varphi, \lambda_j) = \left\{ \begin{array}{l} (\tau, \lambda) \in S : \text{there is } i \in \{L, K\} \text{ such that} \\ \varphi \geq r \bar{\varphi}_i(\tau, \lambda, \lambda_j) + (1 - r) \bar{\varphi}_i(\tau_P, \lambda_P, \lambda_j) \end{array} \right\}.$$

3. If $\min_\lambda \max_{\lambda_j} \min_i r \bar{\varphi}_i(0, \lambda, \lambda_j) + (1 - r) \bar{\varphi}_i(\tau_P, \lambda_P, \lambda_j) \leq \varphi < \max_{\lambda_j} \min_i r \bar{\varphi}_i(0, \lambda_P, \lambda_j) + (1 - r) \bar{\varphi}_i(\tau_P, \lambda_P, \lambda_j)$, then we are either in a semi-consolidated democracy or in an unconsolidated democracy. In the first case, the policy that is implemented is $(\tau_D, \lambda_D) = \arg\max_{(\tau, \lambda) \in \cap_j \bar{S}(\varphi, \lambda_j)} v_P(\tau, \lambda)$ with probability r and (τ_P, λ_P) with probability $(1 - r)$. In the second case, a coup occurs that gives rise to a dictatorship controlled by the elite faction with $\lambda_j = \lambda_P$, and the policy that is implemented is $(0, \lambda_P)$.

4. If $\varphi < \min_\lambda \max_{\lambda_j} \min_i r \bar{\varphi}_i(0, \lambda, \lambda_j) + (1 - r) \bar{\varphi}_i(\tau_P, \lambda_P, \lambda_j)$, then a coup occurs and we are in an unconsolidated democracy.

   (a) If the elite faction with $\lambda_j = \lambda_P$ is the more powerful one,[36] then the dictatorship

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[36] That is $\chi_L \geq \bar{\chi}_L$ when $\lambda_P = \lambda_L \neq \lambda_K$ or $\chi_L < \bar{\chi}_L$, when $\lambda_P = \lambda_K \neq \lambda_L$.

is controlled by the more powerful elite, and the policy that is implemented is
$(0, \lambda_P)$.

(b) *If the elite faction with $\lambda_j \neq \lambda_P$ is the more powerful one,[37] then, when $\varphi < \min_{i,\lambda} r \bar{\varphi}_i (0, \lambda, \lambda_j) + (1-r) \bar{\varphi}_i (\tau_P, \lambda_P, \lambda_j)$, the dictatorship is controlled by the more powerful elite and the policy that is implemented is $(0, \lambda_j)$; while, when $\varphi \geq \min_{i,\lambda} r \bar{\varphi}_i (0, \lambda, \lambda_j) + (1-r) \bar{\varphi}_i (\tau_P, \lambda_P, \lambda_j)$, the dictatorship is controlled by the less powerful elite and the policy that is implemented is $(0, \lambda_P)$.*

Figure 2.2 shows a numerical example that illustrates Proposition 2.2, using the following specification: $Y_T = [(Y_K)^\rho + \sigma (Y_L)^\rho]^{\frac{1-\alpha_N}{\rho}} (Y_N)^{\alpha_N}$, $\alpha_N = 0.35$, $\sigma = 1$, $\rho = 0.35$, $K = 0.85$, $L = 1.75$, $H = 1$, $N = 1$, $\gamma = 0.30$, $n_L = n_K = 0.1$, $n_N = 80$, $C(\tau) = \frac{\tau^{1+\eta}}{1+\eta}$ with $\eta = 0.75$ and $\chi_L \geq \bar{\chi}_L$.

Please see Figure 2.2: Coups and Trade Policy in the Presence of Intra-elite Conflict

2.3.3 Argentina in the Twentieth Century

At the beginning of the twentieth century, Argentina's factor endowment resembled that of a specialized natural-resource-rich economy. Both the elite and the people supported free trade. However, during the inter-war period, trade opportunities became scarce and the terms of trade worsened, which triggered an industrialization process that then accelerated with the Great Depression during the 1930s and the Second World War. As a result, Argentina embarked on the second half of the twentieth century with a very different economic configuration. In addition, once workers had voted on a large scale for the first

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[37]That is $\chi_L \geq \bar{\chi}_L$ when $\lambda_P = \lambda_K \neq \lambda_L$ or $\chi_L < \bar{\chi}_L$, when $\lambda_P = \lambda_L \neq \lambda_K$.

time, in 1946, an urban-rural cleavage developed which lasted until the dictatorship of 1976. This new political equilibrium took the economy to the brink of autarky. Democracy was not consolidated, and a series of coups and democratizations took place during this period. However, none of the dictatorships that ruled the country until the coup of 1976, which deposed a highly populist government, were headed by the agricultural free-trade elite, and none of them opened up the economy to any significant degree. By contrast, the military government that took power in 1976 was primarily controlled by the agricultural elite and brought the economy back from the edge of autarky.

Argentina integrated its economy into world markets in the last quarter of the nineteenth century as an exporter of rural products. Until the 1930s, the country had a specialized economy with very little industrial development, and almost all of the domestic demand for manufactures was met with imports. As the country grew, the service sector in the major cities, particularly Buenos Aires, developed rapidly. The State invested heavily in the infrastructure that was required in order to export rural products, such as railroads and harbors, and, later, also in public education (see Galiani et al., 2008). Thousands of immigrants arrived in the country during this period, particularly from Spain and Italy. Although the country was formally a democracy with a constitution and republican institutions, the rural elite played a predominant role in government. Democratization pressures came almost exclusively from the urban middle class. In fact, in 1914 a new electoral law was passed that has been interpreted as an extension of the franchise to the middle class. Nevertheless, trade policy was never a crucial political issue, and the economy remained under a free-trade regime throughout the period in question (see Galiani and Somaini, 2010).

The Great Depression of the 1930s is generally considered to mark the beginning of the import-substitution process in Argentina. The collapse of commodity prices hit the

country's economy very hard, since it was so heavily dependent upon exports of agricultural products. In economic and political terms, the 1930s were a transitional period (see Galiani and Somaini, 2010). On the one hand, the rural elite retained most of the political power and tried to use it to mitigate the effects of the change in the terms of trade. On the other hand, two new urban groups were emerging: industrial capitalists and industrial workers. Thus, the society was transitioning away from a specialized economy mainly controlled by members of a rural elite (who were faced with a middle class which demanded political participation and some redistribution, but which did not represent a threat to the country's integration into world markets) and toward a much more complex society with two elite factions: the traditional rural elite and the new industrial elite (in conjunction with a large number of protectionist industrial workers, who could easily become a majority in a free election).

The new economic configuration affected almost all the economic and political institutions of the country. In fact, the 1940s were years of direct industrial promotion initiatives, and the State played the leading role in the country's industrial development. First, shortly before Perón assumed power in June 1946, the government created the Argentine Institute for the Promotion of Trade (IAPI). This institution held a monopoly over the country's foreign trade. In its early years, it was clearly anti-agriculture, as it withheld a percentage of the high prices that agricultural products were bringing in the world market after the end of the war. Together with this, a package of what was by then typical protectionist measures was implemented: import tariffs were raised, the multiple exchange-rate system was maintained and a scheme of import permits was created in order to manage the flow of foreign currency. Second, an interventionist State became an active agent in the economy as a result of the wave of nationalizations that the country witnessed in the early Peronist years.

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After the Peronist experience, it was clear to all concerned that democracy meant protectionism and populism; thus, the traditional rural elite had a huge incentive to mount a coup, while the new industrial elite had mixed incentives in that regard. Two elements completed the scene. First, the effervescence of subsidies, industrial promotion efforts and ambitious social programs routinely ran up against a major problem, namely, the appearance of a large deficit on the balance of payments (Diaz Alejandro, 1970). Second, the military was no longer a united force that was obedient to the traditional rural elite. On the contrary, the development of major industrial sectors was now in the armed forces' sphere of influence, when not under their direct control. The coup of 1955 reflected this new and complex situation. Although the coup was welcomed by the traditional rural elite and a majority of the middle class, and although the new government implemented transitional policies to promote agricultural exports, the import-substitution policies were never abandoned. In terms of our model (proposition 2), the industrialists supported the coup because they could control the dictatorship and, hence, keep industrial protection mechanisms in place.[38]

The exclusion of the Peronist party, and hence of industrial workers, from the political arena after 1955 put a great deal of pressure on the government, particularly since, by then, industrial workers were well-organized in unions and worshiped Perón as their national leader. Thus, political tensions persisted. In principle, the elites were willing to accept democracy, but only if populist policies were rescinded. Industrial workers preferred this type of democracy to a dictatorship, but they could not credibly pledge to not vote for Perón if free elections were allowed. The "solution" was a democratic regime in combination with

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[38]Symbolically, one of the most famous slogans used by the new government to describe this new policy was "Peronism without Perón", which essentially meant industrialization through import substitution without the populist component of the Peronist policies. In fact, most of the measures that promoted agricultural exports (for example, a devaluation) were thought to alleviate the balance-of-payments constraint; what is more, most of the burden of these measures fell on urban workers rather than on the industrialist elite.

the proscription of the Peronist party. Under the proscription scheme, Arturo Frondizi was elected President in 1958 with the support of industrial workers and part of the middle class. Fear of a balance-of-payments crisis paved the way for the "developmentalist" strategy originally envisioned by Perón in 1952-1955 and carried out by Frondizi between 1958 and 1962. Under this strategy, the basic inputs sectors, namely, the metallurgical and oil industries, were developed as a way of overcoming the chronic deficit in the balance of payments.[39] After a few years, a new item appeared on the economic policy agenda: the local-market solution for industry was increasingly seen as inefficient, and the idea of an export industry was gaining support among the country's authorities. A military coup overthrew a democratic government in 1966, but economic policy did not change radically.

In the early 1970s, the limitations of the proscription scheme as a permanent solution became increasingly clear. First, the proscription was apparently not enough to convince the elite to refrain from mounting coups, and it did not completely avert populist policies either. In fact, all the democratic governments after 1955 somehow met their demise when they reached the point where they did not have sufficient maneuvering room to simultaneously satisfy the opposing demands of unionized industrial workers and the armed forces (read "the elites"). Second, some industrial workers, although not the traditional Peronist unions, and part of the middle class began to radicalize their position and to move toward socialism. In this context, the proscription scheme was abandoned and the democratic elections of 1973 resulted in the formation of a new Peronist government, which then proceeded to carry out an extreme version of the previous developmentalist strategy. However, the possibilities of growth under import substitution had, by then, been exhausted. The country rapidly slid into chaos: in 1975, in the midst of a social, political and economic crisis that would trigger the bloodiest military coup in Argentina's history the following year,

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[39]In addition, the automotive industry (which was not particularly "heavy" but nonetheless quite in tune with growing middle-class demands) was actively promoted.

the government's fiscal deficit amounted to almost 15% of GDP. The military government that took power in March 1976 very rapidly made it clear that the import-substitution strategy was no longer part of the government's agenda. This time, the authorities opted for a policy of open trade. Industrial capitalists accepted this policy because the alternative was, at best, a highly populist democracy, if not an outright changeover to socialism. Propositions 5 and 6 capture this change. Note, in particular, that proposition 6 implies that an increase in populism makes a coup controlled by the pro-free-trade rural elite more likely.

Summing up, in terms of our model: in the second half of the twentieth century, Argentina appears to have been a particularly clear example of a case in which intra-elite conflict (the pro-free-trade landlords and the protectionist industrialists) coexisted with a protectionist populace. In fact, as O'Donnell (1977) pointed out, the oscillations in the political regime resulted from shifting alliances between social classes. When industrialists were allied with the working class, democracy prevailed, as did a highly protectionist trade policy and redistributive pressures that were curbed by the proscription of the Peronist party. Two destabilizing forces appeared in this context. First, as soon as economic activity gained strength, a balance-of-payments problem emerged as industrial imports grew and agricultural exports remained stagnant. Second, industrial workers demanded more redistribution and the elimination of the proscription of the Peronist party. In that context, industrialists allied themselves with the landlords in order to force a coup and a devaluation of the currency, which basically raised the real revenues of both of these sectors while depressing workers' real wages. After this economic slump came renewed growth, and, under those circumstances, the industrialists again allied themselves with the working class, particularly when the regime was threatened with strikes, riots and demonstrations that seriously disrupted the order of the industrial workforce. And then

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the cycle began again. Viewed from this perspective, it is understandable why, between 1945 and 1975, Argentina continuously switched back and forth from one political regime to the next, but nonetheless invariably maintained its import-substitution industrialization policy as its core development strategy. The radicalization of popular demands in the early 1970s paved the way for the breakdown of the proscription solution, which ultimately led to the 1976 coup and the opening of the economy. As predicted by proposition 2, industrialists supported this policy because the alternative was, at best, a highly populist democracy, if not an outright changeover to socialism.

2.4 A Static Model of Democratization

In this section we assume that the status quo is a dictatorship, but that the populace has the choice of organizing a revolution. The timing of events is as follows:

1. **Elite Bargaining**: Landlords and industrialist bargaining over which elite faction controls the elite government. The elite faction in control gains the right to offer a proposal to the people and reset the policy in the implementation stage, if such option is available. The set of possible offers includes democratization.

2. **People's revolt decision**: The populace assesses the elite's proposal and decides to mount a revolution. If the populace organizes a revolution, all factor endowments are expropriated and redistributed evenly among the people, and the economy moves into autarky. The revolution costs a fraction $\mu \in [0,1]$ of aggregate income, which includes the cost of organizing the revolution as well as the long-standing reduction in economic efficiency caused by the elimination of private property.

3. **Implementation**: If the elite offers to democratize the country and the populace does not organize a revolt, then the people take power and the new democratic

government sets the policy. If the elite makes any other offer and the people do not organize a revolution, then the elite stays in power. The elite faction that controls the government might have the opportunity to reset policy, an event that occurs with probability q, or it might be forced to keep its original promise, an event that occurs with probability $(1 - q)$.

We use backward induction to deduce the sub-game perfect equilibrium of the democratization game.

The implementation stage. The implementation stage is relatively simple. First, suppose that the people mount a revolt. Then, each elite faction gets zero utility and the people get $\frac{(1-\mu)\bar{y}(A)}{n_P}$. Second, suppose that the elite offers to democratize the country and the people don not mount a revolt. Then, the people implement $\lambda_P = \arg\max_\lambda v_P (\tau_P (\lambda), \lambda)$ and $\tau_P = \tau_P (\lambda_P)$. Finally, if the elite stays in power and the elite government is controlled by the elite faction j, with probability q, the policy cannot be reset and the elite government must keep its promise, but with probability $(1 - q)$ the policy can be reset and the elite government will implement $\tau_E = 0$ and $\lambda_E = \arg\max_\lambda v_j (0, \lambda)$.

People's revolt decision. The revolt invariably offers $\frac{(1-\mu)\bar{y}(A)}{n_P}$ to the people. However, the people's expected utility, in the event that they do not revolt, will depend on what the elite is offering. First, suppose that the elite offers to democratize the country. Then, if the people don not mount a revolt, they will obtain $v_P (\tau_P, \lambda_P)$. Thus, when the elite offers to bring in a democracy, there is a revolt if and only if $\frac{(1-\mu)\bar{y}(A)}{n_P} > v_P (\tau_P, \lambda_P)$. Second, suppose that the elite that controls the dictatorship is j and it promise (τ, λ). Then, if the people don not mount a revolt, they obtain $qv_P (\tau, \lambda) + (1 - q) v_P (0, \lambda_j)$. Thus, when the elite in charge is j and it promise (τ, λ), there is a revolt if and only if $\frac{(1-\mu)\bar{y}(A)}{n_P} > qv_P (\tau, \lambda) + (1 - q) v_P (0, \lambda_j)$.

The elite bargaining stage. We can identify four possible regions in the elite bargaining stage.

1. There is no way of stopping the revolt. Formally:

$$\frac{(1-\mu)\,\bar{y}\,(A)}{n_P} > v_P\,(\tau_P, \lambda_P).$$ (34)

Expression (34) simply says that the people prefer a revolution to democracy. Since the people always prefer democracy to any dictatorship, no matter what concession is offered by the elite $(v_P\,(\tau_P, \lambda_P) > qv_P\,(\tau, \lambda) + (1-q)\,v_P\,(0, \lambda_j)$ for all (τ, λ) and for all $\lambda_j)$, this expression implies that the elite cannot stop a revolution.

2. Only democratization stop the revolt. Formally:

$$qv_P\,(\tau_P, \lambda_P) + (1-q)\,v_P\,(0, \lambda_P) < \frac{(1-\mu)\,\bar{y}\,(A)}{n_P} \le v_P\,(\tau_P, \lambda_P).$$ (35)

Expression (35) means that democratization is enough to stop a revolution $(\frac{(1-\mu)\bar{y}(A)}{n_P} \le v_P\,(\tau_P, \lambda_P))$, but there is no other way to stop it. In particular, not even a dictatorship controlled by the elite faction with $\lambda_j = \lambda_P$ plus the promise (τ_P, λ_P) is enough to avert a revolt $(qv_P\,(\tau_P, \lambda_P) + (1-q)\,v_P\,(0, \lambda_P) < \frac{(1-\mu)\bar{y}(A)}{n_P})$.

3. Only an elite government controlled by the elite faction with $\lambda_j = \lambda_P$ can stop the revolt. Formally:

$$qv_P\,(\tau_P, \lambda_P) + (1-q)\min_{\lambda \in \{\lambda_L, \lambda_K\}} v_P\,(0, \lambda) < \frac{(1-\mu)\,\bar{y}\,(A)}{n_P} \le qv_P\,(\tau_P, \lambda_P) + (1-q)\,v_P\,(0, \lambda_P).$$ (36)

Expression (36) says that a dictatorship controlled by the elite faction with $\lambda_j = \lambda_P$ can stop a revolt, provided that it is backed up by the right type of promise ($\frac{(1-\mu)\bar{y}(A)}{n_P} \leq qv_P(\tau_P, \lambda_P) + (1-q)v_P(0, \lambda_P)$), but a dictatorship controlled by the elite faction with $\lambda_j \neq \lambda_P$ cannot ($qv_P(\tau_P, \lambda_P) + (1-q)\min_{\lambda \in \{\lambda_L, \lambda_K\}} v_P(0, \lambda) < \frac{(1-\mu)\bar{y}(A)}{n_P}$).

4. Both elite governments can stop the revolt. Formally:

$$\frac{(1-\mu)\bar{y}(A)}{n_P} \leq qv_P(\tau_P, \lambda_P) + (1-q)\min_{\lambda \in \{\lambda_L, \lambda_K\}} v_P(0, \lambda), \qquad (37)$$

Expression (37) means that even a dictatorship controlled by the elite faction with $\lambda_j \neq \lambda_P$ can stop a revolt if it is backed up by the right type of promise.

In regions 1, 2 and 3, the elite factions do not really have many alternatives that they can bring into the negotiations. In region 1 there will be a revolution regardless of the elite proposal; in region 2, both elite factions agree that democratization is the only available alternative to a revolt; and in region 3 only one of the elite faction can avoid democratization. This is not the case in region 4, in which both elite factions can control the dictatorship and avert a revolt. Thus, in this region, the elite factions must bargaining over which faction will have the right to propose a policy and reset policy in the event that the opportunity arises. We assume that the bargaining power of the elite faction L is $\chi_L \in [0, 1]$ and the outcome of the bargaining process is given by:

$$\max_j \chi_L \mathbf{E}[v_L(j)] + (1 - \chi_L)\mathbf{E}[v_K(j)],$$

where $\mathbf{E}[v_i(j)]$ is the expected utility of elite faction i when elite faction j controls the dictatorship.

2.4.1 Democratization and Trade Policy in the Absence of Intra-elite Conflict

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When there is no intra-elite conflict, region 3 disappears, since both elite factions prefer the same trade policy, i.e. $\lambda_L = \lambda_K$. Thus, (34), (35), and (37) characterize the regions in which there is a revolution, there is democratization, and the elite stays in power, respectively. Formally, define $\bar{\mu}(\tau, \lambda)$ to be the proportion of aggregate income that the people are willing to sacrifice to expropriate the elite instead of accepting (τ, λ), i.e.:

$$\bar{\mu}(\tau, \lambda) = 1 - \frac{n_P v_P(\tau, \lambda)}{\bar{y}(A)}.$$

Then, from (34), if $\mu < \bar{\mu}(\tau_P, \lambda_P)$, then there is a revolution; from (35), if $\bar{\mu}(\tau_P, \lambda_P) \leq \mu < q\bar{\mu}(\tau_P, \lambda_P) + (1-q)\bar{\mu}(0, \lambda_E)$, then there is democratization; and from (37), if $\mu \geq q\bar{\mu}(\tau_P, \lambda_P) + (1-q)\bar{\mu}(0, \lambda_E)$, then the elite stays in power.

In order to complete a fully characterization of the sub-game perfect equilibrium of the democratization game, we need only to determine which elite faction controls the dictatorship when the elite stays in power and the optimal concession that this faction will promise to make in order to avert the revolt. If the elite has the chance to reset the policy, regardless of which elite faction has the control of the dictatorship, the policy implemented will be $(0, \lambda_E)$. Thus, the only relevant issue is what promise the elite will offer. The set of promises that stop a revolt is given by all the $(\tau, \lambda) \in S$ such that $qv_P(\tau, \lambda) + (1-q)v_P(0, \lambda_E) \geq \frac{(1-\mu)\bar{y}(A)}{n_P}$. Formally:

$$\bar{S}(\mu, \lambda_E) = \{(\tau, \lambda) \in S : \mu \geq q\bar{\mu}(\tau, \lambda) + (1-q)\bar{\mu}(0, \lambda_E)\}.$$

Then, the selected policy will be the one that maximizes $\chi_L v_L(\tau, \lambda) + (1 - \chi_L) v_K(\tau, \lambda)$ subject to $(\tau, \lambda) \in \bar{S}(\mu, \lambda_E)$. Equivalently, if the elite faction j is in control, it will pick $(\tau(j), \lambda(j)) = \arg\max_{(\tau, \lambda) \in \bar{S}(\mu, \lambda_E)} v_j(\tau, \lambda)$. Then, the selected policy will be the one favored by L if and only if the bargaining power of L is such that $\chi_L v_L(\tau(L), \lambda(L)) +$

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$(1 - \chi_L) v_K (\tau (L), \lambda (L))$ is higher than $\chi_L v_L (\tau (K), \lambda (K)) + (1 - \chi_L) v_K (\tau (K), \lambda (H))$.

The following proposition summarizes the results.

Proposition 2.3: *Consider a society with no intra-elite conflict, i.e., $\lambda_E = \lambda_L = \lambda_K \neq \lambda_P$. Let $\bar{\mu} (\tau, \lambda) = 1 - \frac{n_P v_P (\tau, \lambda)}{\bar{y}(A)}$ be the proportion of aggregate income that the people are willing to sacrifice to expropriate the elite instead of accepting (τ, λ). Then, the democratization game has a unique sub-game perfect equilibrium. In this equilibrium:*

1. *If $\mu < \bar{\mu} (\tau_P, \lambda_P)$, then there is a revolution.*

2. *If $\bar{\mu} (\tau_P, \lambda_P) \leq \mu < q\bar{\mu} (\tau_P, \lambda_P) + (1 - q) \bar{\mu} (0, \lambda_E)$, then there is democratization, and the policy that is implemented is (τ_P, λ_P).*

3. *If $\mu \geq q\bar{\mu} (\tau_P, \lambda_P) + (1 - q) \bar{\mu} (0, \lambda_E)$, then the elite stays in power but, possibly, makes concessions.*

    (a) *If the elite faction j controls the dictatorship, then the policy that is implemented is $(\tau (j), \lambda (j)) = \arg\max_{(\tau, \lambda) \in \bar{S}(\mu, \lambda_E)} v_j (\tau, \lambda)$ with probability q and $(0, \lambda_E)$ with probability $(1 - q)$, where:*

    $$\bar{S} (\mu, \lambda_E) = \{(\tau, \lambda) \in S : \mu \geq q\bar{\mu} (\tau, \lambda) + (1 - q) \bar{\mu} (0, \lambda_E)\}.$$

    (b) *The elite faction L controls the dictatorship if and only if $\chi_L \geq \bar{\chi}_L (\mu)$, where:*

    $$\bar{\chi}_L (\mu) = \frac{v_K (\tau (K), \lambda (K)) - v_K (\tau (L), \lambda (L))}{v_L (\tau (L), \lambda (L)) - v_L (\tau (K), \lambda (K)) + v_K (\tau (K), \lambda (K)) - v_K (\tau (L), \lambda (L))}.$$

Figure 2.3 shows a numerical example that illustrates Proposition 2.3, using the following specification: $Y_T = [(Y_K)^\rho + \sigma (Y_L)^\rho]^{\frac{1-\alpha_N}{\rho}} (Y_N)^{\alpha_N}$, $\alpha_N = 0.5$, $\sigma = 1$, $\rho = 1$, $K = 1.75$,

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$L = 1.75$, $N = 1$, $n_L = n_K = 0.1$, $n_N = 0.8$, $C(\tau) = \frac{\tau^{1+\eta}}{1+\eta}$ with $\eta = 0.75$, and $\chi_L \geq \bar{\chi}_L(\mu)$

for all μ.

Please see Figure 2.3: Democratization and Trade Policy in the Absence of Intra-elite

Conflict

2.4.2 Democratization and Trade Policy in the Presence of Intra-elite Conflict

Now we focus on the case of intra-elite conflict. Here again, (34) and (35) identify the regions in which there is a revolution and democratization, respectively.

From (36), if $q\bar{\mu}(\tau_P, \lambda_P) + (1-q)\bar{\mu}(0, \lambda_P) \leq \mu < q\bar{\mu}(\tau_P, \lambda_P) + (1-q)\max_\lambda \bar{\mu}(0, \lambda)$, then only an elite government controlled by the elite faction with $\lambda_j = \lambda_P$ can stop the revolt. Thus, in this region, the elite factions agree that the faction with $\lambda_j = \lambda_P$ must take control of the dictatorship and next this faction promises to institute a policy that maximizes its utility from the set of promises that stop a revolt. Formally, if the faction with $\lambda_j = \lambda_P$ is j, it selects $(\tau(j), \lambda(j)) = \arg\max_{(\tau,\lambda)\in\bar{S}(\mu,\lambda_j)} v_j(\tau, \lambda)$, where:

$$\bar{S}(\mu, \lambda_j) = \{(\tau, \lambda) \in S : \mu \geq q\bar{\mu}(\tau, \lambda) + (1-q)\bar{\mu}(0, \lambda_j)\}.$$

Moreover, since $v_j(\tau, \lambda_j) \geq v_j(\tau, \lambda)$ and $q\bar{\mu}(\tau, \lambda) + (1-q)\bar{\mu}(0, \lambda_j) \geq q\bar{\mu}(\tau, \lambda_j) + (1-q)\bar{\mu}(0, \lambda_j)$, it must be the case that $\lambda(j) = \lambda_j = \lambda_P$. Thus, j selects $(\tau(j), \lambda_j)$.

From (37), if $\mu \geq q\bar{\mu}(\tau_P, \lambda_P) + (1-q)\max_\lambda \bar{\mu}(0, \lambda)$, then either elite governments can stop a revolt. Thus, in this region, the elite factions bargain over which faction will control the dictatorship. Assume that they agree that the elite faction j will be in control. Then, this faction will promise to institute $(\tau(j), \lambda(j))$, which will only be implemented if j is forced to keep its promise, while if j can reset policy, it will implement

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$(0, \lambda_j)$. Therefore, the expected utility of elite faction i when the elite faction j is in control is $\mathbf{E}[v_i(j)] = qv_i(\tau(j), \lambda(j)) + (1-q)v_i(0, \lambda_j)$. Thus, L can impose its will if and only if $\chi_L \mathbf{E}[v_L(L)] + (1 - \chi_L)\mathbf{E}[v_K(L)] \geq \chi_L \mathbf{E}[v_L(K)] + (1 - \chi_L)\mathbf{E}[v_K(K)]$, i.e.,

$\chi_L \geq \bar{\chi}_L(\mu, q) = \frac{\mathbf{E}[v_K(K)] - \mathbf{E}[v_K(L)]}{\mathbf{E}[v_L(L)] - \mathbf{E}[v_L(K)] + \mathbf{E}[v_K(K)] - \mathbf{E}[v_K(L)]}$.

The following proposition summarizes the results.

Proposition 2.4: *Consider a society with intra-elite conflict, i.e., $\lambda_P = \lambda_L \neq \lambda_K$ or $\lambda_P = \lambda_K \neq \lambda_L$. Let $\bar{\mu}(\tau, \lambda) = 1 - \frac{n_P v_P(\tau, \lambda)}{\bar{y}(A)}$ be the proportion of aggregate income that the people are willing to sacrifice in order to expropriate the elite instead of accepting (τ, λ). Then, the democratization game has a unique subgame perfect equilibrium. In this equilibrium:*

1. *If $\mu < \bar{\mu}(\tau_P, \lambda_P)$, then there is a revolution.*

2. *If $\bar{\mu}(\tau_P, \lambda_P) \leq \mu < q\bar{\mu}(\tau_P, \lambda_P) + (1-q)\bar{\mu}(0, \lambda_P)$, then there is democratization and the policy that is implemented is (τ_P, λ_P).*

3. *If $q\bar{\mu}(\tau_P, \lambda_P) + (1-q)\bar{\mu}(0, \lambda_P) \leq \mu < q\bar{\mu}(\tau_P, \lambda_P) + (1-q)\max_\lambda \bar{\mu}(0, \lambda)$, then the elite stays in power but the dictatorship must be controlled by the elite faction with $\lambda_j = \lambda_P$. Assume that the faction with $\lambda_j = \lambda_P$ is j. Then, the policy that is implemented is $(\tau(j), \lambda_j)$ with probability q and $(0, \lambda_j)$ with probability $(1-q)$.*

4. *If $\mu \geq q\bar{\mu}(\tau_P, \lambda_P) + (1-q)\max_\lambda \bar{\mu}(0, \lambda)$, then the elite stays in power and the dictatorship can be controlled by any of the elite factions.*

   (a) *If the elite faction j controls the dictatorship, then the policy that is implemented is $(\tau(j), \lambda(j)) = \arg\max_{(\tau, \lambda) \in \bar{S}(\mu, \lambda_j)} v_j(\tau, \lambda)$ with probability q and $(0, \lambda_j)$ with*

probability $(1 - q)$, *where:*

$$\bar{S}\left(\mu, \lambda_j\right) = \left\{(\tau, \lambda) \in S : \mu \geq q\bar{\mu}\left(\tau, \lambda\right) + (1 - q)\bar{\mu}\left(0, \lambda_j\right)\right\}.$$

(b) *Let* $E\left[v_i\left(j\right)\right] = qv_i\left(\tau\left(j\right), \lambda\left(j\right)\right) + (1 - q)v_i\left(0, \lambda_j\right)$ *be the expected utility of elite faction* i *when elite faction* j *controls the dictatorship. Then, the elite faction* L *controls the dictatorship if and only if* $\chi_L \geq \bar{\chi}_L\left(\mu, q\right)$, *where:*

$$\bar{\chi}_L\left(\mu, q\right) = \frac{\mathbf{E}\left[v_K\left(K\right)\right] - \mathbf{E}\left[v_K\left(L\right)\right]}{\mathbf{E}\left[v_L\left(L\right)\right] - \mathbf{E}\left[v_L\left(K\right)\right] + \mathbf{E}\left[v_K\left(K\right)\right] - \mathbf{E}\left[v_K\left(L\right)\right]}.$$

Figure 2.4 shows a numerical example that illustrates Proposition 2.4, using the following specification: $Y_T = \left[\left(Y_K\right)^\rho + \sigma\left(Y_L\right)^\rho\right]^{\frac{1-\alpha_N}{\rho}}\left(Y_N\right)^{\alpha_N}$, $\alpha_N = 0.5$, $\sigma = 1$, $\rho = 0.35$, $K = 2$, $L = 0.75$, $N = 1.5$, $n_L = n_K = 0.1$, $n_N = 0.8$, $C\left(\tau\right) = \frac{\tau^{1+\eta}}{1+\eta}$ with $\eta = 0.75$, and $\chi_L \geq \bar{\chi}_L\left(\mu, q\right)$ for all (μ, q).

Please see Figure 2.4: Democratization and Trade Policy in the Presence of Intra-elite

Conflict

2.4.3 Great Britain in the Nineteenth Century

Britain's bold move toward free trade in 1846 was both unprecedented and unilateral; moreover, it ran counter to the core protectionist ideology of the conservative party while simultaneously undercutting the economic interests of the ruling landed aristocracy. Thereafter, Great Britain had a stable free-trade policy throughout its transition to a fully consolidated democracy, even during international crises and depressions that put the system under stress and prompted many British trading partners to adopt protectionist measures.

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Before the Reform Act of 1832, the rural aristocracy dominated British politics. The Reform Act established the right to vote based solely on income and property, thereby considerably changing the distribution of political power. As discussed in Acemoglu and Robinson (2006), the Reform Act had three main features. First, it was passed primarily because there was a fear that social disturbances would arise. Second, it was a strategic concession on the part of the aristocracy, since it did not create a full democracy, but simply extended the franchise to the new industrial and commercial elite and the upper-middle class. Third, the working classes were completely excluded by the reform. In terms of our model, the rural aristocracy and the industrial and commercial elite were the two elite factions. Before the reform, the aristocracy controlled the autocratic government. The reform, although it did not completely transfer control over the autocracy to the industrial and commercial elite, did erode the power of the aristocracy and significantly expand the power of the new industrial and commercial elite. However, this was just the beginning of a process that reallocated political power between the aristocracy and the industrial and commercial elite. The debate about the Corn Laws was another decisive factor in this process, as well as an excellent test for the new distribution of political power.

Manufacturers had opposed the protectionist Corn Laws as early as the 1820s, but were never strong enough to repeal them. But, beginning in 1836, an economic downturn, together with a series of poor harvests, goaded the industrialists into action. High food prices and unemployment also gave impetus to both the middle and working classes, with the former being organized as the Anti-Corn Law League and the latter as the Chartist movement. The Anti-Corn Law League was the first modern, nationwide political pressure group to emerge in Britain (see, among others, Howe, 1984, and Turner, 1995). The leaders of the League were manufacturers and professionals engaged in export trade. By the 1840s, the Anti-Corn League had garnered the support of many urban groups, including

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some urban workers. The Chartists were an organized working-class movement that sought parliamentary reform, arguing that reform must encompass the entire social and political horizon. In contrast, the League chose a single-issue strategy in it efforts to achieve repeal (Schonhard-Bailey, 2006).

The Conservatives entered the government in 1841 with a strong and unified commitment to protecting agriculture, yet their leader, Prime Minister Sir Robert Peel, completely reversed this stance within a few years. In 1846, Prime Minister Peel decided to accept the repeal of the Corn Laws, and about a third of the members of Parliament in his party followed his lead; the rest remained firmly committed to protecting agriculture. Within a month of securing the repeal, the Peel government fell, while the Conservatives remained divided (the repeal of the Corn Laws triggered the expulsion of the Peelite faction from the Tories, led by Bentink and Disraeli), and then remained out of office for decades. This division paved the way for almost 30 years of Whig and Liberal dominance, which "rested on a firm alliance of the urban working and middle classes, of labor and capital" (Rogowski, 1989). During this period, a free-trade policy was the norm. Moreover, "liberal governments steadily pursued even freer trade, lower taxes and transaction costs, expansion of the franchise, and diminution of the remaining powers of local landowners, the Crown, and the House of Lords" (Rogowski, 1989).

Schonhardt-Bailey (2006) tells a simple but compelling story: economic interests generated the momentum behind the repeal movement, a momentum that overshadowed almost all else. Indeed, as part of a broader movement toward democratic reform, these same interests, left unsatisfied, could have snowballed into revolution, as Peel and others had feared (and as happened, just two years later, in France). Schonhard-Bailey (2006) rightly argues that the fatal factor for the Corn Laws was the growth of the British manufacturing industry and export trade, especially in textiles. More particularly, as the industrial

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prosperity and export boom of the early 1830s began to wane, industrialists became increasingly vocal about the "unfair" protection enjoyed by agriculturists. In fact, after the repeal of the Corn Laws, Peel himself argued, in an elaborate display of concessionary politics, that he sought repeal in order to "satisfy the wishes of those outside" (the middle-class industrialists). He implied that a "narrow representation of Parliament" (control of Parliament by the landed aristocracy) required that concessions be made to satisfy interest groups that were clamoring for reform. The alternative, he implied, was that pressures for reform might become overwhelming, as they had in France (see Schonhard-Bailey, 2006). In sum, repeal was an attempt to moderate the mounting pressures for parliamentary reform: by satisfying the middle class and industrialists with repeal, their drive to gain control of parliamentary seats would wane and, moreover, the working-class Chartist movement (seeking more radical reform of Parliament) would lose momentum (see Searle, 1993; and Schonhard-Bailey, 2006). In terms of our model, the protectionist aristocracy, by partially transferring control over the government to the pro-free-trade industrialists (the Reform Act of 1832) and allowing a switch in trade policy (the repeal of the Corn Laws in 1846), placated the populace, thereby convincing it to relinquish its more radical demands.

In such a context, the only option for the Conservatives was to match the set of policies offered by the Liberals. In fact, in 1867, Disraeli supported the Second Reform Act, which significantly extended the franchise. Indeed, after the reform, "working-class voters became the majority in all urban constituencies" (Acemoglu and Robinson, 2006). The particular events leading up to the Second Reform Act were similar to those that preceded the Reform Act of 1832: riots and social disturbances that convinced the capitalist and commercial elite that the only alternative to a revolt was an extension of the franchise to the working classes. In fact, the Chartist movement had significantly increased its power since 1832.

The 1873-1876 crisis provided an excellent test for trade policy. After 1875, imports

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from America had a significant impact on landowners, and the Conservatives, led by Disraeli, had a majority in Parliament. A group of Conservatives guided by Joseph Chamberlain,"...tried to organize a coalition with a family resemblance of Bismarck's grouping of industrialists, farmers and workers hit by foreign competition" (Gourevitch 1986) and attempted to reopen the discussion about tariffs. However, this attempt did not succeed, since even "Disraeli - who had made protection his by-word in the 1840s - flatly refused to help" (Rogowski, 1989). Moreover, this time, workers were clearly against protectionism. "Labor, by the 1870s, was quite strong in support of free trade. In the 1840s, anti-corn-law activists had argued that labor ought to support free trade in order to keep down consumer costs, especially the price of food. Labor activists at the time were more skeptical, seeing tariffs as a middle-class concern that distracted attention from the broader political demands of Chartism. It was only after experiencing the prosperity of the 1850s and 1860s that British labor accepted free trade" (Gourevitch 1986). It is worth mentioning that the protectionist pressures that were brought to bear during the 1873-1876 crisis were really very strong. Internally, some of the consequences of the free-trade policy were "a new wave of bitterness and violence in Ireland (still almost wholly agricultural) [and] the bankruptcy and reform of the Oxford colleges (whose endowments were largely in land)" (Rogowski, 1989). Almost all the countries that played an important role in the international arena, including Germany, France and the United States, implemented protectionist measures, although of different types and to different degrees (Gourevitch, 1986; and Rogowski, 1989).

In 1884 the Third Reform Act extended the coverage of voting regulations to rural constituencies and the "Redistribution Act of 1885 removed many remaining inequalities in the distribution of seats" (Acemoglu and Robinson, 2006). The result was that "after 1884, about 60% of male adults were enfranchised" (Acemoglu and Robinson, 2006). Mainly negotiated during the war, "the Peoples Act of 1918 gave the vote to all adult males over

the age of twenty-one and women over the age of thirty who were ratepayers or married to ratepayers" (Acemoglu and Robinson, 2006). In the realm of trade policy, there was no further attempt to alter the free-trade status quo. As already mentioned, this was to be expected, since the newly enfranchised members of the population were industrial workers who supported free trade. Moreover, it is likely that the new industrial and commercial elite was less reluctant to extend the franchise to industrial workers. This was true for two reasons. First, workers did not pose a threat to the free-trade policy favored by this elite group. Second, free trade probably reduced income inequality, thereby making workers less willing to support redistribution through income taxation. The old aristocracy, already severely weakened, preferred this democratization path, which was coupled with a stable free-trade policy, because, at the least, it restrained the workers' most extreme redistributionist policy proposals. The industrial and commercial elite always enjoyed a huge advantage in its negotiations with the aristocracy, since, if the aristocrats refused to support free trade, the industrial and commercial elite could always accelerate the democratization process and achieve free trade anyway. Of course, this came at a price, namely, welfare legislation.

Summing up, Great Britain in the nineteenth century provides an example of intra-elite conflict (the protectionist, landed aristocracy versus the pro-free-trade industrial and commercial elite) in combination with a pro-free-trade populace. The aristocracy, facing radical demands, had no other option but to gradually concede political power to the new industrial and commercial elite. The Reform Act of 1832 and the repeal of the Corn Laws in 1846 were two landmark events in this process. The repeal of the Corn Laws was an unprecedented move toward free trade that both reflected and reinforced the new distribution of political power. Proposition 2.4 captures this reallocation of political power among the elite, as well as the switch in trade policy. After 1846, Great Britain had a

stable free-trade policy throughout the entire transition to a consolidated democracy, which was fully completed in the twentieth century. The transition was primarily an ongoing bargaining process between industrialists and workers over welfare legislation. Proposition 2.4 properly captures this transition.

2.5 A Dynamic Model of Regime Determination with Endogenous Trade Policy

In this section we present a fully dynamic model of regime determination. There are several reasons for doing so. First, the dynamic model confirms that the democratization and coup static models that we studied in the previous sections are mutually compatible. Second, the dynamic model captures some situations that, by construction, cannot be captured by the static models. In particular, with a dynamic model, it is possible to have an equilibrium in which waves of democratization and coups alternate with each other, which corresponds more accurately to the model of an unconsolidated democracy. Finally, unlike the static models, in the dynamic model there is a natural way of generating partially credible promises.

Let $y_{i,t}$ be the gross income (before the redistribution scheme) of a member of group i in period t. In each period, the government runs a balanced budget redistribution scheme that taxes the income of all citizens at a rate $\tau_t \in [0,1]$ and redistributes the proceeds through a lump-sum transfer. In each period, the government also selects a trade policy $\lambda_t \in \{A, F\}$. The per period utility function of a member of group i is given by:

$$v_i\left(\tau_t, \lambda_t\right) = \left(1 - \tau_t\right) y_i\left(\lambda_t\right) + \left[\tau_t - C\left(\tau_t\right)\right] \bar{y}\left(\lambda_t\right),$$

where $y_i\left(\lambda_t\right)$ is the the gross income of a member of group i when the trade policy is λ_t and $\bar{y}\left(\lambda_t\right) = \sum_i n_i y_i\left(\lambda_t\right)$ is the average income of society when trade policy is λ_t. The

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expected utility of a member of group i at time t is given by:

$$V_i = \mathbf{E}_t \sum_{k=t}^{\infty} \beta^{k-t} v_i \left(\tau_k, \lambda_k \right),$$

where $\beta \in (0,1)$ is the common discount factor and $\mathbf{E}_t$ is the expectation operator taken over the probability distribution of sequences of the form $\{\tau_k, \lambda_k\}_{k=t}^{\infty}$.

The choice of who makes collective decisions (τ, λ) in each period and under what restrictions depends on the distribution of political power in society. There are two sources of political power: *de jure* power, which emanates from legal institutions, and *de facto* power, which emanates from the ability to change legal institutions. Political regimes allocate *de jure* political power to different groups in society. We consider two alternative political regimes: dictatorship or autocracy, and democracy. In a dictatorship, the elites have the *de jure* political power and, hence, the government maximizes the elites' utility. However, sometimes dictatorships face a threat of revolution, which temporarily gives *de facto* political power to the people. In a democracy, the populace has the *de jure* political power and, hence, the government maximizes the people's utility. Sometimes democracies may face the threat of a coup, however, which temporarily gives *de facto* political power to the elites. Revolutions and coups are costly events. A simple way of modeling this is to assume that a fraction μ (φ) of the gross income of society is destroyed in a revolution (coup). The *de facto* political power conferred by the threat of a revolution or a coup is also transitory. A simple way of modeling this is to assume that, if the political regime is a dictatorship, then, during any given period, there is some probability that people will be able to overcome the collective action problem and thus pose a revolutionary threat. Similarly, if the political regime is a democracy, then, in every given period, there is some probability that the elite will be able to pose the threat of a coup. Formally, in a dictatorship, the state of nature can be either H, with probability $q < 1/2$, or L, with

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probability $(1 - q)$. When the state of nature is H, the cost of the revolution is $\mu^H = \mu < 1$; when the state is L, the cost of the revolution is $\mu^L = 1$. Thus, in state H, people may be coming together in order to organize a revolution, while in state L, the revolution has a prohibitive cost. In a democracy, the state of nature can be either H, with probability $r < 1/2$, or L, with probability $(1 - r)$. When the state of nature is H, the cost of the coup is $\varphi^H = \varphi < 1$; when the state is L, the cost of the coup is $\varphi^L = 1$. Thus, in state H, the elites may coalesce for the purpose of organizing a coup, while in state L, the cost of the coup is prohibitive.

The timing of events within a given period in a democracy is as follows:

1. The state φ_t is revealed.

2. The people propose a policy (τ, λ) to be implemented by the democratic government.

3. One of the elite faction, indicated by $l \in \{L, K\}$, observes the people's proposal and then chooses to mount a coup or not. If l mounts a coup, it also backs one of the elite's factions to control the new dictatorship.

4. The other faction of the elite, indicated by $s \in \{L, K\}$, examines the people's proposal and l's move. If l has begun a coup, s must decide whether to support it or not. If s supports the coup, then the coup takes place, the new elite government takes form and the elite faction that controls it selects a policy. The coup costs a faction φ_t of aggregate income. If s does not support the coup, then the coup fails and the elite cannot take power.

5. If there is no effective coup, either because l does not mount it, or because s does not support it, then the people's proposal is implemented.

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The intuition behind this timing is the following. We model a coup as a game between the elites and the people in which the people's promises are credible only when the elites have a credible coup threat, i.e., in the state H. The new issue that we introduce is a second dimension of potential conflict: trade policy. In particular, although all members of the elites prefer the lowest income tax, they may disagree about trade policy. Also, people may have a higher or lower propensity to implement protectionist policies, which implies that democracy may be more costly for one elite group and more attractive for the other. For the intra-elite bargaining over the coup, we assume that one of the elite factions, denoted l, takes the lead and decides whether to mount a coup and proposes which group should control the new elite government, while the other elite faction, denoted s, has veto power. When both elite factions have the same trade policy preferences, it does not significantly matter which one is l and which one is s, since $\lambda_l = \lambda_s \neq \lambda_P$. However, when there is intra-elite conflict over trade policy, it is very important to determine which elite faction has the power to propose and which has veto power. We assume that the elite faction s and the people share the same trade policy preferences, i.e., $\lambda_l \neq \lambda_s = \lambda_P$. Note also that there is no credible commitment problem between the elite factions, since, once a coup has been mounted, only one faction of the elite will control the new dictatorship.

The timing of events within a given period in a dictatorship is as follows:

1. The state μ_t is revealed.

2. The elite faction that controls the dictatorship decides whether to concede the control of the dictatorship to the other elite faction or not.

3. The elite faction that controls the dictatorship proposes democratization or a policy (τ, λ); and

4. The people observe the elite's move and decide whether they should mount a revolution or not. If the elite offers democratization and the people accept the offer, they take over, and the new democratic government selects a policy. If the populace organizes a revolution, all factor endowments are expropriated and redistributed evenly among the people, and the economy moves into autarky. The revolution costs a fraction μ_t of aggregate income, which includes the cost of organizing the revolution as well as the long-standing reduction in economic efficiency caused by the elimination of private property.

Only step 2 requires some explanation. The idea is that the elite faction that controls a dictatorship might prefer to concede the control of the dictatorship to the other elite faction if that would help to avoid democratization. This concession is a reallocation of de jure political power between the elite factions and can be accomplished through an extension of the franchise or any political reform that properly re-balances the legal rights of the two elite factions in the autocratic regime.

In order to study this dynamic game, we only consider Markov strategies, which means that the decision of player i in period t can only depend on the political regime at the beginning of the period, the realization of the random variables μ_t or φ_t, and the actions taken by other players in period t before i must move. Given this restriction, we then find the Markov perfect equilibrium of the game.

In order to characterize the Markov perfect equilibrium, it is useful to define some thresholds values for μ and φ. Recall that $\bar{\mu}(\tau, \lambda) = 1 - \frac{n_P v_P(\tau, \lambda)}{\bar{y}(A)}$ denotes the proportion of aggregate income that the people are willing to sacrifice to expropriate the elite rather than accepting (τ, λ), while $\bar{\varphi}_i(\lambda_j, \tau, \lambda) = 1 - \frac{v_i(\tau, \lambda)}{v_i(0, \lambda_j)}$ denotes the fraction of its income that the elite faction i is willing to sacrifice in order to switch policy from (τ, λ) to $(0, \lambda_j)$.

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In the appendix[40] we prove that the set of promises that will placate a revolt when the autocracy is controlled by the elite faction j is given by:

$$\bar{S}_R\left(\mu, \lambda_j\right) = \left\{(\tau, \lambda) \in S : \mu \geq [1 - \beta(1-q)]\bar{\mu}(\tau, \lambda) + \beta(1-q)\bar{\mu}(0, \lambda_j)\right\}.$$

The intuition is the following. Suppose that the autocracy is controlled by the elite faction j, there is a revolt threat, and the elite promises to implement (τ, λ). For the period concerned, the elite's proposal is completely credible, but in the future it will be credible only when there is a threat of a revolt (an event that occurs with probability q), since if there is no such threat (an event that occurs with probability $(1-q)$), the elite government can safely implement $(0, \lambda_j)$. $q\bar{\mu}(\tau, \lambda) + (1-q)\bar{\mu}(0, \lambda_j)$ indicates the proportion of aggregate income that the people are willing to sacrifice in order to expropriate the elite rather than accepting (τ, λ) with probability q and $(0, \lambda_j)$ with probability $(1-q)$. Thus, $(1-\beta)\bar{\mu}(\tau, \lambda) + \beta[q\bar{\mu}(\tau, \lambda) + (1-q)\bar{\mu}(0, \lambda_j)]$ indicates the proportion of aggregate income that the people are willing to sacrifice in order to expropriate the elite rather than accepting (τ, λ) now and (τ, λ) with probability q and $(0, \lambda_j)$ with probability $(1-q)$ in the future. Since, μ is the proportion of aggregate income that the people must sacrifice in order to mount a revolt and expropriate the elite, $\bar{S}_R(\mu, \lambda_j)$ is the set of promises that placate those threatening to revolt.

In the appendix, we prove that the set of promises that will stop a coup that would give rise to a short-lived dictatorship controlled by the elite faction j is given by:

$$\bar{S}_C\left(\varphi, \lambda_j\right) = \left\{(\tau, \lambda) \in S : \text{there is } i \in \{L, K\} \text{ such that } [1 - \beta(1-q)]\varphi \geq\right.$$

$$\left.[1 - \beta(1-q-r)]\bar{\varphi}_i(\tau, \lambda, \lambda_j) + \beta(1-q-r)\bar{\varphi}_i(\tau_P, \lambda_P, \lambda_j)\right\}.$$

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[40]Please see online appendix.

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The intuition is the following. Consider a situation in which a threat of a revolt forces the elite to offer to institute a democracy (since, otherwise, the people will revolt). Thus, autocracies cannot be long-lasting because, sooner or later, a revolt will lead to a democracy. Suppose that we are in a democratic regime, there is a coup threat and the people promise to implement (τ, λ). During the period in question, the promise is completely credible, but, in the future, it will be credible only when there is a coup threat (an event that occurs with probability r), since, when there is no such threat, the people can safely implement (τ_P, λ_P). Thus, if the elite does not mount a coup, with probability r, the policy is (τ, λ) and, with probability $(1 - r)$, it is (τ_P, λ_P). Conversely, if every time that there is a coup threat the elite mounts a coup that gives rise to a dictatorship controlled by the elite faction j, then society will continuously switch back and forth between one political regime and the other. Under democracy, the people implement (τ_P, λ_P) until there is a coup and the policy is switched to $(0, \lambda_j)$, which in turn is implemented until a new revolt threat leads to another wave of democratization. Thus, from the point of view of the elite, the key difference between accepting the people's promise or not is that a coup would lead to $(0, \lambda_j)$ under circumstances in which the policy to be implemented would have been (τ, λ) or (τ_P, λ_P). More formally, $(1 - \beta) \bar{\varphi}_i (\tau, \lambda, \lambda_j) + \beta [(r + q) \bar{\varphi}_i (\tau, \lambda, \lambda_j) + (1 - r - q) \bar{\varphi}_i (\tau_P, \lambda_P, \lambda_j)]$ indicates the proportion of its income that elite faction i is willing to sacrifice in order to get $(0, \lambda_j)$ instead of (τ, λ) now and (τ, λ), with probability $(r + q)$, and (τ_P, λ_P), with probability $(1 - r - q)$, in the future. Engineering this policy change has an expected cost for the elite, which is given by $(1 - \beta) \varphi + \beta q \varphi$ (the cost is expressed as a fraction of i's income). The first term is the immediate cost of mounting a coup, while the second term is the expected discounted cost of future coups (there will be a coup each time that a democracy is established, an event that occurs with probability q). Finally, the inequalities that characterize $\bar{S}_C (\varphi, \lambda_j)$ must be valid only for one $i \in \{L, K\}$ because only one elite faction

needs to oppose the coup in order for it to fail.

In the appendix, we also prove that the set of promises that stop a coup which gives rise to a lasting dictatorship controlled by the elite faction j is given by:

$$\tilde{S}_C\left(\varphi,\mu,\lambda_j\right) = \{(\tau,\lambda) \in S : \text{there is } i \in \{L,K\} \text{ such that } (1-\beta)\,\varphi \geq$$

$$\left[1-\beta\left(1-r\right)\right]\bar{\varphi}_i\left(\tau,\lambda,\lambda_j\right) + \beta\left(1-r\right)\bar{\varphi}_i\left(\tau_P,\lambda_P,\lambda_j\right) - \beta q\bar{\varphi}_i\left(\tau\left(j\right),\lambda\left(j\right),\lambda_j\right)\}$$

where $\left(\tau\left(j\right),\lambda\left(j\right)\right) = \arg\max_{(\tau,\lambda)\in\bar{S}_R(\mu,\lambda_j)} v_j\left(\tau,\lambda\right)$. The intuition is similar to the one behind $\bar{S}_C\left(\varphi,\lambda_j\right)$. However, there is one key difference: once the elite mounts a coup, there will be no further attempt at democratization. This does not affect the value of the people's offer, but it significantly changes the cost and benefits of a coup. Now a coup implements $(0,\lambda_j)$ when there is no revolt threat and $\left(\tau\left(j\right),\lambda\left(j\right)\right)$ when there is a revolt threat. More formally, $(1-\beta)\,\bar{\varphi}_i\left(\tau,\lambda,\lambda_j\right) + \beta\left[r\bar{\varphi}_i\left(\tau,\lambda,\lambda_j\right) + (1-r)\,\bar{\varphi}_i\left(\tau_P,\lambda_P,\lambda_j\right)\right]$ indicates the proportion of its income that elite faction i is willing to sacrifice in order to obtain $(0,\lambda_j)$ instead of (τ,λ) now and (τ,λ) with probability r and (τ_P,λ_P) with probability $(1-r)$ in the future. However, a coup cannot always implement $(0,\lambda_j)$, since, when there is a revolt threat, the elite must placate the potential rebels by offering $\left(\tau\left(j\right),\lambda\left(j\right)\right)$. For this reason we must subtract $\beta q\bar{\varphi}_i\left(\tau\left(j\right),\lambda\left(j\right),\lambda_j\right)$ from the benefits of a coup. In terms of the costs, in this situation, a coup occurs only once, which implies that a long-lasting dictatorship costs the elite (expressed as a fraction of its income) just $(1-\beta)\,\varphi$.

2.5.1 In the Absence of Intra-elite Conflict

We begin with a situation in which there is no intra-elite conflict. The following proposition summarizes the results.

Proposition 2.5: *Consider a society with no intra-elite conflict over trade policy, i.e.,* $\lambda_L = \lambda_K = \lambda_E \neq \lambda_P$. *Then, the political regime determination game has a unique Markov perfect equilibrium. In this equilibrium:*

1. *If* $\mu \geq [1 - \beta(1-q)]\bar{\mu}(\tau_P, \lambda_P) + \beta(1-q)\bar{\mu}(0, \lambda_E)$, *the society remains non-democratic. When* $\mu_t = \mu^L$, *the elites set* $(0, \lambda_E)$; *when* $\mu_t = \mu^H$, *they offer* $(\tau(l), \lambda(l)) = \arg\max_{(\tau, \lambda) \in \bar{S}(\mu, \lambda_E)} v_l(\tau, \lambda)$.

2. *If* $\mu < [1 - \beta(1-q)]\bar{\mu}(\tau_P, \lambda_P) + \beta(1-q)\bar{\mu}(0, \lambda_E)$, *society switches to democracy the first time* $\mu_t = \mu^H$. *Thereafter:*

   (a) *If* $[1 - \beta(1-q)]\varphi \geq \min_i \bar{\varphi}_i(\tau_P, \lambda_P, \lambda_E)$, *then democracy is fully consolidated and the people set* (τ_P, λ_P).

   (b) *If* $\beta(1 - q - r)\min_i \bar{\varphi}_i(\tau_P, \lambda_P, \lambda_E) \leq [1 - \beta(1-q)]\varphi < \min_i \bar{\varphi}_i(\tau_P, \lambda_P, \lambda_E)$, *then democracy is semi-consolidated. When* $\varphi_t = \varphi^L$, *the people set* (τ_P, λ_P); *when* $\varphi_t = \varphi^H$ *they offer* $(\tau, \lambda) = \arg\max_{(\tau, \lambda) \in \bar{S}(\varphi, \lambda_E)} v_P(\tau, \lambda)$.

   (c) *If* $[1 - \beta(1-q)]\varphi < \beta(1 - q - r)\min_i \bar{\varphi}_i(\tau_P, \lambda_P, \lambda_E)$, *then democracy is unconsolidated. The society continuously switches political regimes and trade policies. In a dictatorship, when* $\mu_t = \mu^L$, *the elites set* $(0, \lambda_E)$; *when* $\mu_t = \mu^H$, *they democratize and the people set* (τ_P, λ_P). *In a democracy, when* $\varphi_t = \varphi^L$, *the people set* (τ_P, λ_P); *when* $\varphi_t = \varphi^H$, *there is a coup and the elites set* $(0, \lambda_E)$.

Proof: we present a detailed proof in an online appendix. ■

The main message of proposition 2.5 can be easily summarized in a less formal way, which also has the advantage of highlighting the relationships between the political regime and trade policy. Consider a society in which there is **no intra-elite conflict over trade policy**. If the cost of organizing a revolt is high enough ($\mu \geq [1 - \beta(1-q)]\bar{\mu}(\tau_P, \lambda_P) +$

$\beta \left(1 - q \right) \bar{\mu} \left(0, \lambda_E \right))$, the elites can always placate the populace by offering a temporary concession. In this case, society remains non-democratic, there is very low redistribution and the economy tends to operate under the trade policy preferred by the elites, except under special circumstances, when the best way of stopping a revolt without giving up the political regime is by offering a temporary change in trade policy. If the cost of organizing a revolt is low enough ($\mu < \left[1 - \beta \left(1 - q \right) \right] \bar{\mu} \left(\tau_P, \lambda_P \right) + \beta \left(1 - q \right) \bar{\mu} \left(0, \lambda_E \right))$, then a temporary concession cannot placate the people and the elites are forced to democratize. The type of democratic regime that emerges will depend on the cost of coups. If the cost of organizing a coup is relatively high ($\left[1 - \beta \left(1 - q \right) \right] \varphi \geq \min_i \bar{\varphi}_i \left(\tau_P, \lambda_P, \lambda_E \right))$, then, after the first revolt, society switches from a dictatorship with no income redistribution and the trade policy preferred by the elite to a consolidated democracy with high levels of income taxation and redistribution and a trade policy preferred by the people. If the cost of organizing a coup is moderate ($\beta \left(1 - q - r \right) \min_i \bar{\varphi}_i \left(\tau_P, \lambda_P, \lambda_E \right) \leq \left[1 - \beta \left(1 - q \right) \right] \varphi < \min_i \bar{\varphi}_i \left(\tau_P, \lambda_P, \lambda_E \right))$, then, after the first revolt, society switches from a dictatorship with no income redistribution and the trade policy preferred by the elites to a semi-consolidated democracy, which usually levies high income taxes and implements the trade policy preferred by the people, but may sometimes face a coup threat, which it can counter by moderating income taxation and perhaps by introducing a change in trade policy for a brief period. Finally, if the cost of organizing a coup is relatively low ($\left[1 - \beta \left(1 - q \right) \right] \varphi < \beta \left(1 - q - r \right) \min_i \bar{\varphi}_i \left(\tau_P, \lambda_P, \lambda_E \right))$, then society continuously switches between political regimes, levels of income taxation and types of trade policy. Under a dictatorship, there is no income taxation and the trade policy that is implemented is the one preferred by the elite, while, under a democracy, there is a high level of income taxation and the trade policy that is implemented is the one preferred by the people.

2.5.2 Intra-elite Conflict

Next, we study the equilibrium of the dynamic game when there is intra-elite conflict over trade policy. First, we cover situations in which at least one elite faction can stop a revolt by offering a temporary concession and, hence, the key political issue is who controls the autocracy. The following proposition summarizes the results.

Proposition 2.6: *Consider a society with intra-elite conflict over trade policy, i.e., $\lambda_l \neq \lambda_s = \lambda_P$. Then, the political regime determination game has a unique Markov perfect equilibrium. In this equilibrium, before the first time that $\mu_t = \mu^H$, the autocracy is controlled by the elite faction l, which sets $(0, \lambda_l)$. Thereafter:*

1. *If $\mu \geq [1 - \beta(1-q)]\bar{\mu}(\tau_P, \lambda_P) + \beta(1-q)\bar{\mu}(0, \lambda_l)$, the society remains nondemocratic, but the autocracy continues under the control of l only if $V_l(l, \mu^H) \geq V_l(s, \mu^H)$.[41] Otherwise, the first time that $\mu_t = \mu^H$, the control of the autocracy is transferred to s. Moreover, when the autocracy is under the control of the elite faction j, when $\mu_t = \mu^L$, the autocratic government sets $(0, \lambda_j)$, while when $\mu_t = \mu^H$, it sets $(\tau(j), \lambda(j)) = \arg\max_{(\tau, \lambda) \in \bar{S}_R(\mu, \lambda_j)} v_j(\tau, \lambda)$.*

2. *If $[1 - \beta(1-q)]\bar{\mu}_P(\tau_P, \lambda_P) + \beta(1-q)\bar{\mu}_P(0, \lambda_s) \leq \mu < [1 - \beta(1-q)]\bar{\mu}_P(\tau_P, \lambda_P) + \beta(1-q)\bar{\mu}_P(0, \lambda_l)$, then, the first time that $\mu_t = \mu^H$, society switches to an autocracy controlled by s or to a democracy. Moreover:*

   (a) *Suppose that democratization leads to: (i) a fully consolidated democracy; (ii) a semi-consolidated democracy in which each time $\varphi_t = \varphi^H$, the people set $\tau \leq \tau_P(\lambda_P)$ and λ_P; or (iii) a short period of democracy until $\varphi_t = \varphi^H$, followed by a coup that gives rise to a permanent autocracy controlled by s. Then, the first time $\mu_t = \mu^H$, the elite faction l transfers the control of the autocracy to s.*

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[41]Note that $V_i(j, \mu^H) = (1-\beta)^{-1}\{[1 - \beta(1-q)]v_i(\tau(j), \lambda(j)) + \beta(1-q)v_i(0, \lambda_j)\}$, where $(\tau(j), \lambda(j)) = \arg\max_{(\tau, \lambda) \in \bar{S}_R(\mu, \lambda_j)} v_j(\tau, \lambda)$.

(b) *Suppose that democratization leads to: (i) a semi-consolidated democracy in which each time $\varphi_t = \varphi^H$, the people set $\tau \leq \tau_P(\lambda_l)$ and λ_l; or (ii) an unconsolidated democracy with periodic coups that give rise to a dictatorship controlled by l. Then the elite faction l choose to democratize if and only if*

$$V_l(D, \varphi^L) \geq V_l(s, \mu^H).^{42}$$

Proof: we present a detailed proof in an online appendix. ■

The main message of proposition 2.6 (parts 1 and 2) can be easily summarized in a less formal but clearer way. Consider a society in which there is **intra-elite conflict** over trade policy. In particular, suppose that the **aristocracy is protectionist, while the capitalists and the populace are pro-free-trade**. If the cost of organizing a revolt is high enough ($\mu \geq [1 - \beta(1-q)]\bar{\mu}(\tau_P, \lambda_P) + \beta(1-q)\bar{\mu}(0, \lambda_l)$), then society remains non-democratic. If the autocracy is controlled by the aristocracy, the economy tends to operate under protectionism, except when the people are threatening to revolt and must be placated with temporary redistribution measures and, possibly, a brief period of free trade. If the autocracy is controlled by the capitalists, there is always a free-trade policy and the potential proponents of a revolt are placated with temporary redistribution measures. The aristocracy will be more willing to transfer control of the autocracy over to the capitalists if such an autocracy can stop revolts with much lower taxation levels than an autocracy controlled by the aristocracy. If the cost of organizing a revolt is low enough ($[1 - \beta(1-q)]\bar{\mu}_P(\tau_P, \lambda_P) + \beta(1-q)\bar{\mu}_P(0, \lambda_s) \leq \mu < [1 - \beta(1-q)]\bar{\mu}_P(\tau_P, \lambda_P) + \beta(1-q)\bar{\mu}_P(0, \lambda_l)$), then there are two possible situations: either the aristocracy transfers the control of the autocracy to the capitalists and, hence,

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[42]For a semi-consolidated democracy $V_i(D, \varphi^L) = (1-\beta)^{-1}\{\beta r v_i(\tau_D, \lambda_D) + (1 - \beta r) v_i(\tau_P, \lambda_P)\}$, where $(\tau_D, \lambda_D) = \arg\max_{(\tau,\lambda) \in \tilde{S}_C(,\varphi,\mu,\lambda_P)} v_P(\tau, \lambda)$. For an unconsolidated democracy $V_i(D, \varphi^L) = (1-\beta)^{-1}[1 - \beta(1-q-r)]^{-1}\{[1 - \beta(1-q)]v_i(\tau_P, \lambda_P) + \beta r v_i(0, \lambda_l) - \beta r[1 - \beta(1-q)]\varphi v_i(0, \lambda_l)\}$. For the defintion of $V_l(s, \mu^H)$ see the previous footnote.

democratization can be avoided, or the aristocracy democratizes. Depending on the type of democratic regime that emerges, the aristocracy prefers one or the other alternative. In particular, suppose that the aristocracy has very little de facto political power in a democracy, such that democratization leads to a fully consolidated democracy, a semi-consolidated democracy that always implements a free trade policy, or a brief period of democracy, followed by a coup that gives rise to an embedded autocracy controlled by capitalists. Then, the aristocracy will always prefer to transfer control over the autocracy to the capitalists. However, suppose that the de facto political power wielded by the aristocracy in a democracy is such that democratization leads to a semi-consolidated democracy that must offer a protectionist trade policy whenever there is a coup threat or to an unconsolidated democracy with periodic coups that give rise to a dictatorship controlled by the aristocracy. Then, the aristocracy might be better off if it offers democratization than if it transfers the control of the autocracy to the capitalists.

Next, we cover situations in which only democratization will stop a revolt and, hence, the key political issues are the consolidation of democracy and the nature of the coups that could take place. The following proposition summarizes the results.

Proposition 2.6 (continued): *Consider a society in which there is intra-elite conflict over trade policy, i.e., $\lambda_l \neq \lambda_s = \lambda_P$. Then, there is a unique Markov perfect equilibrium in the game. In this equilibrium, before the first time that $\mu_t = \mu^H$, the autocracy is controlled by the elite faction l, which sets $(0, \lambda_l)$. Thereafter:*

3. *If $\mu < [1 - \beta(1 - q)]\bar{\mu}_P(\tau_P, \lambda_P) + \beta(1 - q)\bar{\mu}_P(0, \lambda_s)$, the first time that $\mu_t = \mu^H$, society switches to democracy. Moreover, let $r' = [1 - \beta(1 - q - r)]$, and $\varphi' = [1 - \beta(1 - q)]\varphi$. Then:*

   (a) *If $\varphi' \geq \max_{\lambda_j} \min_i \bar{\varphi}_i(\tau_P, \lambda_P, \lambda_j)$, democracy is fully consolidated and the people*

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set (τ_P, λ_P).

(b) *If* $\quad \max_{\lambda_j} \min_i r' \bar{\varphi}_i \left(0, \lambda_P, \lambda_j\right) \;+\; \left(1 - r'\right) \bar{\varphi}_i \left(\tau_P, \lambda_P, \lambda_j\right) \quad \leq \quad \varphi' \quad <$ $\max_{\lambda_j} \min_i \bar{\varphi}_i \left(\tau_P, \lambda_P, \lambda_j\right),$ *democracy is semi-consolidated. In particular, when* $\varphi_t = \varphi^L$, *the people set* (τ_P, λ_P); *while when* $\varphi_t = \varphi^H$, *they offer a temporary concession in order to stop the coup.*

(c) *If* $\quad \min_\lambda \max_{\lambda_j} \min_i r' \bar{\varphi}_i \left(0, \lambda_P, \lambda\right) \;+\; \left(1 - r'\right) \bar{\varphi}_i \left(\tau_P, \lambda_P, \lambda_j\right) \quad \leq \quad \varphi' \quad <$ $\max_{\lambda_j} \min_i r' \bar{\varphi}_i \left(0, \lambda_P, \lambda_j\right) \;+\; \left(1 - r'\right) \bar{\varphi}_i \left(\tau_P, \lambda_P, \lambda_j\right),$ *democracy is either semi-consolidated or unconsolidated democracy. In the first situation, when* $\varphi_t = \varphi^L$, *the people set* (τ_P, λ_P); *while when* $\varphi_t = \varphi^H$, *they offer a concession that includes* λ_l *in order to stop the coup.*[43] *In the second situation, society continuously switches between political regimes, but it always maintains the same trade policy* $\lambda_s = \lambda_P$. *In particular, when* $\mu_t = \mu^L$, *the elites set* $(0, \lambda_s)$; *when* $\mu_t = \mu^H$, *there is democratization and the people set* (τ_P, λ_P); *when* $\varphi_t = \varphi^L$, *the people set* (τ_P, λ_P); *and when* $\varphi_t = \varphi^H$, *there is a coup and the elites set* $(0, \lambda_s)$. *Democracy is semi-consolidated democracy if and only if the people cannot induce a coup controlled by s or, even if they can so, they prefer to defend democracy.*[44]

(d) *If* $\quad \min_{i,\lambda} r' \bar{\varphi}_i \left(0, \lambda, \lambda_l\right) \;+\; \left(1 - r'\right) \bar{\varphi}_i \left(\tau_P, \lambda_P, \lambda_l\right) \quad \leq \quad \varphi' \quad <$ $\min_\lambda \max_{\lambda_j} \min_i r' \bar{\varphi}_i \left(0, \lambda_P, \lambda\right) \;+\; \left(1 - r'\right) \bar{\varphi}_i \left(\tau_P, \lambda_P, \lambda_j\right),$ *democracy is unconsolidated and society continuously switches between political regimes, but it always maintains the same trade policy* $\lambda_s = \lambda_P$. *In particular, when* $\mu_t = \mu^L$,

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[43]Formally, the people promise $\tau = \arg\max_{(\tau,\lambda_l) \in \cap_j \bar{S}_C(\varphi,\lambda_j)} v_P\left(\tau, \lambda_l\right)$ and $\lambda = \lambda_l$

[44]Formally, the people can induce a coup controlled by the elite faction s if and only if there is $(\tau, \lambda) \in \bar{S}_C\left(\varphi, \lambda_l\right) - \bar{S}_C\left(\varphi, \lambda_s\right)$. If such (τ, λ) exists, it is still possible that the people prefer a semi-democratic regime if $V_P\left(D, \varphi^H, \tau, \lambda\right) \geq V_P\left(s, \mu^L\right) - \varphi v_P\left(0, \lambda_s\right)$, where $V_P\left(D, \varphi^H, \tau, \lambda\right) = (1 - \beta)^{-1}\left\{\left[1 - \beta\left(1 - r\right)\right] v_i\left(\tau, \lambda\right) + \beta\left(1 - r\right) v_i\left(\tau_P, \lambda_P\right)\right\}$, $\tau = \arg\max_{(\tau,\lambda_l) \in \cap_j \bar{S}_C(\varphi,\lambda_j)} v_P\left(\tau, \lambda_l\right)$, $\lambda = \lambda_l$, and $V_i\left(s, \mu^L\right) - \varphi v_i\left(0, \lambda_s\right) = (1 - \beta)^{-1}\left[1 - \beta\left(1 - q - r\right)\right]^{-1}\left\{\left[1 - \beta\left(1 - r\right)\right] v_i\left(0, \lambda_s\right) + \beta q v_i\left(\tau_P, \lambda_P\right) - \left[1 - \beta\left(1 - r\right)\right]\left[1 - \beta\left(1 - q\right)\right] \varphi v_i\left(0, \lambda_s\right)\right\}$.

the elites set $(0, \lambda_s)$; *when* $\mu_t = \mu^H$, *there is democratization and the people set* (τ_P, λ_P); *when* $\varphi_t = \varphi^L$, *the people set* (τ_P, λ_P); *and when* $\varphi_t = \varphi^H$, *there is a coup and the elites set* $(0, \lambda_s)$.

(e) *If* $\varphi' < \min_{i,\lambda} r' \bar{\varphi}_i (0, \lambda, \lambda_l) + (1 - r') \bar{\varphi}_i (\tau_P, \lambda_P, \lambda_l)$, *democracy is unconsolidated and society continuously switches between political regimes and trade policies. In particular, when* $\mu_t = \mu^L$, *the elites set* $(0, \lambda_l)$; *when* $\mu_t = \mu^H$, *there is democratization and the people set* (τ_P, λ_P); *when* $\varphi_t = \varphi^L$, *the people set* (τ_P, λ_P); *and when* $\varphi_t = \varphi^H$, *there is a coup and the elites set* $(0, \lambda_l)$.

Proof: we present a detailed proof in an online appendix. ∎

The main message of proposition 2.6 (part 3) can be easily summarized in a less formal way. Consider a society in which there is **intra-elite conflict over trade policy and a protectionist populace**. Let $\lambda_l = F$ and $\lambda_s = \lambda_P = A$, which can represent, for example, the economic cleavages seen in Argentina in the second half of the twentieth century ($l = L$ are the landlords and $s = K$ are the capitalists). Suppose that the cost of organizing a revolt is relatively low ($\mu < [1 - \beta (1 - q)] \bar{\mu}_P (\tau_P, \lambda_P) + \beta (1 - q) \bar{\mu}_P (0, \lambda_s)$). If the cost of mounting a coup is very high ($\varphi' \geq \max_{\lambda_j} \min_i \bar{\varphi}_i (\tau_P, \lambda_P, \lambda_j)$), then, after the first revolt, society will switch from an autocracy controlled by l, no redistribution and a free trade policy to a consolidated democracy that implements high levels of taxation and redistribution and a protectionist trade policy. If the cost of mounting a coup is high ($\max_{\lambda_j} \min_i r' \bar{\varphi}_i (0, \lambda_P, \lambda_j) + (1 - r') \bar{\varphi}_i (\tau_P, \lambda_P, \lambda_j) \leq \varphi' < \max_{\lambda_j} \min_i \bar{\varphi}_i (\tau_P, \lambda_P, \lambda_j)$), then, after the first revolt, society will switch from an autocracy controlled by l, no redistribution and a free-trade policy to a semi-consolidated democracy which usually implements high levels of redistribution and a protectionist trade policy, but which sometimes lowers income taxes and may introduce free trade for a short period of time in order to counter

a threatened coup. If the cost of the coup is moderate ($\min_\lambda \max_{\lambda_j} \min_i r' \bar{\varphi}_i(0, \lambda_P, \lambda) +$
$(1 - r') \bar{\varphi}_i(\tau_P, \lambda_P, \lambda_j) \leq \varphi' < \max_{\lambda_j} \min_i r' \bar{\varphi}_i(0, \lambda_P, \lambda_j) + (1 - r') \bar{\varphi}_i(\tau_P, \lambda_P, \lambda_j)$), then, after the first revolt, society will switch from an autocracy controlled by l, no redistribution and a free-trade policy to either a semi-consolidated or an unconsolidated democracy. A semi-consolidated democracy usually implements high levels of taxation and redistribution and a protectionist trade policy, but sometimes faces a coup threat which it counters by lowering income taxes and temporarily instituting a free trade policy. If the transition is to an unconsolidated democracy, the society will continuously switch between political regimes and levels of income taxation and redistribution, but the protectionist trade policy will always be retained. If the cost of a coup is low ($\min_{i,\lambda} r' \bar{\varphi}_i(0, \lambda, \lambda_l) + (1 - r') \bar{\varphi}_i(\tau_P, \lambda_P, \lambda_l) \leq$
$\varphi' < \min_\lambda \max_{\lambda_j} \min_i r' \bar{\varphi}_i(0, \lambda_P, \lambda) + (1 - r') \bar{\varphi}_i(\tau_P, \lambda_P, \lambda_j)$), then, after the first revolt, society will switch from a dictatorship controlled by l, no redistribution and a free-trade policy to an unconsolidated democracy, with ongoing changes in the political regime and levels of income taxation and redistribution, but with a stable protectionist trade policy. If the cost of a coup is very low ($\varphi' < \min_{i,\lambda} r' \bar{\varphi}_i(0, \lambda, \lambda_l) + (1 - r') \bar{\varphi}_i(\tau_P, \lambda_P, \lambda_l)$), then, after the first revolt, society will switch from an autocracy controlled by l, no redistribution and a free-trade policy to an unconsolidated democracy, with continuous changes in the political regime, levels of income taxation and redistribution, and trade policy.

2.6 Conclusions

In this paper we have looked at some of the connections between the political regime and trade policy. As we have shown, international trade can crucially affect political alignments and hence the political regime, as well as trade policy. Indeed, our model suggests that significant connections exist among political transitions, trade policy switches, and the comparative advantages of an economy. The critical point is that trade policy opens the

way for a political cleavage other than the rich-poor/elite-populace one. Indeed, though we stress the role of trade policy in this paper, our model is more general and applies to any policy variable that could potentially divide the elites.

In fact, once we introduce trade policy as an endogenous outcome of the political game, even when there is no intra-elite conflict over trade policy, the model predicts that major changes in the political regime will be associated with major switches in trade policy. Moreover, the direction of those switches depends on the comparative advantages of the economy and the nature of the political change that occurs. Thus, for instance, democratization in societies with a protectionist elite and a pro-free-trade populace should be associated with an opening of the economy, while democratization in societies with a pro-free-trade elite and a protectionist populace should be accompanied by the proliferation of protectionist measures. When we also incorporate intra-elite conflict over trade policy into the model, a new and more diverse landscape emerges. First, as we have already mentioned in connection with the case of Great Britain, a crucial switch in trade policy can happen before full democratization takes place through a reallocation of political power within the elite. Second, as we discussed in relation to the case of Argentina, there can be coups that give rise to dictatorships that maintain protectionist policies or to dictatorships that open up the economy.

Additionally, for societies with no intra-elite conflict and a pro-free-trade (protectionist) populace, our model predicts a democratization process that begins with an autocracy implementing a protectionist (free-trade) policy; it then moves to a period of unconsolidated democracy and an unstable trade policy and then ends with a consolidated democracy with a free-trade (protectionist) policy. On the other hand, for societies in which there is intra-elite conflict, the model predicts a much more complicated democratization process that can potentially include a changeover in control of the prevailing autocracy and coups that either

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close or open the economy. The discussion of the cases of Great Britain and Argentina shows that intra-elite conflict over trade policy is an important factor in arriving at an understanding of the different political and economic paths followed by these countries.

The model also points to interesting implications for some institutions and organizations, such as unions or the armed forces, which affect the cost of coups and revolts. For example, unionization probably decreases the cost of a revolt and increases the cost of a coup. If this is the case, then our model can tell us how the different groups will react to legislation that promotes labor unions. Similarly, the cost of a coup depends on the availability and organization of the armed forces. Thus, our model can indicate which groups will be more willing to extend financial support to the military. In general, when there is no intra-elite conflict, the elite is better off when the cost of a coup is low and the cost of a revolt is high, while the opposite is usually true for the general public. However, when there is an intra-elite conflict, the analysis is more subtle. In particular, it is perfectly possible that one of the elite factions will be better off when a coup would be more costly or when a revolt would be less costly. The details are somewhat involved, but the intuition is simple. Consider, for example, the situation of the commercial and industrial elite in Great Britain at the beginning of the nineteenth century. While a revolt would have been very costly for the populace, the aristocracy was able to placate the people without relinquishing control of the government. However, when the people found that a revolt would be less costly, the aristocracy was forced to transfer its control over the autocracy to the commercial and industrial elite, which paved the way for the repeal of the Corn Laws. Thus, it is very likely that a moderate decrease in the cost of a revolt was beneficial for the commercial and industrial elite.

Another interesting implication refers to how populism affects the political regime. Since populism tends to be an elusive and sometimes not very precise concept, we can

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adopt an agnostic approach and simply associate populism with two parameters of our model. The parameter $1 - q$ captures how credible the people's promises are. In this sense, we can say that populism is greater when the people's promises become less credible. A second parameter captures the degree of redistributive pressures exerted on democratic institutions. In this second sense, we can say that populism is greater when democratic institutions are more redistributionist. It is not difficult to show that, for a society with no intra-elite conflict, a more populist democracy, measured in either of these two alternative ways, makes coups more likely and, hence, the consolidation of democracy less likely. It is also possible to show that, for a society in which there is an intra-elite conflict, populism can affect the nature of coups. As we have seen, Argentina is an excellent example. As populist pressures were held at bay in the late 1950s and the 1960s, coups kept protectionist barriers in place, while, when Argentina's democracy became more populist in the 1970s, the protectionist industrial elite agreed to join the pro-free-trade landlords in mounting a coup that did away with protectionist barriers.

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# Figures

Figure 2.1: Coups and Trade Policy in the Absence of Intra-elite Conflict
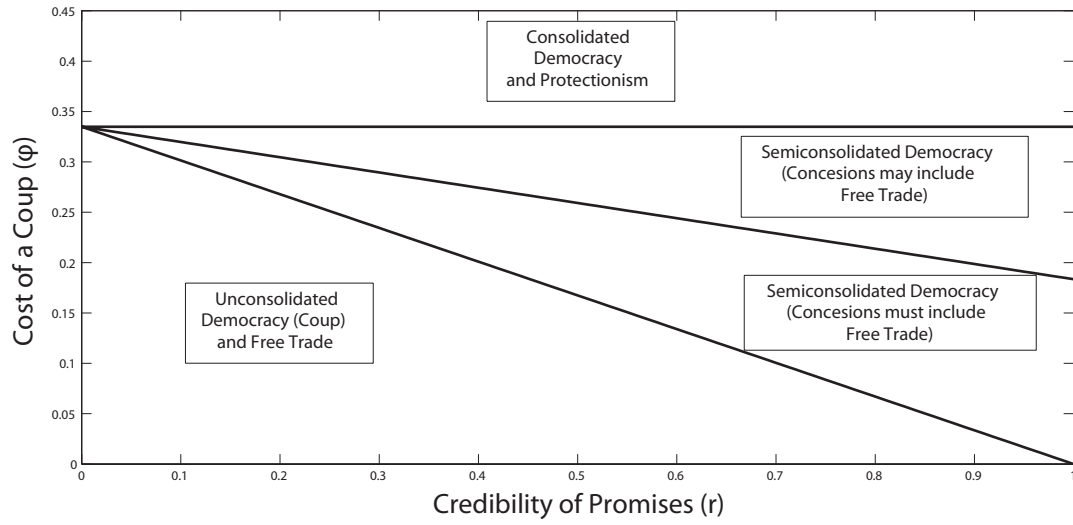
Figure 2.2: Coups and Trade Policy in the Presence of Intra-elite Conflict
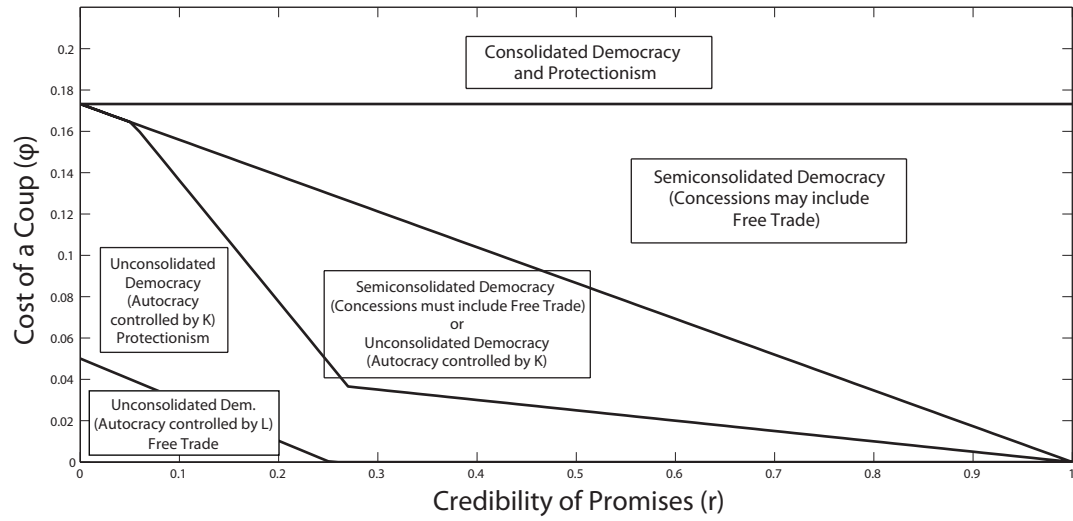
Figure 2.3: Democratization and Trade Policy in the Absence of Intra-elite Conflict
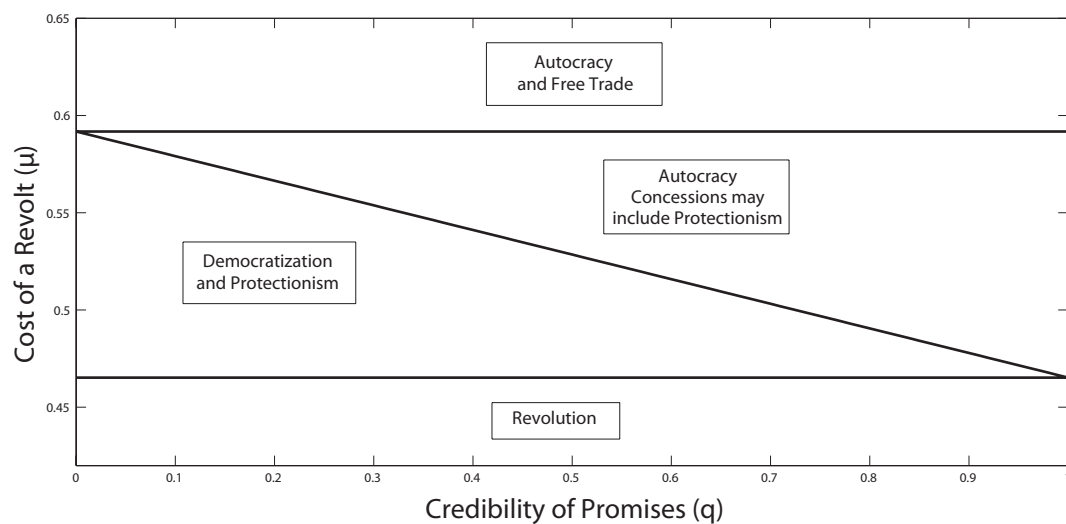
Figure 2.2: Democratization and Trade Policy in the Presence of Intra-elite Conflict
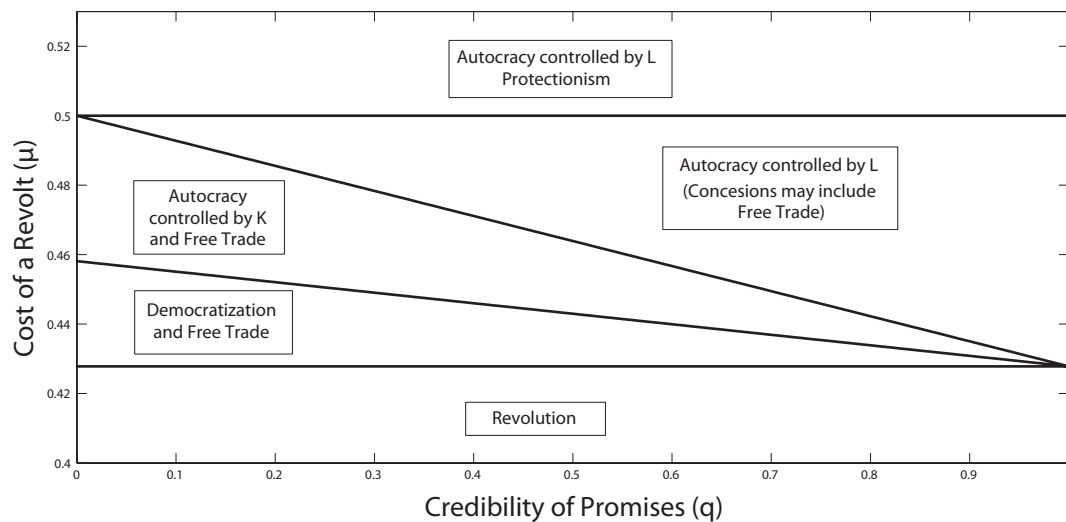
PART II

THE POLITICAL ECONOMY OF THE MEDIA INDUSTRY

Chapter 3: Optimal Regulation of the Media Industry

Abstract

This paper studies how a society should optimally organize and regulate its media industry. First, a political economy model of the media industry is developed. Second, a constitutional stage is considered and the optimal regulation of the industry is deduced. A simple but powerful normative message is derived from this analysis. The media should not be treated as a standard industry. Even if it operates under increasing returns to scale, this is not enough to conclude that the best solution is a media monopoly. Unless media productivity is extremely low, the optimal regulation is either to encourage entry with subsidies or to impose moderate entry limitations. It is worthwhile to pay the extra costs associated with several media companies obtaining and reporting the same news because competition avoids media capture and the corresponding dissipation of resources in the political system.

3.1 Introduction

The media industry plays a crucial role in all modern societies, where the majority of citizens does not have direct access to relevant information about public policies, but rather obtains it by reading newspapers, listening to the radio and watching television. Many authors have acknowledged the importance of the media in modern politics and drawn attention to the effects of the media on political outcomes (see, e.g., MacChesney 2004 and Bagdikian 2004). However, to the best of my knowledge, there is no systematic work that studies how society should organize and regulate its media industry. The goal of this paper is to fill this gap.

The organization and regulation of the media industry varies greatly across countries and, sometimes, even within a country over time. In contrast to most of the autocratic regimes where the state tightly controls the media, in democracies, the state presence in media is more restricted and diverse. For example, Dejankov et al. (2002) document the contrast between autocratic regimes in which the state almost always controls television and has a strong presence in newspapers, with democratic countries, where the government does not own newspapers and has a limited presence in television (almost none in the United States and intermediate presence in Europe and other democracies). Moreover, there has been an increasing interest in the regulation of the media and regulatory reforms have been discussed and even introduced in some countries.[45] This paper seeks to develop a normative framework that can be used to evaluate current organizational diversity and potential future reforms to existing regulations in the media industry.

Information, the commodity provided by the media industry, has several characteristics. First, information can be seen as a public good since many agents can use the same piece of information at the same time (it is a non-rival good) and it is difficult to exclude the agents that do not pay for it (it is a non-excludable good). Second, there are important economies of scale in the process of gathering and disseminating information. While there are significant fixed costs of gathering information (e.g., journalists and distribution facilities), the marginal costs of an extra subscription are very low. Thus, information is a public good with decreasing average costs of production. This suggests that we should employ the standard literature on Public Economics and Regulation in order to deduce the optimal regulation of the media industry.

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[45] For example, in 2009 the Argentine Congress enacted the controversial Law No. 26522, which introduced changes in the regulation of the media (see http://www.infoleg.gov.ar for the full text of the law). In 2011 the Brazilian Congress enacted Law No. 12485, which changed the norms for the provision of Pay TV services. In particular, the law eliminated previous restrictions to foreign investments in Pay TV services, and introduced restrictions on cross-ownership in telecommunications activities (see Beppu and Sampaio at http://www.latinlawyer.com for a summary of the law).

Unfortunately, the existing literature cannot be blindly applied to the media industry because a distinctive characteristic of the media is its vulnerability to political manipulation. Some groups might pay for receiving accurate information while others might pay to suppress or distort information. For example, politicians and bureaucrats could be tempted to censor or bribe the media to suppress information about corruption; or special interest groups could use their economic power to influence news about the effects of public policies. Obviously, this is not in the interest of the general public, which benefits from accurate and unbiased information.[46]

These two characteristics have created a tension on conventional views about the optimal organization and regulation of the media. On one hand, those who emphasize economies of scale and believe in a more benevolent government tend to recommend a state-owned monopoly or, at least, more government involvement. Indeed, a state-owned company or a regulated private monopoly would be the standard textbook solution to an industry with decreasing average costs. On the other hand, those who focus attention on information distortion and manipulation tend to favor a more competitive industry integrated by several privately owned companies. The starting point of this paper is to acknowledge that both features are present and then ask the normative question: How should society organize the media industry? Following Laffont (2000), the approach is to consider this question as a problem of constitutional design. In other words, the goal of this paper is to deduce optimal constitutional norms for the media industry.

Besides more fundamental issues, such as freedom of speech, and more practical issues, such as journalists' right to not reveal their sources, there are two key instruments to consider in a realistic constitutional design problem. First, should society encourage or

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[46]An extreme case is Peru during the 1990's. As McMillan and Zoido (2003) document, Vladimiro Montesinos, president Fujimori's chief of the secret police, systematically bribed congressmen, judges and other political players. Moreover, he managed to avoid any public exposure for more than 10 years offering very generous bribes to the most important newspapers and television stations of the country.

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restrict entry into the media industry? Note the normative trade off. While economies of scale call for entry restrictions, the dangers of information distortion and manipulation suggest a need for a more competition. Second, should society encourage or restrict the participation of some specific groups in the media? Note again the normative trade off. A highly conglomerated media industry probably helps special interest groups manipulate information about public policies, especially when they are required to inform the public about policies that affect business within the conglomerate. For example, if the same conglomerate owns a company that pollutes the environment and a newspaper, the newspaper may report distorted information about the impact of a new environmental regulation. Similarly, bureaucrats that control a public media may tend to suppress news that would negatively affect an incumbent politician. However, conglomerates can help special interest groups to limit the power of politicians and public media can help politicians to reduce the power of special interest groups. In other words, the constitution can use conglomerates and public media to erect an optimal web of checks and balances.

Modeling different groups that try to control several media companies is not an easy task. Hence, I begin by developing a baseline model with only one group capable of influencing the media. Then, I extend the analysis to two groups. The baseline model includes a politician, who is more informed than the general public about collective decisions (the cost of public projects) and a media industry that gathers information about these collective decisions (each media company receives an informative signal of the cost of public projects). The politician would like to keep the general public uninformed so he can extract informational rents, but in order to do so he must convince each media company to suppress the information about these collective decisions. Media companies which decide to suppress information collects bribes from the politician, but lose their audience. Since audience-related revenues are particularly high when no company is reporting news, in

equilibrium, the politician captures the whole industry only if he is willing to bribe every media company with the amount that each company would receive if it was the only one in the industry. As a result competition in the media industry makes media capture more difficult.

The baseline model has some of the basic features of a model developed by Besley and Prat (2006). In particular, it assumes that the general public is informed even when only one media reports the news. This implies that if the politician wants to suppress information, he must bribe and capture the whole industry. However, there are important differences between this paper and Besley and Prat (2006). First, the main focus of the current work is normative, i.e., the goal is to deduce the optimal organization of the media. Second, while Besley and Prat (2006) consider an adverse selection model in which the general public must decide whether to reelect an incumbent who can be good (i.e., generates a surplus of 1 to the general public) or bad (i.e., generates no surplus to the general public), in my model the general public and the politician play a principal-agent game in which the general public is the uninformed principal and the politician is the informed agent. As a consequence, the rents of the politician and the surplus of the general public come from the principal-agent game, rather than being exogenous variables.

Adding a constitutional stage to the baseline model I deduce the optimal regulation of the media industry. A simple but powerful normative message is derived from this analysis. The media should not be treated as a standard increasing-returns industry. Although there can be good reasons to believe that the media operates under increasing returns to scale, this is not enough to conclude that the best solution is a media monopoly. In fact, if media productivity is higher than a threshold, the optimal regulation is either to encourage entry with subsidies or to impose a moderate entry limitation (proposition 3.2). It is worthwhile to pay the extra costs associated with several media companies obtaining and

reporting the same news because competition makes media capture more difficult, avoiding the dissipation of resources in the political system. In more technical terms, the general public is the principal, the politician is the agent and the media plays the role of a supervisor that can be captured by the agent. Indeed, there are multiple supervisors because there are several media companies and the optimal regulation encourages or restricts entry in order to induce the optimal number of supervisors.

A limitation of the baseline model is that only the politician is allowed to influence the media. However, special interest groups could also have incentives to manipulate information (Grossman and Helpman, 2001). In fact, Corneo (2005) and Petrova (2008) build models of media capture that stress the role of special interest groups. In Corneo's model, agents have different shares in a company that pollutes the environment, but they do not know the social cost of the pollution. The media gathers information about this cost and then approaches one agent to bargain over the report. In equilibrium, the media tends to form a conglomerate with a rich agent and to misreport the social cost of pollution. In Petrova's model, there are only two groups: the rich, who are informed about the cost of public goods, and the poor, who do not know the cost of public goods. As a consequence of this information asymmetry, the rich have an incentive to bribe the media to keep the poor median voter uninformed about the cost of public goods. In an extension, I introduce special interest groups to the baseline model.[47]

In the extended model there are two policy variables and two players who try to influence the media (the politician and the elite). One of the policy variables models the vertical dimension of social conflict (i.e., the conflict between citizens and the politician) while the other models the horizontal dimension of social conflict (i.e., the conflict between the elite and the general public). In equilibrium, the elite plays an ambiguous role in the

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[47]The politician of the baseline model can be considered a special interest group. However, the really interesting environment is one in which a politician and a special interest group are two separate entities.

media industry. On one hand, it tends to neutralize the politician by making media capture more difficult for him. On the other hand, the elite encourages the media to withhold information when it can be used to promote policies that negatively affect its interest. Two new messages emerge from the normative analysis of this extended model. First, restricting the involvement of the elite in the media industry tends to increase social welfare when the horizontal dimension of social conflict dominates, but tends to reduce it when the vertical dimension horizontal dominates (proposition 3.6). Second, free entry is even more appealing when the elite has the ability to influence the media (proposition 3.7).

The rest of the paper is organized as follows: Section 3.2 presents the baseline model. Section 3.3 defines and characterizes the equilibrium of the model (proposition 3.1). Section 3.4 derives the optimal regulation of the media under the assumption that the media industry is a natural monopoly. This section contains the core message of the paper (propositions 3.2-3.4). Section 3.5 confirms that analogous results apply if the media industry is a natural oligopoly (proposition 3.5). Section 3.6 extends the baseline model and characterizes the optimal regulation in this extended setting (propositions 3.6 and 3.7). Finally, section 3.7 presents the conclusions.

3.2 A Model of the Media Industry

In this section I develop a principal-agent model augmented with a media industry. The general public is the principal, the politician is the agent and the media companies gather information about public policies and transmit it to the general public.

Consider a simple economy with one private good and one public good. The general public has an endowment of the private good y. The public good is produced with a simple linear technology, i.e., the total cost of producing g units of it is cg units of the private

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good. The unit cost of the public good c is a random variable that can adopt the values c_L or c_H $(c_L < c_H)$ with probabilities $p \in (0, 1)$ and $(1 - p)$, respectively.

The general public gets utility from the consumption of both goods. The provision of the public good is financed with a tax T, which generates a deadweight loss of λT units of the private good, where $\lambda \geq 0$. The general public also expends E_M units of its endowment on media subscriptions. Thus, the utility function of the general public is given by:

$$u_{GP}(g, T, E_M) = u(g) + y - (1 + \lambda) T - E_M, \qquad (38)$$

where the sub-utility function u is strictly increasing, strictly concave, twice continuously differentiable and satisfies $\lim_{g \to 0} u'(g) = \infty$ and $\lim_{g \to \infty} u'(g) = 0$. $E_M = \sum_{i=1}^{n} E_{M,i}$, where $E_{M,i}$ is the general public expenditure on media subscriptions of company $i = 1, ..., n$.

The politician collects the taxes and provides the public good. He also expends B units of the private good on bribes to the media industry. Thus, the utility function of the politician is given by:

$$u_P(g, c, T, B) = T - cg - B, \qquad (39)$$

where $B = \sum_{i=1}^{n} B_i$, and B_i is the bribe the politician gives to media company $i = 1, ..., n$.[48]

The information about the cost of the public good is asymmetrically distributed among

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[48]In reality bribes can adopt several forms and they do not only represent direct payments to newspapers, radios and television channels as it was the case of Peru during the 1990's. Advertising can be a more subtle and indirect way of bribing the media. Indeed, DiTella and Franceschelli (2011) show that the extent to which the main newspapers in Argentina report government corruption is negatively correlated with the extent to which each newspaper receive government advertisement. Bribes can also be non-pecuniary in the form of favorable treatment or access. For example, McChesney (2004) suggests that presidents in the United States give exclusive interviews only to journalists who report a favorable view of their administration. Thus, although in the model bribes are direct payments, they should be interpreted as representing any direct or indirect way through which the politician buys media silence.

the politician, the general public and the media. In particular, the politician knows the realization of c, the general public only knows the probability distribution of c, and the media industry receives an informative signal about c, which I denote s. Table 3.1 shows the probability distribution of the signal s. Note that when $c = c_L$, the media is perfectly informed ($s = c_L$) with probability δ and it does not have any information ($s = \emptyset$) with probability $(1 - \delta)$, while when $c = c_H$, the media does not receive any information ($s = \emptyset$).

Table 3.1: Probability Distribution of the Signal s

		Signal Value	
		$s = c_L$	$s = \emptyset$
	$c = c_L$	δ	$1 - \delta$
Actual Value			
	$c = c_H$	0	1

The media cannot fabricate news. Thus, when $s = \emptyset$, every media company is forced to report $r_i = \emptyset$, while when $s = c_L$, each media company can choose to report the truth ($r_i = c_L$) or it can withhold the signal ($r_i = \emptyset$). Table 3.2 summarizes possible media reports for each signal value.

Table 3.2: Possible Reports

	Signal Value	
	$s = c_L$	$s = \emptyset$
Possible Reports (r_i)	$\{c_L, \emptyset\}$	$\emptyset$

The assumption that the media can withhold, but not fabricate information implies that information is verifiable. Although this seems a strong assumption, the key idea is

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that news are at least partially informative. In other words, news are not pure cheap talk, which implicitly requires that the signal s comes from an "independent" source of information.[49]

Media companies have two sources of revenue: news-related revenues (e.g., subscriptions and advertisement) and bribes.[50] In particular, media company i gets $E_{M,i}$ from news-related revenues (the general public expenditure on media i) and B_i from bribes paid by the politician. The cost of receiving the signal for an individual company is C_S (for example, the cost of journalists and facilities). Then, the payoff function of media company i is given by:

$$u_{M,i}\left(E_{M,i}, B_i, C_S\right) = E_{M,i} + B_i - C_S. \tag{40}$$

The expenditure on media subscriptions depends on the news. When there are no news ($r_i = \varnothing$ for all $i = 1, ..., n$) the general public does not expend anything on media subscriptions, while when there are some news the general public expends a positive amount. Thus, the expenditure on subscriptions as a function of the reports is given by:

$$E_M\left(r_1, ..., r_n\right) = \begin{cases} 0 & \text{if } r_i = \emptyset \text{ for all } i, \\ \bar{E}_M & \text{if } r_i = c_L \text{ for at least one } i, \end{cases} \tag{41}$$

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[49]For example, Bagdikian (2004) and McChesney (2004) discuss the role of the media during the Iraq war and they conclude that the media failed to inform the American public about crucial issues (such as the existence of weapons of mass destruction in Iraq). They argue that the critical problem was that media companies blindly relied on official sources of information. However, this is probably an extreme case, in which it is very costly to get an independent source of information. In terms of the model, this is a situation in which the politician controls the signal or the cost of an independent signal is prohibitive.

[50]Theoretically, it is easy to separate news-related revenues and bribes. The key distinction is that news-related revenues come from agents that demand information (e.g., subscribers and commercial advertisement), while bribes come from agents that want to suppress or manipulate information. However, in reality it is very difficult to disentangle them. For example, imagine that the government is advertising in the media a new vaccination program. This advertisement could be part of a real effort to inform the population about the advantages of the program and, hence, it should be treated as a news-related revenue. However, it is also possible that the advertisement, or part of it, is just a hidden bribe to media companies in order to suppress information about corruption in the vaccination program.

where $\bar{E}_M > 0$. There are several ways of interpreting (41). One simple possibility is to consider that at least a fraction of the population is interested in politics and, hence, they are willing to pay for media subscriptions in order to be informed about public policies. The intuition is that those who stay uninformed free ride those who pay for subscriptions. Another possibility is to assume that people demand information about public policies not because they are interested in making more informed collective decisions, but rather because they need this information to take better private decisions (Strömberg, 2004). Regardless of the interpretation, the key idea is that the general public is willing to pay $\bar{E}_M > 0$ whenever the media informs $c = c_L$.

The total expenditure on media subscriptions must be somehow distributed among media companies. Following Besley and Prat (2006), suppose that the total expenditure is evenly shared by all the active media companies, i.e., the companies that are reporting some news. Formally, the news-related revenue of media company i (bribes are the other source of revenue) is given by:

$$
E_{M,i}(r_1, ..., r_n) = \begin{cases} 0 & \text{if } r_i = \emptyset, \\ \frac{\bar{E}_M}{m} & \text{if } r_i = c_L, \end{cases} \tag{42}
$$

where $m = \#\{i : r_i = c_L\}$ is the number of companies reporting news.

The timing of events is as follows:

1. **Entry**: Companies simultaneously decide to enter into the media industry. If a company decides to enter it must pay C_S, regardless of the its future report.

2. **Signal**: Nature determines c. The politician observes the realization of c. A signal s about c is realized. All the media companies and the politician observe this signal.

3. **Bribes**:

a. The politician offers bribes to the media companies. Each bribe is a take it or leave it offer of the following form: the politician commits to pay a bribe $B_i(r_i)$ to media company i if and only if the media company i agrees to report r_i. Since the media cannot fabricate news, if $s = \emptyset$, then $r_i = \emptyset$, while if $s = c_L$, then $r_i \in \{c_L, \emptyset\}$.

b. The media companies simultaneously accept or reject the bribe offers and then report news.

4. **Contracts**:

a. The general public observes the news and then offers a contract or a menu of contracts to the politician. A contract specifies the level of the public good g and taxes T.

b. The politician selects a contract among the alternatives offered by the general public.

A key idea behind this timing is that the general public can use the information provided by the media to control the politician. Note that the general public offers a menu of contracts to the politician after observing media reports.[51]

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[51]There are several works that suggest that mass media play an important role monitoring politicians. Besley and Burgess (2001) use data from India to show that state governments react more to falls in food production and floods where newspaper circulation is higher (they expend more on public food distribution and calamity relief). Finan and Ferraz (2008) study the effects of disclosing information about corruption using data from an anti-corruption program implemented by the Brazilian federal government. They find that the release of information has a significant impact on incumbents's electoral performance, and that the effects are more pronounced in areas with more local radios. Querubin and Snyder (2011) employ data from the United States to estimate the rents obtained by congressmen between 1850-1880. They find significant rents during the Civil War period and they hypothesize that this is partly due to a decrease in control by the media, which was mainly focus on reporting news about the war. Snyder and Strömberg (2008) use modern data from the United States and they show that "congressmen who are less covered by local press work less for their constituencies". Moreover, they also document that "federal spending is lower in areas where there is less press coverage of the local members of congress".

This model can be represented as a game with incomplete information. A strategy for the politician is a schedule of bribes $(B_1, ..., B_n)$ (a bribe offer to each media company in the industry) and a public budget (T, g). Each B_i is of the following form: the politician commits to pay $B_i(r_i)$ to the media company i if and only if i agrees to report r_i. The politician also selects a public budget (T, g) for each menu of budgets offered by the general public. A strategy for media company i is a report r_i. A strategy for the general public is a menu of possible public budgets for each schedule of reports $(r_1, ... r_n)$. Formally, let M be the set of possible public budgets and let $\mathbf{P}(M)$ be the power set of M. Then, a strategy profile $(\alpha_P, \alpha_{M,1}, ..., \alpha_{M,n}, \alpha_{GP})$ is given by: (i) Politician: $\alpha_P = (B_1, ..., B_n, T, g)$, where $B_i : \{c_L, \varnothing\} \to \Re_+^2$ and $(T, g) : \mathbf{P}(M) \to M$; (ii) Media companies: $\alpha_{M,i} : B_i \to \{c_L, \varnothing\}$ for $i = 1, ..., n$; and (iii) General Public: $\alpha_{GP} : (r_1, ..., r_n) \to \mathbf{P}(M)$.

Definition 3.1: *A perfect Bayesian equilibrium with n media companies is a strategy profile $(\alpha_P, \alpha_{M,1}, ..., \alpha_{M,n}, \alpha_{GP})$ and a belief about the cost of the public good such that:*

1. **Belief**: *Bayesian updating given the media reporting strategy.*

2. **Contracts**:

   a. *Given its belief, the general public offers the menu of public budgets that maximizes its expected utility.*

   b. *For each menu of budgets offered by the general public, the politician selects the budget that maximizes his utility.*

3. **Bribes**: *The politician selects the bribe schedule that maximizes his expected utility.*

4. **Reports**: *Given the bribe schedule, each media company selects the report that maximizes its expected utility.*

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It is useful to distinguish two different types of equilibria. When the politician uses bribes to keep the general public uninformed (formally, when in equilibrium $r_i = \emptyset$ for all i) we say that the media industry has been *captured* by the politician, while when the media truthfully reports the news (formally, when in equilibrium $r_i = s$ for at least one i), we say that the media industry is *free*.

Definition 3.1 assumes that there are n media companies in the market. It is not difficult to extend this definition to introduce endogenous entry.

Definition 3.2: *An equilibrium with endogenous entry is a strategy profile* $(\alpha_P, \alpha_{M,1}, ..., \alpha_{M,n}, \alpha_{GP})$, *a belief about the cost of the public good, and a number of media companies n such that:*

1. *The strategy profile and the belief is a perfect Bayesian equilibrium with n media companies.*

2. *The expected profit of each media company is nonnegative and it would be negative in any perfect Bayesian equilibrium with $n + 1$ companies.*

Definitions 3.1 and 3.2 apply for any specification of C_S. However, it is useful to impose some assumptions on C_S. In particular, since the total revenue of the industry is equally shared among the companies that report news, it is easy to induce several market structures just making C_S a function of the number of active companies. The simplest market structure is a natural monopoly.

Assumption 3.1: *The media industry is a natural monopoly.Formally, the cost of a media company is $C_S(n) = \bar{C}_S > 0$ for all $n \geq 1$.*

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It is useful to clarify why assumption 3.1 implies that the media industry is a natural monopoly.[52] The cost of receiving the signal for an individual media company is $C_S(n) = \bar{C}_S$. This means that if there are n companies the total cost of the industry is $n\bar{C}_S$, which it is minimizes when $n = 1$. In other words, from a technological point of view, the only relevant feature of this industry is whether the signal is received or not by at least one company, which implies that one company can supply the market at a lower cost than two or more companies.

Assumption 3.2: *A media monopoly is always profitable. Formally, $p\delta\bar{E}_M > \bar{C}_S$.*

Note that, if it were the case that $p\delta\bar{E}_M < \bar{C}_S$, then the expected revenue of the industry $(p\delta\bar{E}_M)$ would be lower than its lowest possible cost $(\bar{C}_S)$ and, hence, not even a single company would be willing to enter into the media market.

3.3 Equilibrium

In this section I characterize the equilibrium of the media industry. The menu of contracts that the general public offers to the politician depends on media reports. Subscriptions, bribes and the number of active companies determine media reports and, ultimately, the expected revenue obtained by each media company. Finally, companies optimally decide whether to enter into the media industry and, hence, the equilibrium number of media companies is determined. The key message of this section is that as media companies are more productive, there is more competition in the media market and capture is more difficult.

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[52]I follow the standard definition of a natural monopoly due to Baumol (1977): "an industry in which multi-firm production is more costly than production by a monopoly".

Proposition 3.1 below formally characterizes the equilibrium of the media industry; but first I need to introduce some notation. Let g_L and g_H^{cap} be implicitly defined by the following expressions:

$$u'(g_L) = c_L(1 + \lambda), \tag{43}$$

$$u'(g_H^{cap}) = \left(\frac{c_H - pc_L}{1 - p}\right)(1 + \lambda), \tag{44}$$

where recall that $c \in \{c_L, c_H\}$ is the cost of the public good, $p = \Pr(c = c_L)$ and $\lambda \geq 0$ is the deadweight loss associated with a tax of one unit of the private good.[53] It is not difficult to prove that the utility gain of the politician when the media withholds $s = c_L$ (formally, when $s = c_L$ but $r_i = \emptyset$ for all i) is

$$\Delta_P = g_H^{cap}(c_H - c_L). \tag{45}$$

Proposition 3.1: *Let $int(x)$ indicates the integer part of x. Let Δ_P be defined by expression (45) and let n denotes the number of media companies. Then, the media industry is free if $n > \bar{n} = int\left(\frac{\Delta_P}{\bar{E}_M}\right)$, while it is captured by the politician if $n \leq \bar{n}$. Moreover, suppose that assumptions 3.1 and 3.2 hold. Then, free entry leads to a free media industry if and only if $\bar{C}_S \leq \frac{\delta p \bar{E}_M}{\bar{n}+1}$. Indeed, if $\bar{C}_S > \frac{\delta p \bar{E}_M}{\bar{n}+1}$, the equilibrium number of media companies is $\bar{n}$, while if $\bar{C}_S \leq \frac{\delta p \bar{E}_M}{\bar{n}+1}$, it is $\hat{n} = int\left(\frac{p \delta \bar{E}_M}{\bar{C}_S}\right)$.* **Proof**: See appendix 3.1.1. ∎

A few remarks about proposition 3.1. First, I am interpreting $\bar{E}_M$ as a parameter of

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[53] It is easy to verify that g_L and g_H are unique and $g_L > g_H > 0$. $\lim_{g \to 0} u'(g) = \infty$, $\lim_{g \to \infty} u'(g) = 0$ and $u''(g) < 0$ imply that: (i) there is a unique $g_L > 0$ such that $u'(g_L) = c_L(1 + \lambda)$; and (ii) there is a unique $g_H > 0$ such that $u'(g_H) = \left(\frac{c_H - pc_L}{1 - p}\right)(1 + \lambda)$. $c_L < \frac{c_H - pc_L}{1 - p}$ and $u''(g) < 0$ imply that $g_L > g_H$.

the media demand, but it is also possible to consider it as a combination of a demand parameter and the transaction costs of bribes. For example, in Besley and Prat (2006) B dollars of bribes paid by the politician becomes B/τ dollars received by the media, where $\tau > 0$ is a measure of the transactions costs involved in bribing. Then, we must replace $\bar{E}_M$ by $\bar{E}_M\tau$. Second, technically speaking when $n\bar{E}_M = \Delta_P$, the politician is indifferent between paying bribes of $n\bar{E}_M$ and a captured media and do not paying bribes and a free media. I arbitrarily break this indifference assuming that the politician captures the media. Since the final goal is to find a constitutional rule for the media industry, I prefer to be in the safe side and have a free media industry only when this is strictly better for the politician. In the next section, the assumption is also convenient because it simplifies welfare comparisons.

The first part of proposition 3.1 establishes that if there is enough competition in the media market, then the media will be free. The intuition behind this result is that if the politician wants to capture the media, he must pay to each company a bribe equal to the amount that a company would obtain if it was the only one that reports the truth. The second part of proposition 3.1 establishes that free entry will lead to enough competition to avoid capture if the productivity of the media is higher than some threshold. Media productivity is measured as the ratio $\frac{\delta}{C_S}$. The higher the ratio $\frac{\delta}{C_S}$ the more productive the media industry is, in the sense that it is less costly to obtain the same signal (equivalently, it costs the same to obtain a more precise signal). The threshold is the inverse of the expected revenue of a media company when the number of companies is just enough to makes the industry free, i.e., $\bar{n}+1$. Alternatively, free entry leads to a free media industry if the expected profit of each media company when there are $\bar{n}+1$ companies is nonnegative, i.e., $\frac{p\delta\bar{E}_M}{\bar{n}+1} - \bar{C}_S \geq 0$.

Figure 3.1 illustrates proposition 3.1 for $u(g) = A\ln(g)$ with $A = 1$ million, $c_L = 1$,

$c_H = 2.25$, $\bar{C}_S = 500, 1500$, $p = 0.25$, $\lambda = 0.35$, and $\delta = 0.25$. The dark curve indicates the expected revenue of a media company for each possible value of n (the number of companies that operates in the market). For $n \leq \bar{n} = 4$, the media is captured by the politician and, hence, the expected revenue of each company is $p\delta\bar{E}_M$ (which is coming from bribes). For $n > \bar{n} = 4$, the media is free and, hence, the expected revenue of each company is $p\delta\bar{E}_M/n$ (which is coming from subscriptions). The two thin horizontal lines indicate the cost of receiving the signal ($\bar{C}_S = 500, 1500$). The equilibrium number of firms is given by the intersection between the expected revenue curve and the cost line. For $\bar{C}_S = 500$, nine companies enter into the market and the media is free, while for $\bar{C}_S = 1500$ only four firms enter into the market and the media is captured by the politician.

Please see Figure 3.1: Equilibrium with Endogenous Entry

Example: Let $u(g) = A\ln(g)$. Then, $\Delta_P = \frac{A(1-p)(\chi-1)}{(1+\lambda)(\chi-p)}$, where $\chi = \frac{c_H}{c_L}$. Hence, from proposition 1, the media industry is free if and only if the following condition holds (recall that $int(x)$ indicates the integer part of x)

$$n > \bar{n} = int\left(\frac{A(1-p)(\chi-1)}{(1+\lambda)(\chi-p)\bar{E}_M}\right).$$

Free entry leads to a free media industry if and only if $\bar{C}_S \leq \frac{\delta p \bar{E}_M}{\bar{n}+1}$. It is easy to check that as taxation is more costly (λ higher), or the general public is more willing to expend in the media, or the transaction cost of bribing are higher ($\bar{E}_M$ higher), a less productive media is enough to secure a free media. It is easy to see that the RHS is increasing in χ. Thus, as the agency problem becomes more serious (χ higher), a more productive media is necessary to avoid capture.

3.4 Optimal Regulation

In the previous section I have fully characterized the media industry when there is no public intervention. In this section I study the optimal regulation of the industry. After finding the first best allocation, I argue that it is very unlikely that any realistic regulation can implement it. Then, I consider a relatively unrestrictive constitutional environment in which entry can either be restricted or promoted to any degree. Finally, I study increasingly restrictive environments in which the constitution can only restrict or promote entry and, even more restrictively, it has a discrete choice: monopoly or free entry.

First Best Allocation. It is useful, as a benchmark, to begin deducing the first best allocation. On the one hand, in appendix 3.1.2 I show that under very mild conditions, a captured media industry imposes a welfare loss. Thus, in order to avoid this loss it is better to have a free media industry. On the other hand, since all media companies receive and transmit the same signal, an industry with more than one company is an unnecessary waste. Thus, in order to avoid this waste it is better to have a media monopoly. Therefore, the first best allocation is reached when a media monopoly always reports the truth to the general public. The problem with this solution is that it is really hard to imagine any realistic environment in which it is possible to force a media monopoly to truthfully report the news. Note that the textbook solution, i.e., public ownership, does not seem to work in this case since the bureaucrat that runs the state-owned company will be easily captured by the politician.[54] A regulated privately owned monopoly does not seem to work either,

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[54]An interesting example that illustrates the difficulties involved in regulating a state-owned media company is TVE and RTVE in Spain. After a terrorist attack in Madrid one week before a national election, TVE and RTVE were accused of manipulating the information about the perpetrators, favoring the official point of view of the event. As a consequence, a new procedure was established to design the CEOs and important managers of TVE and RTVE. According to the new system any designation requires 65% of the parliamentary votes, implicitly forcing an agreement between the two major parties (PP and PSOE). The goal was to avoid that the party that wins the election also captures TVE and RTVE. However, very recently, after a national election that gave a parliamentary majority to PP, a simple majority repealed

unless there is an independent and incorruptible regulatory agency that somehow observes the signal. Summing up, it is very unlikely that any realistic regulation can implement the first best allocation.

A Constitutional Stage. Suppose that at the beginning of the game a stage 0 is added, which can be interpreted as a constitutional stage. The goal is to find a constitutional norm for the media industry that maximizes aggregate welfare. In order to so I explore constitutional norms that can only restrict or promote entry into the media industry. Moreover, I assume a simple, but realistic asymmetry. The constitution can always restrict entry at no cost, but it cannot completely shut down the industry (there must be at least one media company, i.e., $n \geq 1$.) However, to promote entry the constitution must subsidize media companies. The intuition behind this asymmetry is that in the long run it is relatively difficult to promote entry into an industry only employing threats and legal punishments.[55] However, it is easy to restrict entry employing non-pecuniary punishments such as legal licenses and fines. The key assumption is that through a constitutional norm or any other social mechanism society is able to impose and enforce restrictions and incentives to entry into the media industry.

The expected aggregate welfare that the constitution tries to maximize as a function of the number of companies is given by:[56]

$$W(n) = \mathbf{E}[u_{GP}] + \mathbf{E}[u_P] + \sum_{i=1}^{n} \mathbf{E}[u_{M,i}].$$

the new law, allowing the government to designed new authorities for TVE and RTVE. Moreover, the PP justified the change, alleging that the previous authorities were strongly linked with PSOE.

[55]Legal punishments to force entry into a market could also infringe fundamental rights, usually protected by liberal constitutions.

[56]I adopt a utilitarian welfare function, i.e., the aggregate welfare is the sum of the payoffs the agents involved. This is a standard approach in the literature on industrial organization and regulation of public utilities (see for example Laffont 2000). An analogous normative exercise can be repeated for other welfare functions.

In other words, the constitution tries to influence n in order to maximize $W(n)$ employing two policy instruments (entry restrictions and entry subsidies).[57] The crucial trade off depends on whether free entry leads to a free or a captured media industry. When, free entry leads to a captured media industry, the constitution can try to subsidize entry in order to obtain a free media or it can restrict entry to obtain a captured monopoly. When, free entry leads to a free media industry, the constitution can try a moderate entry limitation to avoid the costs of excessive entry by keeping a free media or it can go all the way to a captured monopoly. Proposition 3.2 below formally formally considers this trade off; but first I need to introduce some notation.

Let ΔB denotes the expected benefit of a free media (relative to captured media). In appendix 3.1.2, I prove that:

$$\Delta B = p\lambda(c_H - c_L)\left[g_H^{cap} - (1-\delta)g_H^{free}\right] +$$
$$+ (1-p)\left[u\left(g_H^{free}\right) - u\left(g_H^{cap}\right) - (1+\lambda)c_H\left(g_H^{free} - g_H^{cap}\right)\right], \tag{46}$$

where g_H^{cap} and g_H^{free} are implicitly given by expression (44) (i.e., $u'\left(g_H^{cap}\right) = \left(\frac{c_H - pc_L}{1-p}\right)(1+\lambda)$) and

$$u'\left(g_H^{free}\right) = \left[\frac{(1-\delta p)c_H - p(1-\delta)c_L}{1-p}\right](1+\lambda), \tag{47}$$

respectively.

Proposition 3.2: *Natural Monopoly. Suppose that assumptions 3.1 and 3.2 hold. Let ΔB be defined by expression (46) and assume $\Delta B > p\delta\bar{E}_M\left(\frac{\bar{n}}{\bar{n}+1}\right)$, and let $\bar{n} = int\left(\frac{\Delta_P}{E_M}\right)$.*

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[57]Later I also consider alternative constitutional environments in which the constitutional choices are even more restrictive.

Assume that the constitution can restrict and promote entry. Then:

1. *Suppose that a media monopoly will be captured by the politician (formally, $\bar{n} \geq 1$). Then:*

    a. *If $\bar{C}_S > \frac{\Delta B + \lambda p \delta \bar{E}_M}{(1+\lambda)\bar{n}+\lambda}$, then the optimal media industry is a monopoly captured by the politician.*

    b. *If $\frac{p \delta \bar{E}_M}{\bar{n}+1} < \bar{C}_S \leq \frac{\Delta B + \lambda p \delta \bar{E}_M}{(1+\lambda)\bar{n}+\lambda}$, then the optimal media industry is free. Moreover, entry to the industry must be subsidized, with the optimal subsidy given by $S = \bar{C}_S - \frac{p \delta \bar{E}_M}{\bar{n}+1}$.*

    c. *If $\bar{C}_S \leq \frac{p \delta \bar{E}_M}{\bar{n}+1}$, then the optimal media industry is free. Moreover, entry to the industry must be restricted to $\bar{n}+1$ companies.*

2. *Suppose that a media monopoly cannot be captured by the politician (formally, $\bar{n} < 1$). Then, the optimal media industry is a monopoly.*

Proof: See appendix 3.1.2. ■

The message of Proposition 3.2 is simple, but powerful. The media should not be treated as a standard natural monopoly. Although there can be good reasons to believe that the media in an increasing-returns industry, this is not enough to conclude that the best we can do is to have one big media company. In fact, if the entry cost is low enough ($\bar{C}_S \leq \frac{\Delta B + \lambda p \delta \bar{E}_M}{(1+\lambda)\bar{n}+\lambda}$), the optimal regulation is either to encourage entry with subsidies or to impose just a moderate entry limitation. The reason is that it is worthwhile to pay the extra costs associated with several media companies obtaining and reporting the same signal, if extra competition helps to avoid the dissipation of resources in the political system.

Proposition 3.2 can be seen as a formalization of the concerns informally discussed in Djankov et al (2001), who expose the limitations of a standard Pigouvian approach to

the media industry. They argue that a standard Pigouvian approach would lead us to recommend that the media industry should be organized as one public owned company or, at least, as a regulated monopoly. However, they ask what would happen with the incentives to collect and report news if the media is monopolized and/or controlled by the state, a political economy issue not covered by the standard approach, but the central point of this paper.

Proposition 3.2 can also be contrasted with the literature on optimal entry. For example, Mankiw and Whinston (1986) and Zhao (2009) show that in a Cournot oligopoly free entry could lead to excessive entry, in the sense that the optimal number of firms is less than the equilibrium number of firms. The main reason is that when firms take their entry decisions they do not fully internalize economies of scale. A similar logic also applies to the model in this paper. However, in the media industry there could also exist a counterbalancing effect; namely, free entry may lead to too few companies and, therefore, to a captured media industry. Indeed, Proposition 3.2 balances these two opposite effects.

Proposition 3.2 is also related to the literature on principal-agent relationships with supervisors. The key idea in this literature is that the principal must design a contract in such a way that the agent does not have an incentive to collude with the supervisors (see for example Laffont 2000). Usually, more supervisors help the principal because they make collusion more complicated, but they also cost more resources. The trade off behind proposition 3.2 is analogous, with the media companies playing the role of supervisors. However, there are two important differences between the principal-agent models with supervisors and the model in this paper. First, in the principal-agent literature the principal is allow to design a full contract subject to the incentive and participation constraints while here the constitution can only restrict or promote entry. Second, in the principal-agent literature more supervisors hinder collusion in several different ways (for example yardstick

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competition), while in the model of this paper more media companies make capture more difficult due to the way they compete for news-related revenues.

Example. Let $u(g) = A \ln(g)$. Then, from (44) and (47):

$$g_H^{cap} = \frac{A(1-p)}{(c_H - pc_L)(1+\lambda)}, \quad g_H^{free} = \frac{A(1-p)}{[(1-\delta p)c_H - p(1-\delta)c_L](1+\lambda)}.$$

From proposition 3.1 (recall that $int(x)$ denotes the integer part of x and $\chi = \frac{c_H}{c_L}$):

$$\bar{n} = int\left(\frac{\Delta_P}{\bar{E}_M}\right) = int\left(\frac{A(1-p)(\chi-1)}{(1+\lambda)(\chi-p)\bar{E}_M}\right), \quad \hat{n} = int\left(\frac{p\delta\bar{E}_M}{\bar{C}_S}\right).$$

From (46):

$$\Delta B = (1-p)A \ln\left[\frac{(\chi-p)}{(1-\delta p)\chi - p(1-\delta)}\right] - \frac{\delta Ap(1-p)^2 \chi(\chi-1)}{(\chi-p)[(1-\delta p)\chi - p(1-\delta)](1+\lambda)}.$$

It is tedious but easy to prove that $\Delta B(\delta = 0) = 0$ and $\frac{\partial \Delta B}{\partial \delta} > 0$ for all $\delta > 0$. Hence $\Delta B > 0$ for all $\delta > 0$, i.e., a captured media industry imposes a welfare loss.

From proposition 3.2 part 1, the optimal regulation leads to a free media industry if and only if $\bar{C}_S \leq \frac{\Delta B + \lambda p \delta \bar{E}_M}{(1+\lambda)\bar{n} + \lambda}$. Since $\frac{\partial \Delta B}{\partial \delta} > 0$ and $\bar{n}$ does not depend on δ as the media becomes more productive ($\bar{C}_S$ lower or δ higher) the the region for which the optimal media is free is bigger. Analogously, since $\bar{n}$ is decreasing in $\bar{E}_M$, as the general public is more willing to expend in the media ($\bar{E}_M$ higher), the region for which the optimal media is free expands.

When regulation requires an entry subsidy (proposition 3.2 part 1.b), the optimal subsidy is $S = \bar{C}_S - \frac{p\delta\bar{E}_M}{\bar{n}+1}$, which is decreasing in $\bar{E}_M$ and δ and increasing in $\bar{C}_S$. Thus, as the general public is more willing to expend in the media ($\bar{E}_M$ higher), and the media is more productive (δ higher or $\bar{C}_S$ lower), the subsidy we need to make the industry free is lower. When regulation requires an entry restriction (proposition 3.2 part 1.c), it is optimal to

allow only $\bar{n}+1$ companies, while free entry would leave to $\hat{n}$ companies. The difference, i.e., $\Delta n = \hat{n} - (\bar{n}+1)$, is a measure of the magnitude of the restriction. Δn is increasing in $\bar{E}_M$, and $\frac{\delta}{C_S}$. Thus, as the general public is more willing to expend in the media ($\bar{E}_M$ higher), more firms would enter into the market under free entry ($\hat{n}$ higher) and fewer firms are enough to secure a free media ($\bar{n}+1$ lower). As a consequence, the magnitude of the entry restriction imposed by the optimal regulation increases. When the productivity of the media industry increases ($\frac{\delta}{C_S}$ higher) more firms would enter under free entry and, hence, the entry restriction becomes more severe.

Alternative Constitutional Environment I. The welfare analysis behind Proposition 3.2 assumes that the constitution can promote and restrict entry. However, there could be situations in which the constitution can promote but not restrict entry or vice versa. Proposition 3.3 summarizes the optimal regulation in such constitutional environments.

Proposition 3.3: *Suppose that assumptions 3.1 and 3.2 hold. Let ΔB be defined by expression (46) and assume $\Delta B > p\delta\bar{E}_M\left(\frac{\bar{n}}{\bar{n}+1}\right)$, let $\bar{n} = int\left(\frac{\Delta_P}{\bar{E}_M}\right) \geq 1$, and $\hat{n} = int\left(\frac{p\delta\bar{E}_M}{\bar{C}_S}\right)$. Then:*

1. *Assume that the constitution can promote, but not restrict entry. Then:*

    a. *If $\bar{C}_S \leq \frac{\Delta B + \lambda p\delta\bar{E}_M}{(1+\lambda)\bar{n}+\lambda}$, then the optimal media industry is free. Entry to the industry might be subsidized, with the optimal subsidy given by $S = \max\left\{\bar{C}_S - \frac{p\delta\bar{E}_M}{\bar{n}+1}, 0\right\}$. Moreover, the optimal industry is an oligopoly with $\max\{\bar{n}+1, \hat{n}\}$ companies.*

    b. *If $\bar{C}_S > \frac{\Delta B + \lambda p\delta\bar{E}_M}{(1+\lambda)\bar{n}+\lambda}$, then the optimal media industry is an oligopoly with $\bar{n}$ companies captured by the politician.*

2. *Assume that the constitution can restrict, but not promote entry. Then:*

a. If $\bar{C}_S \leq \frac{p\delta\bar{E}_M}{\bar{n}+1}$, then the optimal media industry is free. Entry should be restricted to $\bar{n}+1$ companies.

b. If $\bar{C}_S > \frac{p\delta\bar{E}_M}{\bar{n}+1}$, then the optimal media industry is a captured monopoly. Entry should be restricted to only one company.

Proof: See appendix 3.1.3. ■

Comparing proposition 3.2 part 1 with proposition 3.3 part 1, if the constitution cannot employ entry restrictions, then the region for which the optimal media is free is bigger.[58] The reason is that when it is not possible to restrict entry the equilibrium number of companies will be at least $\bar{n}$. In other words, entry restrictions make a captured industry more attractive because a monopoly avoids the unnecessary duplication of C_S. Comparing proposition 3.2 part 1 with proposition 3.3 part 2 it is possible to prove that if the constitution cannot employ entry subsidies, then the region for which the optimal media is free is smaller.[59] The reason is again that entry restrictions make a captured industry a better alternative.

Alternative Constitutional Environment II. Consider an even more restrictive constitutional environment in which the constitution can only make a discrete choice: free entry or monopoly. Proposition 3.4 summarizes the optimal regulation in such environment.

Proposition 3.4: *Suppose that assumptions 3.1 and 3.2 hold. Let ΔB be defined by expression (46) and assume $\Delta B > 0$, let $\bar{n} = int\left(\frac{\Delta_P}{E_M}\right) \geq 1$ and $\hat{n} = int\left(\frac{p\delta\bar{E}_M}{C_S}\right)$. Assume that the constitution can only select between free entry and a monopoly. Then, free entry dominates monopoly if and only if $\bar{C}_S \leq \min\left\{\frac{p\delta\bar{E}_M}{\bar{n}+1}, \frac{\Delta B}{\hat{n}-1}\right\}$.* **Proof**: See appendix 3.1.4. ■

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[58]Formally, $\frac{\Delta B + \lambda p\delta\bar{E}_M}{\lambda\bar{n}+1+\lambda} \geq \frac{\Delta B + \lambda p\delta\bar{E}_M}{(1+\lambda)\bar{n}+\lambda}$ since $\bar{n} \geq 1$.

[59]Note that $\frac{\Delta B + \lambda p\delta\bar{E}_M}{(1+\lambda)\bar{n}+\lambda} \geq \frac{p\delta\bar{E}_M}{\bar{n}+1}$.

Proposition 3.4 reaffirms the case against a media monopoly. Even when the media operates under increasing returns and the only available option to a media monopoly is free entry, monopoly is not automatically justified.

3.5 Extension I: Natural Oligopoly

The notion that the media industry is a natural monopoly might sound extreme. However, the main message of proposition 2 remains unaltered if this assumption is relaxed. Consider the following generalization of assumption 3.1.

Assumption 3.1bis: *The media industry is a natural oligopoly with $n_{\min} \geq 1$ companies. Formally, the cost function $C_S(n)$ is given by:*

$$C_S(n) = \begin{cases} \frac{G_S(n)}{n} & \text{if } n \leq n_{\min}, \\ \frac{\bar{C}_S}{n_{\min}} & \text{if } n \geq n_{\min}, \end{cases}$$

where $G_S(n)$ is any decreasing function such that $G_S(n_{\min}) = \bar{C}_S$.

It is easy to see that if $n_{\min} = 1$, then assumption 3.1bis is equivalent to assumption 1. For $n_{\min} > 1$, assumption 3.1bis generates a natural oligopoly of $n_{\min} > 1$ companies. In order to see this, note that $n_{\min} = \arg\min_n \{nC_S(n)\}$. In other words, $n_{\min}$ companies can supply the media market at the lowest possible cost. Several remarks about assumption 1bis apply. First, note that the minimum cost of the industry is always $\bar{C}_S$, regardless of the value of $n_{\min}$. This implies that when $n_{\min}$ varies only the market structure of the media industry is changing, but the total minimum cost of the industry is fixed. Second, assumption 3.1bis is compatible with a standard constant return to scale industry for which the number of companies is undetermined. Just define $G_S(n) = \bar{C}_S$ and $n_{\min} = \infty$, which

means that $C_S(n) = \frac{\bar{C}_S}{n}$ for all $n \geq 1$ and, therefore, the total cost of the industry is $\bar{C}_S$ for all n.

The following assumption is a generalization of assumption 3.2.

Assumption 3.2bis: *A media oligopoly of $n_{\min}$ companies is always profitable. Formally, $p\delta\gamma\Delta_{GP} > \bar{C}_S$.*

Proposition 3.5 summarizes the optimal regulation when the media industry is a natural oligopoly.

Proposition 3.5: *Natural Oligopoly. Suppose that assumptions 3.1bis and 3.2bis hold. Let ΔB be defined by expression (46) and assume $\Delta B > p\delta\bar{E}_M\left(\frac{\bar{n}+1-n_{\min}}{\bar{n}+1}\right)$, and let $\bar{n} = int\left(\frac{\Delta_P}{\bar{E}_M}\right)$. Assume that the constitution can restrict and promote entry. Then:*

1. *Suppose that an oligopoly with $n_{\min}$ companies will be captured by the politician (formally, $\bar{n} \geq n_{\min}$.) Then:*

   a. *If $\bar{C}_S > \frac{n_{\min}\left(\Delta B + \lambda p\delta\bar{E}_M\right)}{(1+\lambda)(\bar{n}+1)-n_{\min}}$, then the optimal media industry is a captured oligopoly with $n_{\min}$ companies.*

   b. *If $\frac{p\delta\bar{E}_M n_{\min}}{\bar{n}+1} \leq \bar{C}_S \leq \frac{n_{\min}\left(\Delta B + \lambda p\delta\bar{E}_M\right)}{(1+\lambda)(\bar{n}+1)-n_{\min}}$, then the optimal media industry is free. Moreover, entry to the industry must be subsidized with the optimal subsidy given by $S = \frac{\bar{C}_S}{n_{\min}} - \frac{p\delta\bar{E}_M}{\bar{n}+1}$.*

   c. *If $\bar{C}_S < \frac{p\delta\bar{E}_M n_{\min}}{\bar{n}+1}$, then the optimal media industry is free. Moreover, entry to the industry must be restricted to $\bar{n}+1$ companies.*

2. *Suppose that an oligopoly with $n_{\min}$ cannot be captured by the politician (formally, $\bar{n} < n_{\min}$.) Then, the optimal media industry is an oligopoly with $n_{\min}$ companies.*

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Proof: See appendix 3.1.5. ∎

Proposition 3.5 is a natural generalization of proposition 3.2, with one important remark. Note that, as the media industry becomes more competitive, in the sense that $n_{\min}$ increases, it is more likely that the the constitution favors a free media. In order to see this formally, note that the threshold in part 1 is decreasing in $n_{\min}$. The intuition is that when $n_{\min}$ increases, the difference between the number of companies necessary to make the industry free and $n_{\min}$ decreases.

Proposition 3.5 part 1 implicitly assumes an upper bound on $n_{\min}$ (note that $\bar{n} \geq n_{\min}$, which implies that $n_{\min}$ must be finite). This eliminates the possibility of perfect competition in the media market. However, it is reasonable to ask what would happen if the industry becomes more and more competitive, eventually reaching a point for which $n_{\min} > \bar{n}$. Proposition 3.5 part 2 answers this question. Once this happens, there is no more a trade off between excessive entry (due to duplication of the cost of the signal) and insufficient entry (due to capture). Therefore, the optimal constitution rule can restrict entry to $n_{\min}$, without any fear of inducing a captured industry.

3.6 Extension II: Two Sources of Capture

Previous sections have stressed the role of politicians as the main source of media capture. This is a reasonable starting point because usually government officials are in a privileged position to bribe and extort the press and are those who can profit the most from information manipulation. Nevertheless, powerful constituencies (e.g., special interests groups) could be another important source of media capture and information manipulation. In other words, the baseline model emphasizes the vertical dimension of social conflict, i.e., the conflict between politicians that run the government and citizens with homogeneous policy preferences, but it overlooks the horizontal dimension, i.e., the conflict among groups

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of citizens with heterogeneous policy preferences. In this section, I extend the baseline model in order to introduce two groups of citizens, one of which has privileged access to the media. Then, I use the extended model to study the optimal regulation of the media industry.

3.6.1 An Extended Model of the Media Industry[60]

Consider a society composed by two homogeneous groups, indexed by $h = GP, E$, where GP indicates the general public and E indicates the elite. Each group has a proportion n_h of the citizens, with $n_{GP} > 1/2$, and each citizen in group h has income y_h (i.e., an endowment of the private good), with $y_E > y_{GP}$. Let y indicates the average income of the economy, i.e., $y = n_{GP} y_{GP} + n_E y_E$. Assume also that there are two public goods, g^1 and g^2. Each public good is produced with a simple linear technology, i.e., the total cost of producing g^j units of the public good $j = 1, 2$ is $c^j g^j$ units of the private good, where c^j is a random variable that can adopt the values c^j_L or c^j_H ($c^j_L < c^j_H$) with probabilities $p^j \in (0, 1)$ and $(1 - p^j)$, respectively.

Citizens get utility from the consumption of the private good and the two public goods, whose provision is financed with a proportional income tax. Each unit of the private good taxed at the rate $\tau \geq 0$ generates a deadweight loss equal to $\lambda \tau$, where $\lambda \geq 0$. Citizens in group h also expends $E_M(h)$ on media subscriptions and/or advertisements.[61] The utility function of a citizen of group h is given by:

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[60]As I briefly mentioned in the introduction, Corneo (2005) and Petrova (2008) study media capture in environments populated by citizens with heterogeneous policy preferences. In both models, a group of citizens manage to bribe the media, distorting available information about public policies, and, hence, pushing public policies in the direction of their interests. In particular, Petrova (2005) develops a model in which the rich elite, who are informed about the cost of public goods, tries to influence the media in order to keep the poor median voter uninformed about the real cost of public goods. I adapt and incorporate this framework to the baseline model.

[61]The general public buys subscriptions and the elite pays advertisements.

$$u_h\left(g^1, g^2, \tau, E_M\left(h\right)\right) = \beta u\left(g^1\right) + \left(1 - \beta\right) u\left(g^2\right) + \left[1 - \left(1 + \lambda\right)\tau\right] y_h - E_M\left(h\right), \quad (48)$$

where the sub-utility function u is strictly increasing, strictly concave, twice continuously differentiable and satisfies $\lim_{g \to 0} u'\left(g\right) = \infty$ and $\lim_{g \to \infty} u'\left(g\right) = 0$; and $\beta \in [0, 1]$ is a measure of the importance of g^1.

The politician collects taxes and provides the public goods. He also expends B units of the private good on bribes to the media industry. Thus, the utility function of the politician is given by:

$$u_P\left(g^1, g^2, \tau, B\right) = \tau y - c^1 g^1 - c^2 g^2 - B \quad (49)$$

As in the baseline model, information about the cost of the public goods is asymmetrically distributed. In particular, the politician and the elite observe the realization of $\left(c^1, c^2\right)$, the general public only knows the probability distribution of $\left(c^1, c^2\right)$, and the media industry receives an informative signal $\left(s^1, s^2\right)$. When $c^j = c_L^j$, $s^j = c_L^j$ with probability δ^j and $s^j = \varnothing$ with probability $\left(1 - \delta^j\right)$; when $c^j = c_H^j$, $s^j = \varnothing$. As before media companies cannot fabricate news, i.e., when $s^j = c_L^j$, $r_i^j \in \left\{c_L^j, \varnothing\right\}$, when $s^j = \varnothing$, $r_i^j = \varnothing$. Compared with the baseline model, the innovation is that the elite is informed about $\left(c^1, c^2\right)$.

Media companies have three rather than two sources of revenue. The general public still expends on subscriptions $\left(E_{M,i}\right)$ and the politician pays bribes $\left(B_i\right)$, but now the elite pays advertisements $\left(A_i\right)$. Thus, the payoff function of media company i is given by:

$$u_{M,i}\left(E_{M,i}, A_i, B_i, C_S\right) = E_{M,i} + A_i + B_i - C_S, \quad (50)$$

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where C_S is the cost of an individual company.

As in the baseline model total expenditure on subscriptions is evenly shared among all the active media companies. In particular, let $m_j = \# \left\{ i : r_i^j = c_L^j \right\}$ be the number of companies reporting news about c^j. Then, the subscription-related revenue of media company i is $E_{M,i} = E_{M,i}^1 + E_{M,i}^2$, where $E_{M,i}^j = \frac{\bar{E}_M^j}{m_j}$ if $r_i^j = c_L^j$, $E_{M,i}^j = 0$ if $r_i^j = \varnothing$, and $\bar{E}_M^j > 0$ are two constants.

The timing of events is essentially the same as in the baseline model, except for the following modifications. *1.* **Entry**: In the entry stage now companies must also decide to specialize in gathering information about c^1, c^2 or both. *2.* **Signals**: In the signaling stage, not only the politician but also the elite observes (c^1, c^2) and (s^1, s^2). *3.* **Bribes**: In the bribing stage, now there are two groups (the politician and the elite) with the capacity of influencing news. Moreover, they move sequentially: first, the elite offers advertisements and, then, the politician offers bribes. *4.* **Contracts**: Now a contract specifies g^1, g^2 and a tax rate τ. g^2 must be the same in every contract of the menu and τ can be contingent on the realization of c^2, but not on the realization of c^1. The idea is that g^1 captures the conflict of interests between citizens and the politician, while g^2 captures the conflict between the elite and the general public.[62]

The extended model can be represented as a game with incomplete information.[63]

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[62]The intuition is as follows. On the one hand, when the general public can offer a menu of contracts with different values of g^1, but with a tax rate that cannot be contingent on the realization of c^1, there is a principal-agent problem and, hence, the crucial issue is not the level of g^1 but the rents that the politician keeps due to his information advantage with respect to the general public. On the other hand, when the general public must select a level of g^2, but the tax rate can be contingent on c^2, the politician cannot capture any rents and the crucial issue is the level of g^2 (the elite prefers a lower g^2 than the general public).

[63]A strategy for the politician α_P is a schedule of bribes $\left(\left(B_1^1, B_2^2 \right), ..., \left(B_n^1, B_n^2 \right) \right)$ (a pair of bribe offers to each media company in the industry) and a public budget $\left(g^1, g^2, \tau y \right)$. Each B_i^j is of the following form: the politician commits to pay $B_i^j \left(r_i^j \right)$ to media company i if and only if the media company i commits to report r_i^j. The politician also selects a public budget $\left(g^1, g^2, \tau y \right)$ for each menu of budgets offered by the general public. A strategy for the elite α_E is schedule of advertisements $\left(\left(A_1^1, A_1^2 \right), ..., \left(A_n^1, A_n^2 \right) \right)$ (a pair of advertisement offers to each media company in the industry). Each A_i^j is of the following form: the elite commits to pay $A_i^j \left(r_i^j \right)$ to media company i if and only if media company i commits to report r_i^j. A strategy for media company i $\alpha_{M,i}$ is a pair of feasible reports $\left(r_i^1, r_i^2 \right)$ for each schedule of bribes $\left(B_i^1, A_i^1, B_i^2, A_i^2 \right)$.

Moreover, an equilibrium for this game is a natural extension of definition 1.

Definition 3.3: *An equilibrium with n media companies ($n^j \geq 0$ that special-ize in s^j and $n - n^1 - n^2 \geq 0$ that receive both signals)*[64] *is a strategy profile $(\alpha_P, \alpha_E, \alpha_{M,1}, ..., \alpha_{M,n}, \alpha_{GP})$ and a belief about the cost of the public goods such that: 1.* **Belief**: *Definition 3.1 applies with $c = (c^1, c^2)$, $p = (p^1, p^2)$, $s = (s^1, s^2)$ and $r_i = (r_i^1, r_i^2)$. 2.* **Contracts**: *Definition 3.1 applies with a contract given by a public budget $(g^1, g^2, \tau y)$. 3.* **Bribes**: *(a) The elite selects the advertisement schedule that maximizes its expected utility; and (b) For each advertisement schedule the politician selects the schedule of bribes that maximizes his expected utility. 4.* **Reports**: *Definition 3.1 applies with $r_i = (r_i^1, r_i^2)$.*

When the politician uses bribes to keep the general public uninformed about c^1 (for-mally, when in equilibrium $r_i^1 = \varnothing$ for all i) we say that the media industry has been *captured by the politician* and when the elite uses advertisements to keep the general pub-lic uninformed about c^2 (formally, when in equilibrium $r_i^2 = \varnothing$ for all i) we say that the media industry has been *captured by the elite*.

Definition 3.3 takes (n^1, n^2, n) as given, but if companies can decide entry, these are endogenous variables.

Definition 3.4: *An equilibrium with endogenous entry is a strategy profile, a belief about the cost of the public goods, and a vector (n^1, n^2, n), where $n^j \geq 0$ and $n \geq n^1 + n^2$, such that: 1. The strategy profile and the belief is an equilibrium with n media companies (n^j that specialize in s^j and $n - n^1 - n^2$ that receive both signals); and 2. (n^1, n^2, n) is such that: (a) the expected profit of each company is nonnegative; (b) a company cannot increase its expected profit unilaterally changing its entry decision; and (c) the expected*

A strategy for the general public α_{GP} is a menu of possible public budgets for each schedule of reports.

[64]Note that it is always possible to relabel media companies in such a way that the companies that specialize in s^1 are $i = 1, ..., n_1$, the ones that specialize in s^2 are $i = n_1 + 1, ..., n_1 + n_2$, and the ones that receive both signals are $i = n_1 + n_2 + 1, ..., n$. Thus, only the numbers n^1, n^2, and n matter.

profit of a company that receives s^j would be negative in an equilibrium with one more firm that receives s^j.

Definitions 3.3 and 3.4 are consistent with any specification of the cost function of a media company C_S. However, it is useful to introduce some assumptions about the cost and market structure of the media industry.

Assumption 3.3: *The cost function of a media company is $C_S = e^1 \bar{C}_S^1 + e^2 \bar{C}_S^2 - e^1 e^2 \alpha \left(\bar{C}_S^1 + \bar{C}_S^2 \right)$, where $\bar{C}_S^j > 0$, $e^j = 1$ if the company pays for signal for s^j, $e^j = 0$ if the company does not pay for s^j, and α is a measure of the degree of economies of scope.*

Assumption 3.3 implies that the media industry is either a natural monopoly or a natural duopoly with one company specialized in s^1 and another in s^2. In order to see this, note that the total cost of the media industry is given by

$$ C_S \left(n^1, n^2, n \right) = \left(n - n^2 \right) \bar{C}_S^1 + \left(n - n^1 \right) \bar{C}_S^2 - \left(n - n^1 - n^2 \right) \alpha \left(\bar{C}_S^1 + \bar{C}_S^2 \right). $$

When there are economies of scope ($\alpha > 0$) $C_S \left(n^1, n^2, n \right)$ adopts its minimum for $\left(n^1 = 0, n^2 = 0, n = 1 \right)$. Thus, the industry is a natural monopoly. When there are diseconomies of scope ($\alpha < 0$) $C_S \left(n^1, n^2, n \right)$ adopts its minimum for $\left(n^1 = 1, n^2 = 1, n = 0 \right)$. Thus, the industry is a natural duopoly.

Assumption 3.4: *A natural duopoly with one company specialized in s^1 and another in s^2 is profitable for each company. Formally, $p^j \delta^j \bar{E}_M^j > \bar{C}_S^j$ for $j = 1, 2$.*

Assumption 3.4 simply states that at least one company will be willing to pay the cost of receiving s^j.

3.6.2 Equilibrium

In appendix 3.2.1 I fully characterize the equilibrium of the media industry for the extended model.[65] In this section I briefly summarize the key features of the equilibrium and illustrate it employing a simple example. The critical result is that the elite uses advertisements to make media capture by the politician more difficult, but also to distort information about the cost of g^2.

Let Δ_P denotes the utility gain of the politician when the media withholds $s^1 = c_L^1$, Δ_E^1 the utility gain of the elite when the media reports $r^1 = c_L^1$, and $\gamma_E \in [0, 1]$ the proportion of the elite that pays advertisements. In the online appendix 3.2.1, I prove that:

$$\Delta_P = \left(c_H^1 - c_L^1\right) g_H^{1,cap},$$

$$\Delta_E^1 = \left(c_H^1 - c_L^1\right) g_H^{1,cap} \left(1 + \lambda\right) \left(\frac{n_E y_E}{y}\right),$$

where $g_H^{1,cap}$ is implicitly given by $\beta u'\left(g_H^{1,cap}\right) = \left(\frac{c_H^1 - p^1 c_L^1}{1 - p^1}\right)(1 + \lambda)\frac{y_{GP}}{y}$. Then, in equilibrium, the media is captured by the politician if and only if $n - n^2$, i.e., the number of companies that receive s^1, is less than $\bar{n}^1 + 1$, where $\bar{n}^1$ is given by: (recall the $int\,(x)$ indicates the integer part of x)

$$\bar{n}^1 = int\left(\frac{\Delta_P - \gamma_E \Delta_E^1}{\bar{E}_M^1}\right). \tag{51}$$

Compared with the baseline model, the innovation is $\gamma_E \Delta_E^1$, which is the amount that the elite uses to counter the politician's bribes. Note that if the elite cannot advertise, then the media will be captured by the politician whenever there are less than $\tilde{n}^1 + 1$ companies that receive s^1, where $\tilde{n}^1 = int\left(\frac{\Delta_P}{E_M^1}\right) < \bar{n}^1$. In other words, the presence of the elite makes media capture by the politician more difficult.

Let Δ_E^2 denotes the utility gain of the elite when the media withholds $s^2 = c_L^2$. In the

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online appendix 3.2.1, I prove that

$$\Delta_E^2 = \max\left\{0, (1-\beta)\,n_E\left[u\left(g^{2,cap}\right) - u\left(g_L^2\right)\right] - \left(g_L^2 - g^{2,cap}\right)c_L^2\,(1+\lambda)\,\frac{n_E y_E}{y}\right\},$$

where $g^{2,cap}$ and g_L^2 are implicitly given by $(1-\beta)\,u'\left(g^{2,cap}\right) = (1+\lambda)\left[p^2 c_L^2 + \left(1-p^2\right)c_H^2\right]\frac{y_{GP}}{y}$ and $(1-\beta)\,u'\left(g_L^2\right) = (1+\lambda)\,c_L^2\frac{y_{GP}}{y}$. Then, in equilibrium, the media is captured by the elite if and only if $n - n^1$, i.e., the number of media companies that receive s^2, is less than $\bar{n}^2 + 1$, where $\bar{n}^2$ is given by:

$$\bar{n}^2 = int\left(\frac{\gamma_E \Delta_E^2}{\bar{E}_M^2}\right). \tag{52}$$

Compared with the baseline model, there are two innovations. First, concerning g^2, the source of media distortion is the elite, who is willing to pay up to $\gamma_E \Delta_E^2$ in advertisements if the media withholds $s^2 = c_L^2$. Second, the politician is neutral about g^2. The reason is that the tax rate can be contingent on c^2 and, hence, the politician cannot obtain any rents from g^2.

Figures 3.2.a and 3.2.b illustrate the equilibrium of the media industry under free entry when there are diseconomies of scope ($\alpha < 0$) for $u(g) = A\ln(g)$ with, $\beta = 0.50$, $\lambda = 0.35$, $\gamma_E = 0.50$, $n_{GP} = 0.75$, $n_E = 0.25$, $y_E/y_{GP} = 4$, $p^1 = p^2 = 0.25$, $\delta^1 = \delta^2 = 0.25$, $c_H^1/c_L^1 = c_H^2/c_L^2 = 2.25$, $\bar{C}_S^1 = 250, 1500$, and $\bar{C}_S^2 = 500, 1500$. Note that media companies prefer to operate in only one market, i.e., no company pays both signals. In each figure, the dark curve indicates the expected revenue of a media company for each possible value of n^j (the number of companies that operates in market $j = 1, 2$), while the two thin horizontal lines indicate the cost of receiving the signal $(\bar{C}_S^j)$. The equilibrium number of firms is given by the intersection between the expected revenue curve and the cost line. $\bar{n}^1 + 1$ and $\bar{n}^2 + 1$ are the thresholds for the number of companies that stop capture by the

politician and the elite, respectively. Note, however, an important difference between both markets. While only the elite tries to influence r^2, the elite and the politician are willing to influence r^1. In fact, when $n^1 \in \left[\tilde{n}^1, \bar{n}^1 + 1\right]$, part of the revenue of the media is coming from advertisements paid by the elite.

Please see Figure 3.2.a: Equilibrium in Market 1 with Endogenous Entry (Diseconomies of Scope)

Please see Figure 3.2.b: Equilibrium in Market 2 with Endogenous Entry (Diseconomies of Scope)

Figure 3.3 illustrates the equilibrium of the media industry under free entry when economies of scope are high ($\alpha > \hat{\alpha} = \frac{\max\{\bar{C}_S^1, \bar{C}_S^2\}}{\bar{C}_S^1 + \bar{C}_S^2}$) for $u(g) = A \ln(g)$ with $A = 1$, $\beta = 0.50$, $\lambda = 0.35$, $\gamma_E = 0.50$, $n_{GP} = 0.75$, $n_E = 0.25$, $y_E/y_{GP} = 4$, $p^1 = p^2 = 0.25$, $\delta^1 = \delta^2 = 0.25$, $c_H^1/c_L^1 = c_H^2/c_L^2 = 2.25$, $\bar{E}_M^1 =$, $\bar{E}_M^1 =$, $(1-\alpha)\left(\bar{C}_S^1 + \bar{C}_S^2\right) = 500, 1500$ (for example, $\bar{C}_S^1 = \bar{C}_S^2 = 500, 1500$ and $\alpha = 0.50$). Note that all media companies prefer to operate in both markets, i.e., no company pays only one signal. Again, the dark curve indicates the expected revenue of a media company for each possible value of n (the number of companies), while the two thin horizontal lines indicate the total cost of an integrated firm ($(1-\alpha)\left(\bar{C}_S^1 + \bar{C}_S^2\right)$). The equilibrium number of firms is given by the intersection between the expected revenue curve and the cost line. $\bar{n}^1 + 1$ and $\bar{n}^2 + 1$ are again the key thresholds. Indeed, if the expected profit of a media company when there are $\bar{n}^1 + 1$ companies in the market is nonnegative, at least $\bar{n}^1 + 1$ will enter into the market and, hence, the media will not be captured by the elite or the politician. If the expected profit of a company when there are $\bar{n}^1 + 1$ companies in the market is negative, but it is nonnegative when there are $\bar{n}^2 + 1$, at least $\bar{n}^2 + 1$, but less than $\bar{n}^1 + 1$ companies will enter into the market and, hence, media will be captured by the politician, but not by the elite. Finally,

if the expected profit of a company when there are $\bar{n}^2 + 1$ companies in the market is negative, less than $\bar{n}^2 + 1$ companies will enter into the market and, hence, the media will be captured by the politician and the elite.

Please see Figure 3.3: Equilibrium with Endogenous Entry (Economies of Scope)

3.6.3 Optimal Regulation

In the previous section I have characterized the equilibrium of the media industry when there is no public intervention. In this section I study the optimal regulation of the industry with a focus on how society should regulate the ability of the elite to influence the media. Following the approach of section 3.4, I begin finding the first best allocation. Then, I consider a relatively unrestrictive constitutional environment in which entry can either be restricted or promoted to any degree and the elite can be allowed or not to advertise. Finally, I study a more restrictive environment in which the constitution has a discrete choice, duopoly (monopoly) or free entry, and the elite's ability to influence the media through advertisements cannot be affected by the constitution.

First Best Allocation. It is useful, as a benchmark, to begin deducing the first best allocation. As in the baseline model a media industry captured by the politician induces a welfare loss. In the online appendix 3.2.2, I prove that this welfare loss is given by:

$$\Delta B^1 = p^1 \lambda \left(c_H^1 - c_L^1 \right) \left[g_H^{1,cap} - \left(1 - \delta^1 \right) g_H^{1,free} \right]$$
$$+ \left(1 - p^1 \right) \left\{ \beta \left[u \left(g_H^{1,free} \right) - u \left(g_H^{1,cap} \right) \right] - (1 + \lambda) c_H^1 \left(g_H^{1,free} - g_H^{1,cap} \right) \right\}, \quad (53)$$

where $g_H^{1,cap}$ and $g_H^{1,free}$ are implicitly given by $\beta u' \left(g_H^{1,cap} \right) = (1 + \lambda) \left(\frac{c_H^1 - p^1 c_L^1}{1 - p^1} \right) \frac{y_{GP}}{y}$ and $\beta u' \left(g_H^{1,free} \right) = (1 + \lambda) \left[\frac{(1 - \delta^1 p^1) c_H^1 - (1 - \delta^1) p^1 c_L^1}{(1 - p^1)} \right] \frac{y_{GP}}{y}$. $g_H^{1,cap}$ ($g_H^{1,free}$) is the equilibrium level

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of g^1 when $c^1 = c_H^1$ and the media is (not) captured by the politician. A media captured by the elite also has a negative welfare effect. In the online appendix 3.2.2, I prove that this welfare loss is given by:

$$\Delta B^2 = (1 - \beta) \left[p^2 \delta^2 u \left(g_L^2 \right) + \left(1 - p^2 \delta^2 \right) u \left(g^{2,free} \right) - u \left(g^{2,cap} \right) \right]$$
$$+ (1 + \lambda) \left\{ \left[p^2 c_L^2 + \left(1 - p^2 \right) c_H^2 \right] \left(g^{2,cap} - g^{2,free} \right) + p^2 \delta^2 c_L^2 \left(g_L^2 - g^{2,free} \right) \right\}, \quad (54)$$

where g_L^2, $g^{2,free}$, and $g^{2,cap}$ are implicitly given by $(1 - \beta) u' \left(g_L^2 \right) = (1 + \lambda) c_L^2 \frac{y_{GP}}{y}$, $(1 - \beta) u' \left(g^{2,free} \right) = (1 + \lambda) \left[\frac{(1-\delta^2)p^2 c_L^2 + (1-p^2)c_H^2}{(1-\delta^2)p^2 + (1-p^2)} \right] \frac{y_{GP}}{y}$, $(1 - \beta) u' \left(g^{2,cap} \right) = (1 + \lambda) \left[p^2 c_L^2 + \left(1 - p^2 \right) c_H^2 \right] \frac{y_{GP}}{y}$. Therefore, in order to reach the first best allocation the media must always report the truth, i.e., $r^j = s^j$. Next, consider the total cost of the signals. When there are diseconomies of scope ($\alpha < 0$) the total cost adopts its minimum when the media industry is a duopoly; while when there are economies of scope ($\alpha > 0$), the total cost adopts its minimum when the media industry is a monopoly. Thus, when $\alpha < 0$, the first best allocation is reached with a duopoly (one company that reports $r^1 = s^2$ and another that reports $r^2 = s^2$); while when $\alpha > 0$, the first best allocation is reached with a monopoly that always reports $\left(r^1, r^2 \right) = \left(s^1, s^2 \right)$. For the same reasons discussed in section 3.4, it is very unlikely that any realistic regulation can reach the first best allocation.

A Constitutional Stage. Suppose that the constitution can impose entry restrictions, offer entry subsidies and allow or not the elite to advertise. Compared with the constitutional environment studied in section 3.4, the innovation is the regulation of advertisements. The intuition is that the constitution can directly or indirectly restrict the involvement of the elite in the media industry, for example, imposing some limits on advertising or through explicit ownership restrictions.

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Since in this extension there are two sources of conflict, it is useful to distinguish which source has a greater impact on aggregate welfare. When there are diseconomies (economies) of scope we say that the vertical dimension of social conflict (g^1) is more important than the horizontal dimension (g^2) if and only if the following condition holds

$$\Delta B^2 \leq \Delta B^1 - \begin{cases} \bar{n}^1 \bar{C}_S^1 & \text{if } \alpha < 0, \\ \bar{n}^1 (1 - \alpha) \left(\bar{C}_S^1 + \bar{C}_S^2 \right) & \text{if } \alpha > 0. \end{cases} \tag{55}$$

The interpretation of this condition is simply. Suppose that there are diseconomies (economies) of scope and take as a reference point a natural duopoly (monopoly) captured by the politician and the elite. If the constitution avoids a media industry captured by the politician, there is a welfare gain equal to ΔB^1, but it must be the case that at least $\bar{n}^1$ extra companies are induced to report s^1. Thus, $\Delta B^1 - \bar{n}^1 C_S^1 \left(\Delta B^1 - \bar{n}^1 (1 - \alpha) \left(\bar{C}_S^1 + \bar{C}_S^2 \right) \right)$ is the maximum change in expected welfare that can be obtained avoiding a media industry captured by the politician, a measure of the social importance of the vertical dimension of social conflict. The constitution can always avoid a media industry captured by the elite just forbidding the elite to offer advertisements, which generates a welfare gain equal to ΔB^2. Thus, ΔB^2 is the maximum change in expected welfare that can be obtained avoiding a media industry captured by the elite, a measure of the importance of the horizontal dimension of social conflict.

Proposition 3.6 : *Suppose that assumptions 3.3 and 3.4 hold and free entry leads to a media industry captured only by the elite when the elite can advertise, but it leads to a media industry captured only by the politician when the elite cannot to advertise. Assume that the constitution can impose entry restrictions, offer entry subsidies and allow or not the elite to advertise. Suppose that there are diseconomies of scope, i.e., $\alpha < 0$, and the cost of making the media industry free is lower when the elite can advertise (there are*

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economies of scope, i.e., $\alpha > \hat{\alpha}$, and $\bar{n}^1 < \bar{n}^2 < \tilde{n}^1$). Then, if condition (55) holds, the optimal regulation allows the elite to advertise. Moreover, if the optimal regulation does not allow the elite to advertise, condition (55) does not hold. **Proof**: see online appendix 3.2.3.[66] ∎

Proposition 3.6 shows that restricting the involvement of the elite in the media industry is more attractive when the horizontal dimension of social conflict is more important than the vertical one. The intuition behind this result is that a constitutional restriction that limits the ability of the elite to influence the media will reduce the checks on the politician, but it will increase the checks on the elite. Note, however, that when there are economies of scope it is easier that the horizontal dimension dominates the vertical dimension than when there are diseconomies of scope. The reason is that the extra cost of avoiding a media industry captured by the politician with respect to a situation with only one company that receives s^1 is $\bar{n}^1 C_S^1$ when there are diseconomies of scope, while it is $\bar{n}^1 (1 - \alpha) \left(\bar{C}_S^1 + \bar{C}_S^2 \right)$ when there are economies of scope.

Proposition 3.6 can also be understood as a formalization of an old conservative/liberal debate. Those who emphasize the vertical dimension of conflict tend to welcome the involvement of elite in the media industry because they see it as a way of imposing a limit to politicians. On the other hand, those who emphasize the horizontal dimension of conflict tend to favor restrictions to the involvement of the elite because they fear that a powerful elite that controls the media will manipulate the information about public policies. In terms of the model, when $\beta \to 1$ the horizontal dimension vanishes and the elite contributes to make the media free, while when $\beta \to 0$ the vertical dimension vanishes and the elite distorts information about policies.

Alternative Constitutional Environment. Suppose that the elite's ability to in-

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[66]Appendix 3.2 can be found online at http://gustavotorrens.wordpress.com/.

fluence the media through advertisements is exogenous and cannot be affected by the constitution, which can only select between free entry and a natural duopoly when there are diseconomies of scope and between free entry and a natural monopoly when there are economies of scope.

Proposition 3.7: *Suppose that assumptions 3.3 and 3.4 hold and there are diseconomies of scope, i.e., $\alpha < 0$ (economies of scope, i.e., $\alpha > \hat{\alpha}$). Assume that the constitution can only select between free entry and duopoly (monopoly) and the elite's ability to influence the media through advertisements is exogenous and cannot be affected by the constitution. Then, if free entry dominates a duopoly (monopoly) when the elite cannot advertise then free entry also dominates a duopoly (monopoly) when the elite can advertise.* **Proof**: See online appendix 3.2.4.[67]∎

Proposition 3.7 shows that free entry is more attractive when the elite can advertise. The intuition is that when the elite can advertise free entry is useful to avoid media capture by the politician and the elite, while when the elite cannot advertise, it cannot capture the media either and, hence, free entry is only useful to avoid media capture by the politician.

3.7 Conclusion

This paper develops a political economy model of the media industry and derives the optimal regulation of the media under several alternative constitutional settings. The fundamental message of the paper is that the media should not be treated as a standard industry and that economies of scale are not a sufficient condition for restricting entry or favoring a media monopoly. More competition inoculates the media from being captured by powerful politicians, avoiding the dissipation of resources in the political system. In

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[67]Appendix 3.2 can be found online at http://gustavotorrens.wordpress.com/.

other words, the standard argument in Industrial Organization about excessive entry in oligopolistic industries might not apply to the media industry because it neglects the effect that media competition has on political outcomes. In general, the optimal regulation favors free entry or, at least, the elimination of major entry barriers. Moreover, when free entry leads to a captured media, it might be optimal to actively promote entry rather than passively accept a captured industry.

Although my model stresses how competition contributes to stop media capture, competition in the media industry could be beneficial for other reasons. For example, Gentzkow and Shapiro (2006) show that competition tends to reduce the proclivity of media companies to confirm the public's views (prior beliefs) rather than inform objectively. Furthermore, my model ignores the standard deadweight loss due to imperfect competition. Nevertheless, introducing these or any other positive welfare effects caused by competition can only reinforce the main message of this paper.

The extended model developed in section 3.6 incorporates two sources of social conflict and two groups that try to capture the media (the politician and the elite). The elite plays an ambiguous role in the media industry. On one hand, it tends to neutralize the politician in the sense that it is more difficult for the politician to capture the media when the elite is also trying to influence news. From this point of view, the elite provides a public good. On the other hand, the elite encourages the media to withhold information when it can be used to promote policies that negatively its interest.

Two important results emerge from this extension. First, due to the ambiguous role of the elite, the relative importance of the vertical dimension of social conflict (i.e., the politician versus the general public and the elite) in comparison with the horizontal dimension (i.e., the general public versus the elite) is the key determinant of whether the involvement of the elite in the media industry is welfare enhancing. Second, free entry is even more

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appealing when the elite is involved in the media because if the elite can easily influence the media free entry helps to avoid media capture by the politician and the elite, while if the elite cannot influence the media, free entry is only useful to avoid media capture by the politician. The model also suggests that mergers and acquisitions in the media industry are complicated because they can dramatically change the equilibrium of the industry. For example, if integrated[68] companies merge and block entry, then media capture becomes more likely because there will be fewer media companies in the market. However, if there are economies of scope, allowing mergers between two non-integrated companies is a simple way of reducing entry barriers and, hence, decreasing the chances of capture.

This paper is far from answering all the relevant questions about the optimal organization of the media industry. Indeed, there are several interesting open questions. First, in my model there is no explicit distinction between private and public media companies. Can public media enhance aggregate welfare? It is easy to see that in the baseline model the answer is "no" because ultimately, public media will be controlled by the politician. Thus, it will only reduce the cost of capture, most likely decreasing aggregate welfare. When the horizontal dimension of conflict is present, public media might be useful. In the extended model this is not the case: the politician only cares about the vertical dimension of conflict and he is neutral regarding the horizontal dimension. As a result, a public media controlled by the politician has little incentive to report the true signal about c^2. However, if the game is repeated and the general public can reelect the politician, it is possible that he strictly prefers to use public media to report about c^2. Moreover, the general public will be more willing to reelect a politician that reports the true signal about c^2. Nevertheless, public media will have an ambiguous effect on aggregate welfare, making media capture by the politician easier at the cost of making media capture by the elite more complicated.

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[68]"Integrated" is defined as a company that gathers information about both policy dimensions. A "non-integrated" company is one that only reports about one policy dimension.

There are at least three more specific open issues with respect media industry organization: the distribution of official government advertising; exclusive interviews versus general press conferences; and, the extension of the right of journalists to protect their sources. With respect to the first issue, politicians might be tempted to use government paid advertising to influence the media. A simple way of alleviating this problem could be a regulation that allocates government advertising to media companies according their fraction of readership and/or viewers.[69] Second, sometimes politicians give exclusive interviews only to journalists who favor their agenda, thereby distorting the information received by the public. A simple way to solve this problem is to promote general press conferences in which media companies with diverse ideological leanings can participate and ask questions.[70] Third, journalists tend to protect the anonymity of their sources, while government agencies always find a good reason to ask journalists to disclose them. An optimal regulation should define the extension of the journalists' right to protect the anonymity of their sources by balancing between the potential value of the information for the government against the value of journalists' reputation.

Finally, in future works, it would be really interesting to integrate these specific and more focus regulations with the broader regulations considered in this paper.

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[69]To implement this policy, might not be as simple as it looks. It is not easy to find objectives ways of measuring readership or audience (apparently this is a less pressing problem for television than for newspapers). Self-report measures lack credibility. For example, the Argentine newspaper 'Ambito Financiero' claims that the most important national newspapers (Clarin and LaNacion) over-report their readership when the key issue is government advertising, but they sub-report their readership when the issue is anti-trust laws.

[70]Allegedly a complete ban on exclusive interviews would violate freedom of speech. However, it seems possible to have an informal norm that promotes general press conferences as there is an informal norm that supports candidates' debates in the United States.

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Figures

## Figure 3.1: Equilibrium with Endogenous Entry
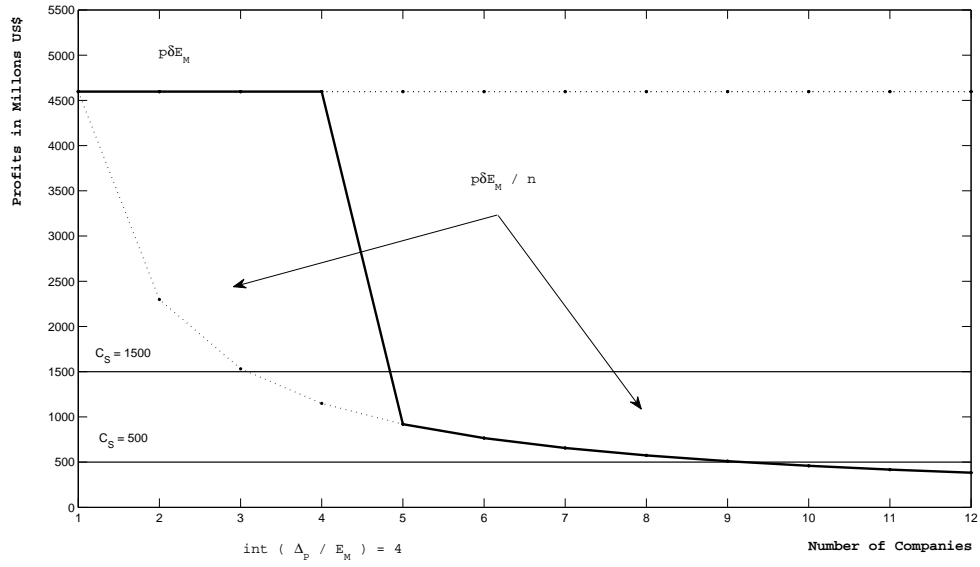
Figure 3.2.a: Equilibrium in Market 1 with Endogenous Entry (Diseconomies of Scope)
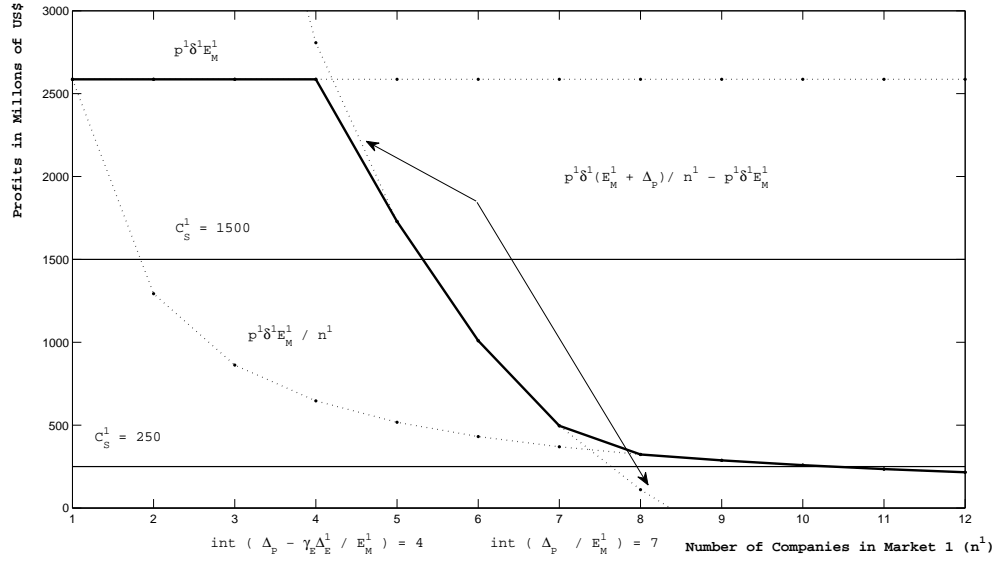
Figure 3.2.b: Equilibrium in Market 2 with Endogenous Entry (Diseconomies of Scope)

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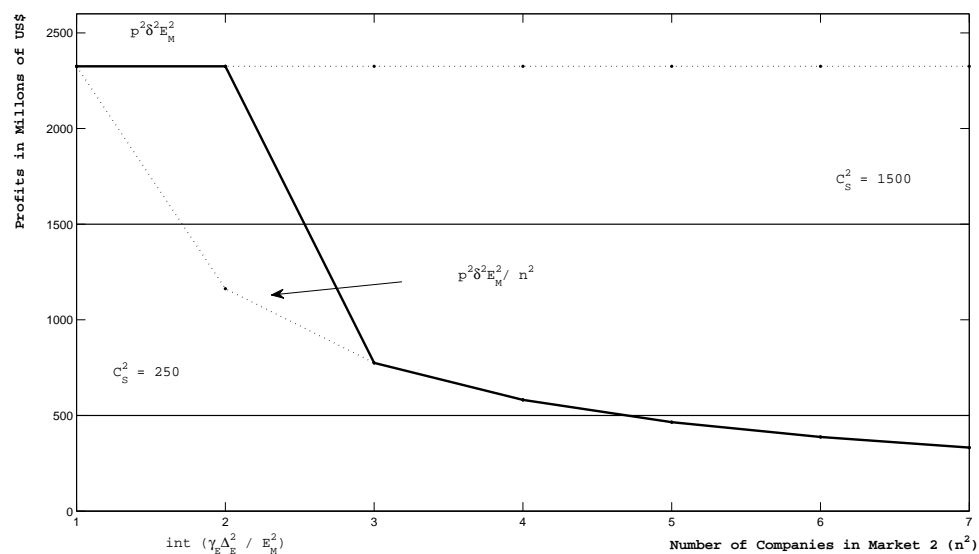
Figure 3.3: Equilibrium with Endogenous Entry (Economies of Scope)
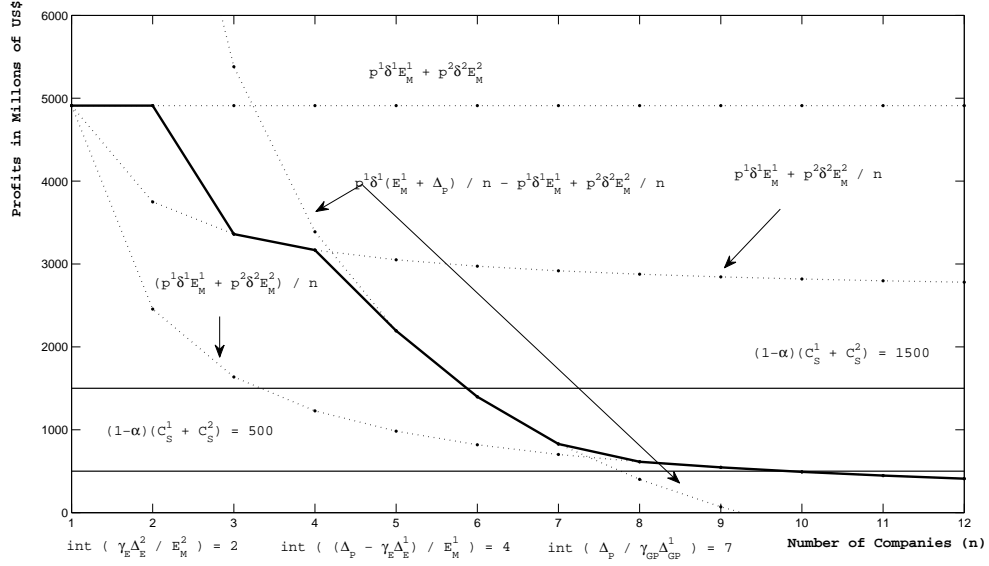
Appendix 3.1: Baseline Model

In this appendix I present the proofs of the propositions for the baseline model (sections 3.3, 3.4 and 3.5).

Appendix 3.1.1: Proof of Proposition 3.1

In order to prove proposition 3.1, it is useful to begin proving the following lemma.

Lemma 3.1: *Let $r = c_L$ if $r_i = c_L$ for at least one $i = 1, ..., n$ and $r = \emptyset$ if $r_i = \emptyset$ for i. Let α_c denotes the probability that the media is captured and let $\mu(r)$ denotes the probability that $c = c_L$ conditional on observing the report r. Then, the menu of contracts offered by the public are (g_L, T_L), (g_H, T_H), where:*

$$u'(g_L) = (1 + \lambda) c_L,$$

$$u'(g_H) = (1 + \lambda) \left[\frac{c_H - \mu(r) c_L}{1 - \mu(r)} \right] \text{ for } \mu(r) < 1, \ g_H = 0 \text{ for } \mu(r) = 1,$$

$$T_L = g_H (c_H - c_L) + c_L g_L, \ T_H = c_H g_H,$$

$$\mu(r) = \Pr(c = c_L | r = r) = \begin{cases} \frac{\alpha_c \delta p + (1-\delta) p}{\alpha_c \delta p + (1-\delta) p + (1-p)} & \text{if } r = \emptyset, \\ 1 & \text{if } r = c_L. \end{cases}$$

Proof: Let α_c denotes the probability that the media is captured and let $\mu(r)$ denotes the probability that $c = c_L$ conditional on observing the report r. Then, from a simple application of the Bayes' rule $\mu(r = \emptyset) = \Pr(c = c_L | r = \emptyset) = \frac{\alpha_c \delta p + (1-\delta) p}{\alpha_c \delta p + (1-\delta) p + (1-p)}$ and $\mu(r = c_L) = \Pr(c = c_L | r = c_L) = 1$. Then, due to the revelation principle the problem of the general public for each possible report is:

$$\max_{\{g_L, T_L, g_H, T_H\}} \{\mu(r) [u(g_L) - (1 + \lambda) T_L] + [1 - \mu(r)] [u(g_H) - (1 + \lambda) T_H]\},$$

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subject to participation constraints $T_L - c_L g_L \geq 0$ and $T_H - c_H g_H \geq 0$, and the incentive compatibility constraints $T_L - c_L g_L \geq T_H - c_L g_H$, and $T_H - c_H g_H \geq T_L - c_H g_L$. Bribes paid by the politician do not appear in the constraints because at this time there have already been paid and, hence, there are just a sunk cost. This is an standard principle-agent problem (see Laffont 2000), whose unique solution is $u'(g_L) = (1 + \lambda) c_L$, $u'(g_H) = (1 + \lambda) \left[\frac{c_H - \mu(r) c_L}{1 - \mu(r)} \right]$ for $\mu(r) < 1$, $g_H = 0$ for $\mu(r) = 1$, $T_L = g_H(c_H - c_L) + c_L g_L$, and $T_H = c_H g_H$. Note that since $\lim_{g \to 0} u'(g) = \infty$, $\lim_{g \to \infty} u'(g) = 0$, and $u''(0) < 0$ there is a unique (g_L, g_H) that satisfies the first two expressions. ∎

Lemma 3.2: *Let* $\Delta_P = g_H^{cap}(c_H - c_L)$, *where* $u'(g_L) = c_L(1 + \lambda)$, *and* $u'(g_H^{cap}) = \left(\frac{c_H - pc_L}{1 - p} \right)(1 + \lambda)$. *Assume that* n *companies have entered into the media market. Then, the media industry is free (indeed* $r_i = s$ *for all* i*) if* $n\bar{E}_M > \Delta_P$, *while it is captured by the politician (* $r_i = \emptyset$ *for all* i*) if* $n\bar{E}_M \leq \Delta_P$.

Proof: When $s = \emptyset$, since the media cannot fabricate news, $r = \emptyset$. Thus, the only relevant node is when $s = c_L$. Suppose that the politician does not bribe the media. Then, whenever $s = c_L$, the media reports $r = c_L$ and, from lemma 3.1, the contract offered by general public is (g_L, T_L), where $u'(g_L) = (1 + \lambda) c_L$ and $T_L = c_L g_L$. Thus, the politicians gets a payoff equal to 0. On the contrary, suppose that the politician decides to capture the media. Then, in equilibrium $\alpha_c = 1$. Hence, $\mu(r = \emptyset) = p$ and, from lemma 3.1, the menu of contracts offered by the general public is (g_L, T_L) and (g_H^{cap}, T_H), where $u'(g_L) = (1 + \lambda) c_L$, $u'(g_H^{cap}) = (1 + \lambda) \left(\frac{c_H - pc_L}{1 - p} \right)$, $T_L = g_H^{cap}(c_H - c_L) + c_L g_L$, $T_H = c_H g_H^{cap}$. Thus, when $s = c_L$ the politician gets a payoff of $g_H^{cap}(c_H - c_L)$, while if he had not captured the media he would have obtained a payoff equal to 0. As a consequence, $\Delta_P = g_H^{cap}(c_H - c_L)$ is the maximum bribe that the politician is willing to offer in order to change the report from $r = c_L$ to $r = \emptyset$ when $s = c_L$.

The total amount that the politician must pay in bribes if he wants to induce a change

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in reports from $r = c_L$ to $r = \emptyset$ is $n \bar{E}_M$. In order to see this, suppose that all media companies are reporting $r_i = \emptyset$. Then, if only one company decides to deviate it gets $\bar{E}_M$ and the report changes from $r = \emptyset$ to $r = c_L$. Thus, if the politician wants $r = \emptyset$, he must offer $\bar{E}_M$ to each company. Since there are n companies, he must pay $n \bar{E}_M$.

If $n \bar{E}_M > \Delta_P$, the amount that the politician must pay is higher than the maximum that he is willing to offer. Hence, the best strategy for the politician is to offer zero bribes to all media companies. Then, the media will be free and all companies will report $r_i = c_L$. Conversely, if $n \bar{E}_M \leq \Delta_P$, the politician will offer $B_i(\emptyset) = \bar{E}_M$ to each media company and the media will be captured by the politician. Note that $B_i(\emptyset) \geq \bar{E}_M$ for all i also induces $r_i = c_L$ for all i, but a bribe in excess of $\bar{E}_M$ is a total waste from the point of view of the politician. ∎

Lemma 3.3: *Suppose that assumptions 3.1 and 3.2 hold. Then, free entry leads to a free media industry if and only if $\bar{C}_S \leq \frac{\delta p \bar{E}_M}{\bar{n}+1}$, where $\bar{n} = int\left(\frac{\Delta_P}{\bar{E}_M}\right)$ Moreover, if $\bar{C}_S > \frac{\delta p \bar{E}_M}{\bar{n}+1}$, the equilibrium number of media companies is $\bar{n}$, while if $\bar{C}_S \leq \frac{\delta p \bar{E}_M}{\bar{n}+1}$, it is $\hat{n} = int\left(\frac{p \delta \bar{E}_M}{\bar{C}_S}\right)$.*

Proof: From lemma 3.2, if $n \leq \bar{n}$, the politician captures the media, while if $n \geq \bar{n}+1$, the politician cannot capture the media. Thus, the expected profit of a company is given by:

$$
\mathbf{E}\left[u_{M,i}\right] = \begin{cases} p \delta \bar{E}_M - C_S & \text{if } n \leq \bar{n}, \\ \frac{p \delta \bar{E}_M}{n} - C_S & \text{if } n \geq \bar{n}+1. \end{cases}
$$

Note that $\mathbf{E}\left[u_{M,i}\right]$ is a decreasing function of n. Under free entry a company will enter into the market whenever $\mathbf{E}\left[u_{M,i}\right] \geq 0$. Therefore, if $\frac{p \delta \bar{E}_M}{\bar{n}+1} \geq C_S$ then at least $\bar{n}+1$ companies will enter and, hence, the politician will not capture the media. Indeed, the equilibrium number of companies will be $\hat{n}$. In order to prove this note that $\frac{p \delta \bar{E}_M}{\hat{n}} \geq C_S$, but $\frac{p \delta \bar{E}_M}{\hat{n}+1} < C_S$. On the other hand, if $\frac{p \delta \bar{E}_M}{\bar{n}+1} < C_S$, at most $\bar{n}$ companies will enter and,

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hence, the politician will capture the media. Indeed the equilibrium number of firms will be $\bar{n}$. In order to prove this note that when there are $\bar{n}$ companies each gets $p\delta\bar{E}_M - C_S \geq 0$, while when there are more than $\bar{n}$, each company gets a negative expected profit. ∎

The proof of proposition 3.1 is immediate from lemmas 3.1, 3.2, and 3.3. ∎

Appendix 3.1.2: Proof of Proposition 3.2

In order to prove proposition 3.2, first I need to prove the following lemma. Indeed, the lemma will also be useful to prove propositions 3.3, 3.4, and 3.5.

Lemma 3.4: *The expected benefit under a free media (relative a captured media) ΔB is given by:*

$$\Delta B = p\lambda\left(c_H - c_L\right)\left[g_H^{cap} - (1-\delta)\,g_H^{free}\right]$$
$$+ (1-p)\left[u\left(g_H^{free}\right) - (1+\lambda)\,c_H g_H^{free} - u\left(g_H^{cap}\right) + (1+\lambda)\,c_H g_H^{cap}\right].$$

Moreover, if $-\frac{g u''(g)}{u'(g)} > \frac{(1-\delta)p(c_H - c_L)}{(1-\delta p)c_H - (1-\delta)pc_L}$, $\Delta B \geq 0$ (with strict inequality if $\delta > 0$) and ΔB is increasing in δ.

Proof: When the media is free, $\mu(r) = \Pr(c = c_L | r = r) = \frac{(1-\delta)p}{(1-\delta)p + (1-p)}$ if $r = \emptyset$ and $\mu(r) = 1$ if $r = c_L$. Then, from lemma 3.1, the menu of contract offered by the general public is (g_L, T_L) and (g_H, T_H), where $u'(g_L) = (1+\lambda)c_L$, $u'\left(g_H^{free}\right) = (1+\lambda)\left[\frac{(1-\delta p)c_H - (1-\delta)pc_L}{(1-p)}\right]$, $T_L = g_H^{free}(c_H - c_L) + c_L g_L$, $T_H = c_H g_H^{free}$. Therefore, the expected aggregate benefit under a free media industry is given by:

$$B_F = p\delta\left[u(g_L) - (1+\lambda)c_L g_L\right]$$
$$+ p(1-\delta)\left[u(g_L) - (1+\lambda)c_L g_L - \lambda g_H^{free}(c_H - c_L)\right]$$
$$+ (1-p)\left[u\left(g_H^{free}\right) - (1+\lambda)c_H g_H^{free}\right].$$

When the media is captured, $\mu(r) = \Pr(c = c_L | r = r) = p$ if $r = \emptyset$, and $\mu(r) = 1$ if $r = c_L$. Then, from lemma 3.1, the menu of contract offered by the general public is (g_L, T_L) and (g_H, T_H), where $u'(g_L) = (1+\lambda)c_L$, $u'(g_H^{cap}) = (1+\lambda)\left(\frac{c_H - pc_L}{1-p}\right)$, $T_L = g_H^{cap}(c_H - c_L) + c_L g_L$, $T_H = c_H g_H^{cap}$. Therefore, the expected aggregate benefit under a captured media industry is given by:

$$B_C = p\delta\left[u(g_L) - (1+\lambda)c_L g_L - \lambda g_H^{cap}(c_H - c_L)\right]$$
$$+ p(1-\delta)\left[u(g_L) - (1+\lambda)c_L g_L - \lambda g_H^{cap}(c_H - c_L)\right]$$
$$+ (1-p)\left[u(g_H^{cap}) - (1+\lambda)c_H g_H^{cap}\right].$$

Therefore, the expected benefit of a free media (relative to a captured media) is:

$$\Delta B = (B_F - B_C)$$
$$= p\lambda(c_H - c_L)\left[g_H^{cap} - (1-\delta)g_H^{free}\right]$$
$$+ (1-p)\left[u\left(g_H^{free}\right) - (1+\lambda)c_H g_H^{free} - u\left(g_H^{cap}\right) + (1+\lambda)c_H g_H^{cap}\right]$$

Note that $\Delta B(\delta = 0) = 0$ because $\delta = 0$ implies $g_H^{free} = g_H^{cap}$. Moreover

$$\frac{\partial(\Delta B)}{\partial\delta} = p\lambda(c_H - c_L)\left[g_H^{free} - (1-\delta)\frac{\partial g_H^{free}}{\partial\delta}\right] + (1-p)\left[u'\left(g_H^{free}\right) - (1+\lambda)c_H\right]\frac{\partial g_H^{free}}{\partial\delta}.$$

Since $\frac{\partial g_H^{free}}{\partial\delta} = \frac{-(1+\lambda)p(c_H - c_L)}{(1-p)u''\left(g_H^{free}\right)} > 0$ and $u'\left(g_H^{free}\right) > (1+\lambda)c_H$, a sufficient condition for $\frac{\partial(\Delta B)}{\partial\delta} > 0$ is $g_H^{free} > (1-\delta)\frac{\partial g_H^{free}}{\partial\delta}$, or, which is equivalent, $-\frac{g_H^{free}u''\left(g_H^{free}\right)}{u'\left(g_H^{free}\right)} > \frac{(1-\delta)p(c_H - c_L)}{(1-\delta p)c_H - (1-\delta)pc_L}$. ∎

Proof of proposition 3.2: Assume that $\Delta_P \geq \bar{E}_M$. Then, from proposition 3.1, for $n = 1$ the media industry is captured by the politician. Suppose that $\bar{C}_S > \frac{\delta p\bar{E}_M}{\bar{n}+1}$.

Then, from proposition 3.1, free entry leads to a captured media industry. There are two alternative constitutional rules. First, the constitution can try to restrict entry. Since free entry is not enough to induce a free media industry, any restriction to entry will also induce a captured industry. Thus, the best possible restriction is to allow only one firm. Under such rule, by lemma 4 the expected welfare is $W(1) = B_C - \bar{C}_S$. Second, the constitution can try to induce more entry. Any extra entry on top of the number of firms under free entry that is not enough to make the media industry free is useless. The reason is that, any new firm increases the cost of the industry in $\bar{C}_S$, but it does not make any difference in the voter's behavior. Thus, any subsidy to entry must be generous enough to transform the media industry into a free one. Moreover, there is no good reason to induce more entry that the strictly necessary to make the industry free. Thus, the best possible option is to set a subsidy to entry S such that the number of firms that enter the market is just enough to have a free media industry. Formally, the optimal S is given by $S = \bar{C}_S - \frac{p\delta\bar{E}_M}{\bar{n}+1}$, which induces $\bar{n}+1$ media companies. Therefore, by lemma 4, expected welfare is $W(\bar{n}+1) = B_F - (\bar{n}+1)(\bar{C}_S + \lambda S)$. Therefore

$$W(\bar{n}+1) \geq W(1) \Leftrightarrow \frac{\delta p \bar{E}_M}{\bar{n}+1} < \bar{C}_S \leq \frac{\Delta B + \lambda p \delta \bar{E}_M}{(1+\lambda)\bar{n}+\lambda}$$

Note that $\Delta B \geq p\delta\bar{E}_M \frac{\bar{n}}{\bar{n}+1}$ assures that $\frac{\Delta B + \lambda p \delta \bar{E}_M}{(1+\lambda)\bar{n}+\lambda} \geq \frac{\delta p \bar{E}_M}{\bar{n}+1}$, which completes the proof of parts 1.a and 1.b. of the proposition.

Suppose that $\bar{C}_S \leq \frac{\delta p \bar{E}_M}{\bar{n}+1}$. Then, from proposition 3.1, free entry leads to a free media industry. And again, there are two alternative constitutional rules. First, the constitution can try to avoid the excessive number of firms without changing the nature of the industry. That is, the constitution can promote a moderate entry limitation that just keeps the media industry free. Formally, the constitution only allows $\bar{n}+1$ media companies, which implies, by lemma 3.4, that the expected welfare is $W(\bar{n}+1) = B_F - (\bar{n}+1)\bar{C}_S$. Note

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that subsidies are not necessary in this case because under free entry there are more media companies than $\bar{n} + 1$, the number necessary to have a free media industry. Second, the constitution can try a more radical approach and extend the limitation below $\bar{n} + 1$. In such a case, the media will be captured by the politician, which implies that it is better to go all the way down till the industry becomes a monopoly. Formally, the constitution only allows one firm and the expected aggregate welfare is $W(1) = B_C - \bar{C}_S$. Comparing $W(\bar{n} + 1)$ and $W(1)$, it is easy to prove that $\Delta B \geq p\delta \bar{E}_M \frac{\bar{n}}{\bar{n}+1}$ implies that it is always the case that $W(\bar{n} + 1) \geq W(1)$, which completes the proof of part 1.c of the proposition.

Suppose that $\Delta_P < \bar{E}_M$. Then, from proposition 1, for $n = 1$ the media industry is free. Then, the optimal media industry is a monopoly. ∎

Appendix 3.1.3: Proof of Proposition 3.3

Let's begin studying a constitutional environment in which entry restrictions are not allowed. From proposition 3.1, if $\bar{C}_S \leq \frac{p\delta \bar{E}_M}{\bar{n}+1}$, then free entry will lead to a free media industry with $\hat{n} = int\left(\frac{p\delta \bar{E}_M}{\bar{C}_S}\right)$ companies, while if $\bar{C}_S > \frac{p\delta \bar{E}_M}{\bar{n}+1}$, then free entry will lead to a captured media industry with $\bar{n}$ companies. Since entry restriction is not an option, when $\bar{C}_S \leq \frac{p\delta \bar{E}_M}{\bar{n}+1}$, there will be free press. On the other hand, when $\bar{C}_S > \frac{p\delta \bar{E}_M}{\bar{n}+1}$, the constitution might consider a subsidy to entry that makes the media free. Thus, the welfare comparison at the constitutional stage is as follows. Under no subsidy, the expected aggregate welfare is $W(\bar{n}) = B_C - \bar{n}\bar{C}_S$, while under a subsidy S, the expected aggregate welfare is $W(\bar{n} + 1) = B_F - (\bar{n} + 1)(\bar{C}_S + \lambda S)$. The optimal subsidy is the lowest possible S that induces $\bar{n} + 1$ companies to enter into the market. That is, $S = \bar{C}_S - \frac{p\delta \bar{E}_M}{\bar{n}+1}$, which implies that $W(\bar{n}) = B_F - (\bar{n} + 1)(1 + \lambda)\bar{C}_S + \lambda p\delta \bar{E}_M$. Thus,

$$W(\bar{n} + 1) \geq W(\bar{n}) \Leftrightarrow \bar{C}_S \leq \frac{\Delta B + \lambda p\delta \bar{E}_M}{1 + \lambda + \lambda \bar{n}}.$$

This completes the proof of the first part of proposition 3.3.

Next, consider the opposite constitutional environment, in which entry promoting is not allowed. Then, the constitution has two possible alternatives: either to restrict entry to only one firm and induce the best possible captured media structure, or to restrict entry to $\bar{n}+1$ and try to induce the best possible free media structure. However, the last option would be effective only if free entry would lead to the entry of at least $\bar{n}+1$ firms, i.e., when $\bar{C}_S \leq \frac{p\delta\bar{E}_M}{\bar{n}+1}$. When only one company is allowed to operate, expected aggregate welfare is $W(1) = B_C - \bar{C}_S$. When $\bar{C}_S \leq \frac{p\delta\bar{E}_M}{\bar{n}+1}$ and entry is restricted to $\bar{n}+1$, expected aggregate welfare is $W(\bar{n}+1) = B_F - (\bar{n}+1)\bar{C}_S$. Thus,

$$W(\bar{n}+1) \geq W(1) \Leftrightarrow \bar{C}_S \leq \frac{\Delta B}{\bar{n}}.$$

Note that $\frac{p\delta\bar{E}_M}{\bar{n}+1} \leq \frac{\Delta B}{\bar{n}}$, which completes the proof of the second part of proposition 3.3. ∎

Appendix 3.1.4: Proof of Proposition 3.4

Since a monopoly is always captured by the politician, the expected aggregate welfare under monopoly is $W(1) = B_C - \bar{C}_S$. From proposition 3.1, free entry leads to a free media industry if and only if $\bar{C}_S \leq \frac{p\delta\bar{E}_M}{\bar{n}+1}$. Moreover, when $\bar{C}_S \leq \frac{p\delta\bar{E}_M}{\bar{n}+1}$, the equilibrium number of firms $\hat{n} = int\left(\frac{p\delta\bar{E}_M}{\bar{C}_S}\right)$, while when $\bar{C}_S > \frac{p\delta\bar{E}_M}{\bar{n}+1}$, the equilibrium number of firms is $\bar{n}$. Thus, the expected aggregate welfare under free entry is $W(\hat{n}) = B_F - \hat{n}\bar{C}_S$ when free entry leads to a free media industry and it is $W(\bar{n}) = B_C - \bar{n}\bar{C}_S$ when free entry leads to a captured media industry. From simple inspection $W(1) > W(\bar{n})$. Thus, when $\bar{C}_S > \frac{p\delta\bar{E}_M}{\bar{n}+1}$, monopoly dominates free entry. When $\bar{C}_S \leq \frac{p\delta\bar{E}_M}{\bar{n}+1}$ we have that $W(1) > W(\hat{n})$ if and only if $\bar{C}_S > \frac{\Delta B_F}{(\hat{n}-1)}$. Therefore, monopoly dominates free entry if and only if $\bar{C}_S > \min\left\{\frac{p\delta\bar{E}_M}{\bar{n}+1}, \frac{\Delta B_F}{(\hat{n}-1)}\right\}$. ∎

Appendix 3.1.5: Proof of Proposition 3.5

From lemmas 3.1 and 3.2 (which do not depend on assumptions 3.1 and 3.2), it is always the case that the media industry is free if $n\bar{E}_M > \Delta_P$, while it is captured by the politician if $n\bar{E}_M \leq \Delta_P$. A simple variation of lemma 3 implies that under free entry the media industry is free if and only if $\bar{C}_S \leq \frac{n_{\min}p\delta\bar{E}_M}{\bar{n}+1}$. In order to prove this, note that under free entry the equilibrium number of firms is implicitly given by $p\delta\bar{E}_M \geq nC_S(n)$ and $p\delta\bar{E}_M < (n+1)C_S(n+1)$. Due to assumption 1bis $nC_S(n)$ is decreasing in n for $n \leq n_{\min}$ and increasing for $n \geq n_{\min}$. Due to assumption 2bis $p\delta\bar{E}_M \geq n_{\min}C_S(n_{\min}) = \bar{C}_S$ and $n_{\min}$ is finite. Thus, the number of media firms under free entry must be greater than $n_{\min}$. Specifically, the number of media firms under free entry is $\tilde{n} = int\left(\frac{n_{\min}p\delta\bar{E}_M}{\bar{C}_S}\right)$, which implies, due to lemmas 1 and 2, that the media industry is free if and only if $\tilde{n} > \bar{n}$ or, which is equivalent, if and only if $\bar{C}_S \leq \frac{n_{\min}p\delta\bar{E}_M}{\bar{n}+1}$. The rest of the proof follows analogous steps to the proof of proposition 3.2.

Assume that $\bar{n} \geq n_{\min}$. Then, a natural oligopoly with $n \leq n_{\min}$ companies is always captured by the politicians. Suppose that $\bar{C}_S > \frac{n_{\min}p\delta\bar{E}_M}{\bar{n}+1}$. Then, free entry leads to a captured media industry. There are two alternative constitutional rules. First, the constitution can try to restrict entry. Since free entry is not enough to induce a free media industry, any restriction to entry will also induce a captured industry. Thus, the best possible restriction is to allow $n_{\min}$ firms. Under such rule, the expected aggregate welfare is $W(n_{\min}) = B_C - \bar{C}_S$. Second, the constitution can try to induce more entry. Any extra entry on top of the number of firms under free entry that is not enough to make the media industry free is useless. The reason is that, any new firm increases the cost of the industry in $\frac{\bar{C}_S}{n_{\min}}$, but it does not make any difference in the voter's behavior. Thus, any subsidy to entry must be generous enough to transform the media industry into a free one. Moreover, there is no good reason to induce more entry that the strictly necessary

to make the industry free. Thus, the best possible option is to set a subsidy to entry S such that the number of firms that enter the market is just enough to have a free media industry. Formally, the optimal S is given by $S = \frac{\bar{C}_S}{n_{\min}} - \frac{p\delta\bar{E}_M}{\bar{n}+1}$, which induces $\bar{n}+1$ media companies. Therefore, expected welfare is $W(\bar{n}+1) = B_F - (\bar{n}+1)(1+\lambda)\frac{\bar{C}_S}{n_{\min}} + \lambda p\delta\bar{E}_M$. Thus, $W(1) > W(\bar{n}+1)$ if $\bar{C}_S > \frac{n_{\min}(\Delta B + \lambda p\delta\bar{E}_M)}{(1+\lambda)\bar{n}+1+\lambda-n_{\min}}$ and $W(1) \leq W(\bar{n}+1)$ if $\frac{n_{\min}p\delta\bar{E}_M}{\bar{n}+1} < \bar{C}_S \leq \frac{n_{\min}(\Delta B + \lambda p\delta\bar{E}_M)}{(1+\lambda)\bar{n}+1+\lambda-n_{\min}}$, which completes the proof of parts 1.a and 1.b of the proposition. Note that $\Delta B > \left(\frac{\bar{n}+1-n_{\min}}{\bar{n}+1}\right)p\delta\bar{E}_M$ assures that these two regions are not empty.

Suppose that $\bar{C}_S \leq \frac{n_{\min}p\delta\bar{E}_M}{\bar{n}+1}$. Then, free entry leads to a free media industry. And again, there are two alternative constitutional rules. First, the constitution can try to avoid the excessive number of firms without changing the nature of the industry. That is, the constitution can promote a moderate entry limitation that just keeps the media industry free. Formally, the constitution only allows $\bar{n}+1$ media companies, which implies that the expected aggregate welfare is $W(\bar{n}+1) = B_F - (\bar{n}+1)\frac{\bar{C}_S}{n_{\min}}$. Second, the constitution can try a more radical approach and extend the limitation below $\bar{n}+1$. In such a case, the media will be captured by the politician, which implies that it is better to go all the way down till $n_{\min}$ (assumption 2bis assures that with $n_{\min}$ the industry is captured). Formally, the constitution only allows $n_{\min}$ firms and the expected aggregate welfare is $W(n_{\min}) = B_C - \bar{C}_S$. Since $\Delta B > \left(\frac{\bar{n}+1-n_{\min}}{\bar{n}+1}\right)p\delta\bar{E}_M$ and $\frac{n_{\min}p\delta\bar{E}_M}{\bar{n}+1} \geq \bar{C}_S$, it is always the case that $W(\bar{n}+1) > W(n_{\min})$, which completes the proof of part 1.c of proposition 3.5.

Assume that $\bar{n} < n_{\min}$. Then an oligopoly with $n \leq n_{\min}$ induces a free media industry. Therefore, the optimal media industry is an oligopoly with $n_{\min}$ companies. ∎

PART III

COMMITMENT AND POLITICAL INSTITUTIONS

Chapter 4: Making Rules Credible: Divided Government and Political Budget Cycles[71]

Abstract

Political budget cycles (PBCs) can result from the credibility problems office-motivated incumbents face under asymmetric information, due to the temptation to manipulate fiscal policy to increase their electoral chances. We analyze the role of rules that limit public debt, because borrowing is a necessary condition for aggregate PBCs. Since the legislature must typically authorize new debt, divided government can make these fiscal rules credible. Commitment is undermined by either unified government or imperfect compliance with the budget law, which can help explain why PBCs are stronger in developing countries and in new democracies. When divided government affects efficiency, voters must trade off electoral distortions and government competence.

4.1 Introduction

Political budget cycles (PBCs) are controversial. Early work by Tufte (1978) and Frey and Schneider (1978a,b) was motivated by the experience of OECD countries, but recently some noteworthy empirical work contends they are only significant in developing countries (e.g., Shi and Svensson 2006) or in new democracies (e.g., Brender and Drazen 2005). In our view, a shortcoming of these works is that they are based on models with a single policy maker and hence they implicitly assume that the executive has full discretion over fiscal policy. We provide a different perspective. Motivated by Schuknecht (1996), who

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suggests that stronger PBCs in developing countries are due to weaker checks and balances, we explore the role of the legislature in the budget process.

In the rational choice approach to electoral cycles, asymmetric information allows the incumbent to exploit budgetary discretion for electoral purposes. When the incumbent cannot credibly commit not to use this power, Lohmann (1998a) shows how this leads to stimulative monetary policy in the framework of political business cycles, while Shi and Svensson (2006) and Alt and Lassen (2006a) show how the use of debt for electoral purposes causes aggregate PBCs.

The solution to the credibility problems caused by time consistency has often been cast in terms of the "rules versus discretion" debate (Kydland and Prescott 1977). For fiscal policy, von Hagen (2006) characterizes ex ante fiscal rules as numerical constraints on certain budgetary aggregates, like ceilings on borrowing. He concludes that the empirical evidence on ex ante rules on debt and deficits for US states shows they are ineffective, because they can be circumvented. Besides requiring rules to be clear-cut and comprehensive, Strauch and von Hagen (2001) stress that enforcement of rules should rely on independent agents and restraints should be hard to evade or amend.

This paper focuses on making rules credible through institutional arrangements that limit discretion in changing rules. Since the budget process in constitutional democracies requires the participation of the legislature, we specifically consider a budget rule that prohibits the executive from issuing new debt –the channel for aggregate PBCs in Shi and Svensson (2006) and Alt and Lassen (2006a)– unless authorized by the legislature. Once the assumption of a single fiscal authority is dropped, the possibility of PBCs will depend on the leeway that the legislature allows the executive in pursuing electoral destabilization (Saporiti and Streb 2008).

Drawing on the insight of Alesina and Rosenthal (1995) about the moderating influence

of an opposition legislature in presidential systems with partisan political parties, our first contribution is to show that divided government can solve the credibility problem behind electoral cycles in fiscal policy in an opportunistic framework with office-motivated parties, turning the budget rule into a credible commitment.[72] We rely on the Romer and Rosenthal (1978, 1979) agenda-setter model, which allows one to treat divided government as creating a legislative veto player. This insight applies not only to divided government in presidential systems, but also to coalition governments in parliamentary systems where the veto players are inside the governing coalition (Tsebelis 2002).

Our second contribution is to model how effective checks and balances depend endogenously on the people's vote, who may chose unified rather than divided government. If divided government reduces government efficiency, voters face a trade-off between what Umeno and Bugarin (2008) call the "control" and "selection" motives: voters can control the moral hazard problem that leads to PBCs, electing a divided government so as to ensure the credibility of budget rules, at the cost of introducing an adverse selection effect, namely, forcing the most competent party to share power with less competent parties. Depending on candidates' expected competence differential, voters can either lean towards unified government to avoid the adverse selection costs, or towards divided government to avoid the distortionary effects of PBCs. However, control is ineffective if compliance with the budget law already is weak.

The rest of the paper is organized as follows. Section 4.2 describes the setup. Section 4.3 computes the equilibria when divided government has no costs for voters, and when it induces an efficiency loss. Section 4.4 explores the empirical implications of the model, which allows one to formalize the Schuknecht (1996) conjecture on the moderating role of

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[72]While our focus is on the credibility of rules, Lohmann (1998b) and Keefer and Stasavage (2003) make a related point on the credibility of delegation: an independent central bank, the Rogoff (1985) solution to the time consistency problem of monetary policy, is not credible unless there are political veto players that can block executive action.

checks and balances. Section 4.5 concludes.

4.2 The Model

We develop a PBC model with two office seeking parties. Following Shi and Svensson (2006) and Alt and Lassen (2006a,b), debt financing is distortionary, so expansionary fiscal policies are reversed after elections. We first assume that government competence depends on the leader of the executive branch, either the president in a presidential system or the prime minister in a parliamentary one. We then allow for costs of divided government, especially as Election Day nears, which we use to depict the case of an opposition party controlling the national legislature in a presidential system or of a coalition government in a parliamentary system.

4.2.1 Citizens

Consider an infinite-horizon society. Let t denote time, where odd positive integers are electoral periods and even positive integers are non-electoral periods.

The society comprises a continuum of individuals, labeled by $i \in [0, 1]$, that play roles both as consumers and as citizens. Income $y_{i,t}$ is exogenous, with $y_{i,t} = y$ for all consumers. By the consumer's budget constraint, consumption c_t equals disposable income, namely, y net of the tax burden p_t:

$$c_t = y - p_t. \tag{56}$$

The citizens share the same preferences for a public good g_t and a private good c_t, with a quasi-linear per-period payoff. Voters differ only in their ideological bias, an idiosyncratic

preference shock for each party. The per period payoff of citizen i is given by[73]

$$u_i(c_t,\, g_t) = c_t + \alpha \ln(g_t) + \sigma_{it}, \tag{57}$$

where $\alpha \in (0,1)$, and σ_{it} is the idiosyncratic ideological shock of citizen i, symmetrically distributed around zero and independent over time. Let $M = 1/2$ be the median citizen, with $\sigma_{Mt} = 0$, while the citizens to the left have an ideological preference for party B ($\sigma_{it} < 0$) and those to the right for party A ($\sigma_{it} > 0$).

The intertemporal utility function of citizen i has the standard form

$$U_i = \mathbf{E}_t \sum_{j=t}^{\infty} \beta^{(j-t)} u_i(c_j,\, g_j), \tag{58}$$

where $\beta \in (0,1)$ is the discount factor and $\mathbf{E}_t$ is the expected value operator at time t.

4.2.2 Government Performance

Unlike Rogoff (1990) and the subsequent literature, we distinguish strictly between the production technology and the budget items, to avoid confounding the *provision* of public goods g_t with the *expenditure* on public goods γ_t, which is what the government in fact decides in the budget.[74] Each period t, the government is subject to the budget constraint

$$\gamma_t = \pi_t + d_t - (1 + r(d_{t-1}))d_{t-1}, \tag{59}$$

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[73]Though we could employ a general strictly concave function, this specification generates a closed form solution for the benchmark model, and simplifies the evaluation of expectations.

[74]In Rogoff (1990) there is no debt, but the incumbent can reduce capital expenditures, not visible to voters at election time, to boost consumption expenditures and reduce taxes. Though there is no explicit restriction on how shocks affect the different components of the budget, there is no distinction between the tax burden and tax collection, and the expenditures on public consumption goods are equal to their provision. Hence, in the final analysis the implicit restriction is that competence shocks determine how government expenditures are transformed into the provision of capital goods.

where γ_t denotes budget expenditures on public goods, π_t are tax revenues or receipts, d_t is public debt and $r(d_{t-1})$ is the interest rate on debt, where as in Shi and Svensson (2006) the interest rate is increasing in the level of debt: $r(0) > 0$, $r\prime(0) \geq 0$, and $r\prime\prime(0) > 0$.

Public resources γ_t are transformed into the public good g_t according to the competence θ_t of the government. Similarly, the competence of the government affects how the tax burden p_t translates into government tax receipts π_t, reflecting, among other things, the use of more or less distortionary taxes and the quality of tax administration:

$$g_t = \theta_t \gamma_t, \tag{60}$$

$$p_t = \frac{\pi_t}{\theta_t}. \tag{61}$$

By (60), to provide a given level of public goods, expenditure must be greater with less competent governments. By (61), to generate a given level of tax receipts, the tax burden must be greater with less competent governments. Our technological assumptions lead the provision of the public good and the tax burden to vary with the competence of the government.

The only potential motive for optimal borrowing is during periods in which the government is more distortionary, or inefficient, in raising taxes. This is distinct from the Barro (1979) tax-smoothing hypothesis under distortionary taxation, where the tax distortion does not vary over time; hence, only extraordinary expenditures, like wars, are financed with debt. The following condition assures that, absent electoral concerns, debt will not be optimal:

$$\mathbf{E}_t \left[\frac{1}{\theta_t} \right] \leq \beta(1 + r(0)) \mathbf{E}_t \left[\frac{1}{\theta_{t+1}} \right]. \tag{62}$$

We discuss the no optimal borrowing condition in the Appendix (we also rule out

optimal lending).[75] If competence did not affect the collection of taxes in (61), the no optimal borrowing condition (62) would become $1 \leq \beta(1 + r(0))$ as in Shi and Svensson (2006), where this is satisfied even if $r(0) = 0$ because they assume that $\beta = 1$. In the current model, $r(0)$ must be large enough to satisfy condition (62).

In Section 3.2, we show how in electoral periods the government faces a consistency requirement to replicate the behavior of competence shocks that will lead it to distribute debt between tax reductions and expenditure hikes in specified proportions. This is consistent with the empirical evidence in Frey and Schneider (1978a) and Tufte (1978) on how governments lower taxes and increase expenditure in electoral years. However, if competence affected only the production of public goods in (60) –not revenues in (61)–, then the model would instead behave like Shi and Svensson (2006) and Alt and Lassen (2006a,b), where the incumbent has an incentive in election years to distort only expenditures on public goods. This alternative formulation may be more appropriate in an institutional setup where the executive has more say over expenditure decisions than over taxes.

The standard assumption is that government competence is identified with the party in control of the executive branch, and party competence follows a first-order moving average process, as in Rogoff and Sibert (1988), making retrospective voting rational:

$$\theta_t^j = \bar{\theta} + \varepsilon_{t-1}^j + \varepsilon_t^j. \tag{63}$$

The incumbent does not know the current competence shock when budget decisions are taken. Each competence shock ε (the party superscript j is omitted here) is uniformly distributed over the interval $\left[-\frac{1}{2\xi}, \frac{1}{2\xi} \right]$, with expected value $\mathbf{E}[\varepsilon] = 0$ and density function $\xi > 0$. A higher value of ε corresponds to a more competent politician. The probability distribution of competence θ_t conditional on ε_{t-1}, $\mathbf{F}(\theta_t | \varepsilon_{t-1})$, is also uniform, with support

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[75]The Appendix is available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1972999.

$\left[\bar{\theta} + \varepsilon_{t-1} - \frac{1}{2\xi}, \bar{\theta} + \varepsilon_{t-1} + \frac{1}{2\xi}\right]$, and $\mathbf{E}\left[\theta_t | \varepsilon_{t-1}\right] = \bar{\theta} + \varepsilon_{t-1}$. Henceforth, $\bar{\theta} > 2/\xi$, so $\theta_t > 0$ and (60) and (61) are well-defined.

As an alternative to assumption (63) that government competence reflects the competence of the party in control of the executive, we allow a more general formulation where performance depends on all parties in power. We additionally assume that because of coordination problems performance is particularly worse in electoral periods if there is divided government instead of unified government. More specifically, the competence of the government θ_t is a weighted average of the competence of E, the leader of the executive branch, and V, either the leader of the legislature –in a presidential system– or of the minor coalition party –in a parliamentary system. Given θ_t^E and θ_t^V, overall government competence is determined by weights ρ and $(1 - \rho)$, with $\rho \in (1/2, 1]$:

$$\theta_t = \rho\theta_t^E + (1 - \rho)\theta_t^V. \tag{64}$$

The leaders of the two political parties, A and B, can play roles as E and V; the leader of each party changes before each election.[76] Besides the utility from the consumption of private and public goods, the party leaders receive an exogenous rent χ^E (χ^V) at the beginning of the term if they are elected to E (V), where $\chi^V < \chi^E$. These rents reflect the strengths of the candidates' electoral goals (Lohmann 1998a) and are the source of conflict between political parties and the electorate.

The terms in office in roles E and V last two periods. Every other period, the electorate removes or confirms the incumbent party in an explicit electoral contest; if confirmed in its role, it continues for another term; otherwise, the opposition party takes that office. At the time of the election, party leaders do not know the ideological shocks σ_i, but they form

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[76]This assumption rules out end-period problems, since parties will always be interested in winning the upcoming election. This is consistent with Aldrich (1995) and the literature on how parties solve collective action problems.

a correct conjecture about their distribution in the population.

In non-electoral periods (t even) the competence of E equals the competence of the party $j \in \{A, B\}$ in charge of E, and the competence of V equals that of the party $k \in \{A, B\}$ in charge of V:

$$\text{For } t \text{ even,} \quad \begin{cases} \theta_t^E = \theta_t^j, \\ \theta_t^V = \theta_t^k. \end{cases} \tag{65}$$

In electoral periods (t odd), while the competence of the E equals the competence of the incumbent party $j \in \{A, B\}$, the competence of V either equals the competence of the incumbent party, when $k = j$ (unified government), or zero, when $k \neq j$ (divided government):

$$\text{For } t \text{ odd,} \quad \begin{cases} \theta_t^E = \theta_t^j, \\ \theta_t^V = \theta_t^j \text{ if } k = j, \theta_t^V = 0 \text{ otherwise.} \end{cases} \tag{66}$$

We characterize unified government as the case where the same party controls E and V, while there is divided government otherwise. By (64-66) divided government affects efficiency, particularly so in electoral periods when fiscal outcomes reflect only a fraction of the competence of the party that leads the executive branch.

Specification (66) is used mainly for tractability, to simplify the voter's inference problem, so in electoral years fiscal outcomes under divided government reflect only the competence of the party that leads the executive branch. The inference problem under divided government has been used by Powell and Whitten (1993) to explain why economic voting is less important when responsibility is less clear, e.g., with a bicameral opposition, minority governments, or coalition governments. However, there is a political rationale for assumption (66). Roubini and Sachs (1989) point out that coordination problems in

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divided government can impose significant costs on government performance. Indeed, both hypotheses are observationally equivalent: voters may be less likely to punish the executive leader for poor performance of the economy not because of lack of clarity of responsibility, as Powell and Whitten (1993) suggest, but rather because political parties find it particularly hard to work together when the members of the coalition start campaigning and competing for votes. If voters discount worse performance close to elections under divided government, they should not punish the party in the role of E for that. Though empirically we expect both information and coordination problems to be at work in divided government, Section 3.4 discusses why this analytical simplification does not affect the strategic incentives of the coalition members.

4.2.3 The Budget Process

The agenda setter model of Romer and Rosenthal (1978, 1979) allows modeling the budget process as the interaction of two players, an agenda setter E and a veto player V, who must reach an agreement for there to be a change in the status quo. The idea of veto players applies to both presidential and parliamentary systems (Tsebelis 2002).

We begin assuming the agenda setter E is the head of the executive branch, making a budget allocation proposal that must be accepted by the legislature to become law; no amendment rights exist, so the legislature faces a take-it-or-leave-it proposal where the reversion outcome (the status quo) in case of rejection is specified below.[77]

Our focus is on whether there is an actual veto player to check PBCs caused by office-motivated incumbents. In a presidential system, E is the president, and V the legislative

[77]This perspective is applied more often to European, Asian and Latin American democracies, where the executive can issue decrees unilaterally, than to the United States (McCubbins, Noll, and Weingast 2007: 1680). The case of presidential systems wherein the legislature can amend the executive's proposal, so the legislature has the agenda setting power, is reviewed later.

leader. In a parliamentary system, a legislative majority must be mustered to form a government; if a party is forced to form a coalition to control a majority of seats in parliament, the leader of the major coalition party plays the role of E, as prime minister, while the leader of the minority party plays V and can bring the government down with a negative vote. There is no veto player when E and V are controlled by the same party, which in a parliamentary system is also referred to as single-party rule. On the other hand, there is a veto player when different parties control E and V.

Furthermore, what matters for PBCs is not a nominal veto player, but rather an effective one. Since a potential veto player may not be capable of monitoring and controlling the budget in the implementation stage, we distinguish between two polar cases, perfect and null compliance with the budget law.

The budget proposals are in terms of budget revenue and debt, because the budget restriction determines budget expenditure (only two of these three variables can be chosen freely). The timing of the budget process in period t is as follows:

1. E proposes $\tilde{\pi}_t^E$, $\tilde{d}_t^E$ to V.

2. Since V has no amendment rights, V chooses whether to accept the proposal or not. If the proposal is not accepted, the budget is given by status quo $\bar{\pi}_t$, $\bar{d}_t$. This will determine the approved budget $\tilde{\pi}_t$, $\tilde{d}_t$.

3. E implements π_t, d_t, which equals the approved budget if there is perfect compliance.

4. ε_t is realized and g_t and p_t are determined according to (60) and (61).

5. Voters know the structure of the budget process, and observe g_t and p_t, but neither ε_t nor (γ_t, π_t, d_t), forming a belief $\hat{\theta}_t$ about E's competence.

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6. Without loss of generality, party A controls E. If t is an odd positive integer, i.e., an electoral period, the median voter M decides whether to reelect party A in E, and whether to vote party A or B for V.

7. Individuals observe past competence shocks ε_t, as well as (γ_t, π_t, d_t), and period t ends.

If the executive's budget proposal is rejected, the status quo for taxation is given by an arbitrary reversion point $\overline{\pi}_t$. Expenditure must be authorized by the legislature. Since the chief executive cannot spend more than tax receipts plus new debt, expenditure can equivalently be controlled through borrowing limits. We focus on this indirect control. We assume that new debt must be approved by the legislature, something typical of many budget processes:

$$\overline{d}_t = d_{t-1}. \tag{67}$$

E does not observe ε_t before making budget decisions, operating under uncertainty about the effect of policy actions, but it has a temporary information advantage concerning the actual budget allocation.

4.2.4 Median Voter

With ideological preferences that are symmetrically distributed around zero, and voters that share the same preferences for public and private goods, the choice of the median voter is representative of the majority vote.

Take a presidential system. If the median voter M prefers unified government and votes for party A in the presidential and congressional elections, it will be backed by all voters to the right, forming a majority. Since some voters to the left of M may also favor

party A (particularly those voters with a small ideological preference for party B), this will produce a clear majority.[78] Since each voter has separate choices for the executive and legislative branches under separation of powers, divided government can come about by splitting votes. Say the median voter M prefers A, B for roles E, V, respectively. Voters to the right of M will vote either A, A, if they are very extremist, or A, B, if they are more moderate. The reason is simple: their vote entails an economic cost already considered by the median voter, plus an ideological cost that the median voter does not face, so voters to the right of M will be less likely than M to vote for party B in the legislative election. Similar arguments apply to voters to the left of M, who will vote either B, B or A, B. Therefore, the outcome of the election will be A, B.

In a parliamentary system, single-party rule comes about if the median voter favors either A or B, because a majority will emerge with the support of those either to the right or to the left of M. Again, since economic considerations prevail for voters with a small ideological preference, this majority will typically exceed 50% by more than one vote. A coalition government is also simple to produce if, to abstract from coordination problems of voters (Alesina and Rosenthal 1995), we assume that all voters follow their ideological leanings, except for the median voter, who abstains. The major and minor members of a coalition government, e.g., A, B rather than B, A, can be determined by a simple rule: the party in charge of E continues in its role if its competence shock is non-negative, otherwise the opposition party takes that role.[79]

In what follows, the exposition is in terms of the median voter, because its preferences for either divided or unified government reflect the preferences of a majority of the

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[78]As in the reasoning of Kayser and Wlezien (2005) on how economic voting is more important when political polarization is low, this requires some voters with a degree of ideological polarization small enough to assure that the economic vote predominates.

[79]Another possibility in a parliamentary setting is to introduce a small third party, C, that is favored by the median voter. This party will be needed by either major party A or B to form a coalition government.

electorate.

4.3 Equilibrium

To focus on the credibility problems of economic policy in electoral periods, we use the Lohmann (1998a) timing, i.e., policy makers do not know their current competence shock when selecting policy instruments; the interpretation is that policy is decided under uncertainty.[80] Voters decide without observing the choice of fiscal policy instruments, but after observing fiscal policy outcomes.

We use perfect Bayesian Nash equilibrium as the solution concept. We first deduce the equilibrium under a benevolent ruler as a benchmark. We then turn to policy in an electoral setting, replicating the results of Shi and Svensson (2006) and Alt and Lassen (2006a) in the standard setup of concentration of powers where the incumbent executive has full discretion over fiscal policy. We then consider a constitutional democracy where the budget has to be approved by the legislature, and government competence is determined by the party that heads the executive. Finally, we consider what happens when divided government affects performance negatively, making voters face a trade-off between control and selection.

4.3.1 Benevolent Ruler

Consider a randomly selected candidate in period $t = 0$ who remains in office forever. The no optimal borrowing condition (62) allows abstracting from any optimal borrowing

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[80]Persson and Tabellini (2000: 420-425) characterize models such as Lohmann's (1998a) as moral hazard models of electoral cycles, in contrast to the adverse selection models developed by Rogoff and Sibert (1988), Rogoff (1990), and Persson and Tabellini (1990) where electoral cycles are a signal of the competence of the incumbent. If the incumbent does not have private information about its own competence, but asymmetric information on the choice of policy instruments remains, the moral hazard problem discussed in the text comes to the forefront.

motive (see the Appendix for a formal proof), and concentrate exclusively on electoral incentives to issue debt. Thus, assumption (62) assures that $d_t = 0$ for $t = 0, 1, ...$, allowing the intertemporal problem to be broken down into a sequence of simpler problems:

$$\max_{\{\gamma_t, \pi_t\}} \mathbf{E}_t[c_t + \alpha \ln(g_t)], \ s.t. \ (56), \text{ and } (59)\text{--}(61).$$

The solution, using the properties of the uniform distribution and integrating, is:

Proposition 4.1: Benevolent Ruler. *Suppose that a ruler is randomly selected in period $t = 0$ and remains in office forever. If the condition on no optimal borrowing (62) holds, the ruler chooses optimal expenditure and tax collection each period as follows:*

$$\gamma_t^* = \pi_t^* = \frac{\alpha}{\mathbf{E}_t\left[\frac{1}{\theta_t}\right]} = \frac{\alpha}{\xi \ln\left(\frac{\bar{\theta} + \varepsilon_{t-1} + \frac{1}{2\xi}}{\bar{\theta} + \varepsilon_{t-1} - \frac{1}{2\xi}}\right)}, \ t = 0, 1, \ldots \tag{68}$$

Since the budget is decided ex ante, it cannot be conditioned on the current competence shock ε_t. As to the ex post outcomes, a more competent incumbent provides more of the public good and imposes a lighter burden on taxpayers, so disposable income increases and there is a consumption boom.

4.3.2 Concentration of Powers

Consider next regular elections every other period. There is only one policy-maker, the chief executive. The players are the incumbent party A, the opposition party B, the median voter M, and Nature. From the viewpoint of the median voter M, the two parties differ only in competence. Because the competence shocks are transitory, each election can be treated separately, so the infinite-horizon model can be broken down into a series of

separate problems. The solution can be found via backwards induction in a sequence of steps.

First, in non-electoral period $t + 1$, the incumbent has no incentive to manipulate the voters' perception of its competence. Since the optimal strategies of all incumbents in the post-electoral period are the same, the distinction between the original and the potential incumbents is omitted, and the superscript u refers to an unchecked executive:

$$\gamma_{t+1}^u = \gamma_{t+1}^* = \frac{\alpha}{\mathbf{E}_{t+1}\left[\frac{1}{\theta_{t+1}}\right]}, \pi_{t+1}^u = \gamma_{t+1}^* + (1 + r(d_t))d_t. \tag{69}$$

4.3.2.1 The Inference Problem of Voters

At election time t, the voter's problem is to estimate the competence shock ε_t. Voters do not observe d_t, γ_t and π_t, but they observe the indices g_t and p_t, which give them two sources of information for inferring competence θ_t.[81] If the incumbent uses debt only to reduce taxes, not to increase expenditures (the least distortionary use of debt), by (60) and (61) voters have a simple way of inferring competence:

$$\hat{\theta}_t = \min\left\{\frac{g_t}{\gamma_t^*}, \frac{\pi_t^*}{p_t}\right\}. \tag{70}$$

Whenever voters have two conflicting pieces of information on government competence, they can always play it safe by picking the lowest estimate of competence. This gives the incumbent an incentive to obey the following consistency condition:

$$\gamma_t = \omega_t \gamma_t^*, \quad \pi_t = \frac{\pi_t^*}{\omega_t}, \tag{71}$$

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[81]The term "indices" is used in semiotics for signs that are the consequence of some cause. In our setting, the provision of public goods and the tax burden are indices of government competence.

where the actual budget choices γ_t and π_t are determined by the scale factor ω_t, so

$$g_t = \omega_t \gamma_t^* \theta_t, \quad p_t = \frac{\pi_t^*}{\theta_t \omega_t}, \tag{72}$$

by (60) and (61). The consistency condition (71) assures that both indices, g_t and p_t, provide the same information.[82] The incumbent uses debt in a way that mimics the characteristics of the original distribution of competence shocks, with the expected value of the distribution shifted to the right by $\omega_t \geq 1$.

If there is no previous debt, so $\pi_t^* = \gamma_t^*$, the consistency condition (71) implies that, beyond identity (59), debt must satisfy:

$$d_t = \gamma_t - \pi_t = \left(\omega_t - \frac{1}{\omega_t} \right) \pi_t^*. \tag{73}$$

Call $\hat{\omega}_t$ the voters' estimate of ω_t.[83] The voters' estimate of θ_t is given by the ratio of both fiscal outcomes (either one could also be used to make the inference, see 72):

$$\hat{\theta}_t = \frac{\sqrt{g_t/p_t}}{\hat{\omega}_t}. \tag{74}$$

Using (74), voters can estimate the incumbent's current competence shock ε_t:

$$\hat{\varepsilon}_t = \hat{\theta}_t - \bar{\theta} - \varepsilon_{t-1} = \frac{\sqrt{g_t/p_t}}{\hat{\omega}_t} - \bar{\theta} - \varepsilon_{t-1}. \tag{75}$$

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[82]Our timing à la Lohmann (1998a) differs from the Rogoff (1990) timing where the incumbent decides the budget allocation after observing its competence shock, not before. Rogoff has a signaling model, where the competence shock affects the optimal choice of taxes and public consumption spending.

[83]A more precise, but tedious, notation would define a probability measure over ω that represents voters' beliefs, and then apply Bayes' rule to update them. However, in equilibrium this probability measure will be degenerate, with all the mass in the true ω, which justifies the notation in the text. The same applies to $\hat{\theta}$ and $\hat{\varepsilon}$.

4.3.2.2 The Median Citizen's Vote

The median voter compares the expected utility next period with either the incumbent or the challenger. In regard to the opposition, the median voter knows only the distribution of ε_t and hence that $\mathbf{E}_t[\varepsilon_t] = 0$. Hence, expected utility from a vote for the opposition is not conditional on the current competence shock:

$$\mathbf{E}_t\left[c_{t+1} + \alpha \ln(g_{t+1})\right] = \mathbf{E}_t\left[y - \frac{\pi^u_{t+1}}{\theta_{t+1}} + \alpha \ln(\theta_{t+1}\gamma^u_{t+1})\right]. \tag{76}$$

On the other hand, expected utility from a vote for the incumbent can be conditioned on the current competence shock, which can be estimated from policy outcomes:

$$\mathbf{E}_t\left[c_{t+1} + \alpha \ln(g_{t+1}) \mid \hat{\varepsilon}_t\right] = \mathbf{E}_t\left[y - \frac{\pi^u_{t+1}}{\theta_{t+1}} + \alpha \ln(\theta_{t+1}\gamma^u_{t+1}) \mid \hat{\varepsilon}_t\right]. \tag{77}$$

The expression $c_{t+1} + \alpha \ln(g_{t+1})$ is a function of the two independent stochastic variables ε_t and ε_{t+1}. In the Appendix 4.1, Lemma 4.1 proves that if $Z = h(X, Y)$ is a function of two independent stochastic variables X and Y and $\mathbf{E}[Z \mid x]$, the expected value of Z conditional on x, is a strictly increasing and concave function of x, then there exists $\hat{x} \leq \mathbf{E}[X]$ such that $\mathbf{E}[Z \mid x)] \geq \mathbf{E}[Z]$ if and only if $x \geq \hat{x}$; Lemma 4.2 establishes that $\mathbf{E}_t[c_{t+1} + \alpha \ln(g_{t+1}) \mid \varepsilon_t]$ is strictly increasing and concave. Hence,

Corollary 4.1: *There exists $\hat{\varepsilon} \leq 0$ such that $E_t[c_{t+1} + \alpha \ln(g_{t+1}) \mid \hat{\varepsilon}_t] \geq E_t[c_{t+1} + \alpha \ln(g_{t+1})]$ if and only if $\hat{\varepsilon}_t \geq \hat{\varepsilon}$. The ruling party thus enjoys an incumbency advantage in elections. **Proof:** The proof of Corollary 1 follows from Lemma 4.2 and an application of Lemma 4.1. The vector of information variables to estimate $\hat{\varepsilon}_t$ is given by g_t, p_t, ε_{t-1}, and $\hat{\omega}_t$. Since the median voter M maximizes expected utility, M votes for the incumbent if and only if $\hat{\varepsilon}_t \geq \hat{\varepsilon}$. Given that competence shocks are symmetrically distributed around 0 and $\hat{\varepsilon} \leq 0$, the incumbent wins elections half the time or more.* ∎

Corollary 4.1 can be used to compute the probability $\mu_t = \Pr(\hat{\varepsilon}_t \geq \hat{\varepsilon})$ that the incumbent wins the election. First, replace $\hat{\varepsilon}_t$ by $\frac{\sqrt{g_t/p_t}}{\hat{\omega}_t} - \bar{\theta} - \varepsilon_{t-1}$. Since ε_t equals $\frac{\sqrt{g_t/p_t}}{\omega_t} - \bar{\theta} - \varepsilon_{t-1}$, adding these terms to each side and simplifying, $\mu_t = \Pr\left[\varepsilon_t \geq \hat{\varepsilon} + \frac{\sqrt{g_t/p_t}}{\omega_t}\left(1 - \frac{\omega_t}{\hat{\omega}_t}\right)\right]$. Given that ε_t follows a uniform distribution and $\theta_t = \frac{\sqrt{g_t/p_t}}{\omega_t}$,

$$\mu_t = \left(\frac{1}{2} - \xi\hat{\varepsilon}\right) + \xi\theta_t\left(\frac{\omega_t}{\hat{\omega}_t} - 1\right),\tag{78}$$

where $\hat{\varepsilon} \leq 0$. If voters are surprised $(\omega_t > \hat{\omega}_t)$, the incumbent has a higher probability of winning.

4.3.2.3 The Incumbent's Decision in an Electoral Period

From the incumbent's viewpoint, the electoral outcome is uncertain, and depends on μ_t. The incumbent's objective function is:

$$\max_{\{\gamma_t, \pi_t, d_t\}} \mathbf{E}_t \left[c_t + \alpha\ln(g_t) + \beta\left(c_{t+1} + \alpha\ln(g_{t+1})\right) + \beta\mu_t\,\chi^E\right], \; s.t.(56), (59)\text{–}(61), (71)\text{–}(73) \text{ and } (78).$$

Incorporating these restrictions, the government's problem can be reframed in terms of the choice of ω_t. The first-order condition, after replacing π_t^* by (68), is:

$$\frac{d\mathbf{E}_t\left[\cdot\right]}{d\omega_t} = \alpha\left(\frac{1}{\omega_t} + \frac{1}{\omega_t^2}\right) - \alpha\beta\frac{\mathbf{E}_t\left[\frac{1}{\theta_{t+1}}\right]\left(1 + \frac{1}{\omega_t^2}\right)}{\mathbf{E}_t\left[\frac{1}{\theta_t}\right]}\left((1 + r) + r\prime\frac{\alpha\left(\omega_t - \frac{1}{\omega_t}\right)}{\mathbf{E}_t\left[\frac{1}{\theta_t}\right]}\right) +$$

$$+\beta\xi\frac{\bar{\theta} + \varepsilon_{t-1}}{\hat{\omega}_t}\chi^E \leq 0, \text{with strict equality if } \omega_t > 1.\tag{79}$$

The derivative $\frac{d_t^2\mathbf{E}[.]}{d\omega_t^2}$ is strictly negative for $\omega_t \geq 1$ if the following second-order condition

is satisfied:

$$\frac{\omega_t + 2}{2} > \frac{\beta \, \mathbf{E}_t \left[\frac{1}{\theta_{t+1}}\right]}{\mathbf{E}_t \left[\frac{1}{\theta_t}\right]} \left((1+r) - r\prime \frac{\alpha \left(\omega_t^3 + \omega_t + \frac{2}{\omega_t}\right)}{\mathbf{E}_t \left[\frac{1}{\theta_t}\right]} - r\prime\prime \frac{\alpha^2 \left(\omega_t + \frac{1}{\omega_t}\right)^2 \left(\omega_t^2 - 1\right)}{2 \left(\mathbf{E}_t \left[\frac{1}{\theta_t}\right]\right)^2}\right).$$

(80)

In a perfect Bayesian equilibrium, beliefs on the equilibrium path are determined by equilibrium strategies (i.e., expectations are rational), so $\hat{\omega}_t = \omega_t = \omega_t^u$. The value of opportunism $\bar{\chi}_t$ for which (79) becomes zero at $\omega_t^u = 1$ is

$$\bar{\chi}_t = \frac{2\alpha}{\beta\xi(\bar{\theta} + \varepsilon_{t-1})} \left(\beta \frac{\mathbf{E}_t \left[\frac{1}{\theta_{t+1}}\right]}{\mathbf{E}_t \left[\frac{1}{\theta_t}\right]} (1 + r(0)) - 1\right),$$

(81)

which is positive by (62). If $\chi^E \leq \bar{\chi}_t$, expression $\frac{d\mathbf{E}_t[\cdot]}{d\omega_t}$ is non-negative at $\omega_t^u = 1$, so incumbents have no incentive to distort the budget. For $\chi^E > \bar{\chi}_t$, $\frac{d\mathbf{E}_t[\cdot]}{d\omega_t}$ becomes positive at that point, which implies that in equilibrium the incumbent prefers $\omega_t^u > 1$.

Proposition 4.2: Concentration of Powers. *Suppose there are elections in odd periods and the incumbent E faces no checks and balances. By (81), $\bar{\chi}_t$ is the highest level of opportunism χ^E for which an incumbent is not willing to generate a PBC. If the condition on no optimal borrowing (62) and the second-order condition (80) hold, then:*

1. *In a non-electoral period $t + 1$, the incumbent chooses optimal expenditure and tax collection.*

2. *In an electoral period t:*

    (a) *If opportunism is low ($\chi^E \leq \bar{\chi}_t$), the incumbent does not generate PBCs ($\omega_t^u = 1$), so $\gamma_t^u = \gamma_t^*$ and $\pi_t^u = \pi_t^*$.*

(b) *If opportunism is high ($\chi^E > \bar{\chi}_t$), the incumbent generates PBCs ($\omega_t^u > 1$),
    hence $\gamma_t^u = \omega_t^u \gamma_t^*$ and $\pi_t^u = \frac{\pi_t^*}{\omega_t^u}$.*

In an opportunistic framework the overriding concern of politicians is to be reelected, so the natural scenario is $\chi^E > \bar{\chi}_t$ where the executive is indeed willing to distort fiscal outcomes to be reelected.

4.3.2.4 Time Consistency and Budget Rules

Suppose that an unconstrained executive E formulates plans in non-electoral period $t - 1$. Viewed at $t - 1$, when the incumbent sets policy in advance, the probabilities of reelection μ_t are exogenous. Therefore, the incumbent's best policy is to plan to pick γ_t^* and π_t^*, which are socially optimal. The problem with this optimal plan is that it is not time-consistent: when an electoral period arrives, the incumbent has an incentive to increase expenditure and reduce taxes. This credibility problem underlies Proposition 2 under an unchecked executive.

What happens if the status quo is set according to rule (67)? Well, if the rule were binding, this would effectively curb the credibility problem: in an electoral period the executive would prefer to use debt to increase expenditures and reduce taxes in order to look more competent, but the status quo rules out more public indebtedness. However, it does not make sense to assume that the executive is constrained to follow any rule unless it has to share the power to change rules with somebody else. If the executive is vested with legislative power, it can do and undo any rule it likes. The natural environment where the executive shares rule-making power is a constitutional democracy, where an agreement has to be reached with the legislature for there to be changes in the budget.

4.3.3 Constitutional Democracies

In constitutional democracies, the budget must be approved by the legislature, which depends on an agreement between E and V. For both presidential and parliamentary systems, divided government is described in terms of E being in the hands of one party and V in the hands of the other, while the same party controls both under unified government. In what follows, we assume that both the condition on no optimal borrowing (62) and the second-order condition (80) hold, and opportunism is high ($\chi^E > \bar{\chi}_t$) so the executive has an incentive to distort fiscal outcomes for electoral reasons. We first consider the special case where government competence depends only on E (i.e., $\theta_t = \theta_t^E$), so divided government imposes no efficiency costs.

First consider the case of perfect compliance with the budget law. At election time t, voters will want the incumbent party in E if competence shocks are not too negative. At the same time, they will want divided government, since the legislature can block the executive's attempts to distort the budget in period $t + 2$, without affecting government performance.

Does what actually happens under divided government, in periods $t + 1$ and $t + 2$, conform to voter's expectations? Let A control E and B, V. In electoral period $t + 2$, A would like to increase its electoral chances by using debt to select π_{t+2}^u and γ_{t+2}^u. However, party B can veto any attempt of A to employ debt to increase expenditures and reduce taxes, since the status quo restriction (67) introduces a binding constraint on the executive. Party B has the motivation and the power to veto any attempt of party A to use debt: if this authorization of new debt were unexpected for voters, this would increase the electoral chances of party A at the expense of B; if expected, it would reduce the welfare of party B because of the electoral distortion of fiscal variables. On the other hand, B does not have an incentive to veto the optimal level of taxes and expenditures, because this would not

affect the voters' perception of party A's competence. What voters use in their inference problem is the status quo restriction on new debt, which implies that $\gamma_{t+2} = \pi_{t+2}$, so $\omega_{t+2} = 1$. Hence, the ratio g_{t+2}/p_{t+2} can be used to infer competence, whatever the level of taxation. Given that it cannot affect its perceived competence, the best party A can do is to select the optimal level of taxes and expenditures.

In non-electoral period $t + 1$, E chooses optimal expenditure and repays past debt, if any. V does not veto this proposal, because it does not affect future reelection prospects of either party and leads to the optimal outcome.

The degree of compliance with the authorized budget describes the effective limits V imposes on E. Under null compliance with the balanced budget rule (the extreme case of imperfect compliance), V is not capable of effectively monitoring fiscal policy. The environment then reverts to an unchecked executive. Hence,

Proposition 4.3: Constitutional Democracy. *Suppose there are elections in odd periods, and the legislature must authorize new debt. Let opportunism be high ($\chi^E > \bar{\chi}_t$). If the condition on no optimal borrowing (62) and the second-order condition (80) hold, then:*

1. *In a non-electoral period E, with the agreement of V, will set taxes and expenditures at the optimal level.*

2. *In an electoral period:*

   (a) *Under perfect compliance with the budget law, divided government will set taxes and expenditures at the optimal level, while unified government will generate PBCs. The median voter strictly prefers divided government.*

   (b) *Under null compliance with the budget law, E will generate PBCs. The median voter will be indifferent between divided and unified government.*

The results in Proposition 3 assume that E is the agenda setter. What happens in presidential systems where the legislature has amendment powers? The results are unchanged. Since V can prevent new indebtedness, an unaligned legislature would not be willing to authorize the use of debt for electoral purposes, so $\overline{d}_t = d_{t-1}$. At the same time, V would be willing to authorize the optimal level of expenditure $\gamma_t^* = \pi_t^*$, because a lower level of expenditures and taxes does not reduce E's reelection chances, given that voters can use the g_t/p_t ratio to infer competence.

4.3.4 Trade-off between Control and Selection

To provide a more balanced view of the costs and benefits of divided government, competence now depends on both E and V (i.e., $\theta_t = \rho\theta_t^E + (1-\rho)\theta_t^V$, with $\rho \in (1/2, 1]$), and on whether or not it is an electoral period.

Since government competence in electoral periods reflects only the competence of the party that heads E, in our setup that party is the only one with an incentive to engender PBCs. If we were to allow for government competence in electoral periods to depend on both parties that share power, Hanusch (2010) demonstrates that the larger party in a coalition government has a preference for increasing debt, while the smaller party has an incentive for reducing debt.[84] The intuition is straightforward in our setup: the larger party with $\rho > 1/2$ gets more credit for positive competence shocks than the smaller party, so it is the one that has incentives to engineer PBCs. Though Hanusch (2010) stops short of analyzing equilibrium policy, it is pretty straightforward to do so in our setup: since the smaller party has veto power, it can block the attempts of the larger party to issue new debt. Hence, even if we switched from our simple specification (66), where we assume that

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[84]See equation (39) in Hanusch (2010). We take the case $q = 0$, since this fits our framework with two parties, where the major party may win votes only at the expense of the smaller coalition party. Hanusch also has a case $q = 1$ where the major party may also win votes at the expense of a third party outside the governing coalition.

poorer pre-election performance is due to coordination problems of divided government, to a more complicated specification where competence depends on both parties in power, the strategic incentives of the larger party to issue debt, and of the smaller party to block it, would not change.

In a non-electoral period $t + 1$, the arguments of Propositions 2 and 3 apply, with competence being a weighted average of the competence of E and V, so optimal expenditure is:

$$\gamma_{t+1}^* = \frac{\alpha}{\mathbf{E}_{t+1}\left[\frac{1}{\theta_{t+1}}\right]} = \frac{\alpha}{\mathbf{E}_t\left[\frac{1}{\rho\theta_{t+1}^E+(1-\rho)\theta_{t+1}^V}\right]}.$$

In electoral periods, the argument behind Proposition 3 also applies, so an opposition legislature will not approve new debt, nor will it object to the optimal level of taxes and expenditures. Though divided government eliminates budget cycles, it does so at a cost, due to the efficiency losses generated by power-sharing, plus the breakdown of coordination between both parties in electoral periods. This is the fundamental trade-off that the median voter faces.

4.3.4.1 The Median Citizen's Vote

The voter estimates the competence shocks of E as follows (call these beliefs $\hat{\varepsilon}_t^i$). With unified government, estimated government competence is formed as in equation (75), with an estimated distortion $\hat{\omega}_t = \omega_t^u$. With divided government, estimated government competence is a proportion ρ of the competence of the party in charge of the executive branch, and the estimated distortion is $\hat{\omega}_t = 1$.

The voter's decision is a dynamic programming problem whose solution is a cut-point strategy, as proven in the Appendix. Conceptually, three factors are at play. First, abstracting from second-order effects linked to variance, expected welfare in period $t + 1$ is

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larger if the party that is most competent in expected value has unified power. Second, expected welfare in period $t + 2$ is also larger if there is unified government, since there are no efficiency costs from the breakdown of cooperation between the parties in office, plus the fact that the expectation of PBCs raises both private consumption and the provision of public goods. The downside of unified government appears in period $t + 3$, when expected welfare is lower because the "party" is over and electoral debt has to be payed off. While the welfare effects in periods $t + 2$ and $t + 3$ are fixed benefits and costs of unified government, the positive effects of unified government in period $t + 1$ are increasing in the current competence shock $\hat{\varepsilon}_t^i$.

The standard assumption is that opportunism is high, so $\chi^E > \bar{\chi}_t$ and politicians are willing to engineer a cycle. We now consider how the choice is influenced by ρ, where $(1 - \rho)$ reflects the efficiency costs of divided government, which are null for $\rho = 1$ and reach a maximum for $\rho = 1/2$. By Proposition 3, for $\rho = 1$ and $\chi^E > \bar{\chi}_t$ the median voter strictly prefers divided government, since there are no efficiency costs and electoral cycles are avoided. Given the limited magnitude of electoral cycles, since the efficiency costs of divided government increase as ρ falls, there is a point where voters eventually prefer unified government. When the starting point is a unified government, with party A leading E, there will be a $\rho < 1$ for which there are high (H) and low (L) cutoff values $\varepsilon_H^{A,A}, \varepsilon_L^{A,A}$ such that if $\hat{\varepsilon}_t^A > \varepsilon_H^{A,A}$, then the median voter prefers unified government (A, A) to divided government (A, B), and if $\hat{\varepsilon}_t^A < -\varepsilon_L^{A,A}$, then the median voter prefers unified government (B, B) to divided government (B, A). A similar argument applies when the starting point is divided government. Moreover, as ρ keeps falling, the efficiency costs of divided government will eventually outweigh its moderating effects, so the median voter always prefers unified government. Hence,

Proposition 4.4: Constitutional Democracy with Efficiency Costs of Divided

Government. *Suppose there are elections in odd periods, and the legislature must authorize new debt. Furthermore, in non-electoral periods government competence is a weighted average of the competence of the parties that share power, and in electoral periods a fraction of the competence of the leading party. Let opportunism be high ($\chi^E > \bar{\chi}_t$). If the condition on no optimal borrowing (62) and the second-order condition (80) hold, then:*

1. *In a non-electoral period E, with the agreement of V, will set taxes and expenditures at the optimal level.*

2. *In an electoral period:*

   (a) *Under perfect compliance with the budget law, divided government will set taxes and expenditures at the optimal level, while unified government will generate PBCs. The median voter is more likely to pick unified government either when the current government is very competent (and hence reelected) or very incompetent (and hence replaced by the opposition).*

   (b) *Under null compliance with the budget law, E will generate PBCs. The median voter favors unified government.*

The important message of Proposition 4.4 is that under compliance with the budget law, voters have the ability to select the appropriate institutional arrangement, namely, divided government, to moderate PBCs.

4.4 Empirical Implications

Alesina, Roubini, and Cohen (1997: chaps. 4 and 6) link the lack of recent evidence of PBCs for the United States to the fact that after 1980 many federal transfer programs

became mandatory by acts of Congress, so they cannot be easily manipulated for short run purposes by the president.[85] According to the logic of our model, these developments could be due in turn to the fact that in the postwar period US voters have favored divided government (cf. Alesina and Rosenthal 1995), because Propositions 3 and 4 imply that divided government can prevent PBCs. The role of Congress is key not only because the amount of money the federal government is allowed to borrow is subject constitutionally to a statutory limit that can only be raised by Congress (Heniff 2004), but also because there is a government shutdown if expenditures are not authorized by Congress (Keith 1999).

The moderating influence of divided government in Propositions 3 and 4 assumes that compliance with the budget law is perfect, but not all legislatures actually have the capability to assure such compliance. If not, the budget rule is not credible. The US Congress has an uncommon capability of monitoring and enforcing the budget. Nordhaus (1989) traces the roots of this back to the Nixon administration, whose dissembling prompted the US Congress to establish in 1974 the Congressional Budget Office to have an independent control of the budget.[86]

A sharp empirical implication can be derived from Propositions 3 and 4, namely, that aggregate PBCs should be larger either in countries with few checks and balances, or with weak compliance with the budget law. Streb, Lema, and Torrens (2009) study this implication empirically with the Brender and Drazen (2005) panel of 67 democracies over the 1960-2001 period. Just as in our theoretical model, their data do not reject the null hypothesis that the budget surplus deteriorates significantly before elections and improves

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[85]Though Alesina, Roubini, and Cohen (1997) state there are no opportunistic cycles in the United States, Grier (2008) finds instead clear evidence of opportunistic political business cycles by using a wider range of control variables. Furthermore, he is able to link these cycles to monetary policy, but not to fiscal policy.

[86]In our framework, the credit for good performance in election years accrues to the president. Even if performance reflected the competence of both branches of government, the results in Hanusch (2010) imply that most of the credit would still go to the president. Hence, Congress has no incentive to engage on its own in PBCs.

thereafter by the same magnitude, a feature that can be represented by a dummy variable *pbc* that equals 1 the election year, -1 the following year, and 0 otherwise. To capture legislative checks and balances in countries with strong compliance with the law, they construct a variable *checks* that is the product of *vetoplayer* –which measures the presence of a legislative veto player, equal to 1 (full veto player) if the Henisz (2002) political constraints index POLCON3 $\geq$ 2/3, 3/2*POLCON3 otherwise– and *compliance dummy* –which measures the degree of compliance with the law, equal to 1 (strong) if the ICRG law and order index $\geq$ 4 in all years, 0 (weak) otherwise. The variable *pbc_checks* –the product of *pbc* and *checks*– shows that *checks* indeed has a moderating effect on cycles, providing an empirical counterpart of Propositions 3 and 4 above. Since the effect of *pbc_checks* is of similar magnitude but opposite sign to *pbc*, the variable *pbc_(1-checks)* –the product of *pbc* and (1-*checks*)– can replace them. The variable *pbc_(1-checks)* implies that under strong compliance with the law, which is the typical situation in OECD countries, the discretionary power of the executive depends on the veto players in the legislature, and no PBCs will be observed with a full veto player. Table 1 employs the coefficient of *pbc_(1-checks)* in their full sample of countries (namely 0.47) to measure the mean impact of elections on the budget surplus in different subgroups.

Table 4.1. Impact of Effective Checks and Balances on Aggregate PBCs

	vetoplayer	*compliance dummy*	*checks*	Mean impact of elections on budget surplus
All	0.62	0.55	0.37	-0.29
	(0.19)	(0.50)	(0.35)	
Non-OECD	0.56	0.17	0.11	-0.42
countries	(0.22)	(0.38)	(0.25)	
OECD	0.67	0.93	0.63	-0.17
countries	(0.12)	(0.26)	(0.21)	
Presidential	0.55	0.30	0.12	-0.41
systems	(0.21)	(0.40)	(0.25)	
Parliamentary	0.65	0.74	0.52	-0.22
systems	(0.16)	(0.44)	(0.32)	
New	0.57	0.24	0.16	-0.39
democracies	(0.22)	(0.42)	(0.30)	
Established	0.64	0.70	0.48	-0.24
democracies	(0.16)	(0.46)	(0.33)	

Sources: *vetoplayer*, *compliancedummy*, and *checks* are from Table 1 in Streb, Lema, and Torrens (2009), except for systems of government, where the DPI classification (0 and 1 for presidential, 2 for parliamentary) is used to construct these variables; mean values (in parenthesis, the standard deviations) are reported. The mean impact on the budget surplus, as a percentage of GDP, is calculated multiplying $(1 - checks)$ by the coefficient -0.47 from column (3) of Table 3 in Streb, Lema, and Torrens (2009).

These estimates confirm the Schuknecht (1996) conjecture that stronger PBCs in developing countries are due to weaker checks and balances, since the budget surplus falls

0.4% of GDP in election years in non-OECD countries, while the effect in OECD countries is less than half of that. Persson, Roland, and Tabellini (2000) contrast separation of powers in a presidential-congressional regime to legislative cohesion in a parliamentary regime. If we were to take this literally, it would lead to expect stronger PBCs in parliamentary countries, something exactly counter to the empirical evidence in Persson and Tabellini (2003) on PBCs being stronger in presidential countries. This can be explained in our framework in terms of fewer effective checks and balances in presidential countries compared to parliamentary countries (0.12 versus 0.52, see Table 1). New democracies also exhibit fewer effective checks and balances than established democracies (0.16 versus 0.48, see Table 1), helping to explain the results of Brender and Drazen (2005) on PBCs being stronger in new democracies.

The implications of our framework differ from Persson, Roland, and Tabellini (1997: 1165), which analyzes separation of powers in presidential systems, because they explicitly leave out the issue of unified government brought up by Alesina and Rosenthal (1995) that is the key force behind PBCs in Propositions 3 and 4 of our model.[87] Proposition 3 has a counterfactual implication, that voters will always choose divided government. Instead, Proposition 4 implies that divided government is more likely when the differences in expected competence between both parties are not too large. On the other hand, if a legislature is not capable of assuring compliance with the budget law, then divided government is useless to moderate the executive and only the efficiency costs are left. This outcome seems more likely to befall an opposition legislature in presidential systems, since minor coalition members in parliamentary systems can bring the government down with a simple no-confidence vote.

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[87]Saporiti and Streb (2008) look at how separation of powers in presidential systems moderates PBCs, but the legislature is never aligned with the executive because it acts benevolently as a representative of the people. This assumption rules out by construction the possibility of unified government.

Alt and Lassen (2006b) also provide cross-country evidence that there are PBCs in established democracies of OECD countries, when there is a lack fiscal transparency. There is also evidence from subnational political jurisdictions. Rose (2006) finds there are significant PBCs in US states without balanced budget rules, or with weak balanced budget rules that allow borrowing. However, when stringent balanced budget rules –i.e., those that prohibit to issue public debt or require a popular referendum to authorize debt– are in place, she has the nice result that PBCs are eliminated. Rose (2006) also finds that "when Republicans control both branches, the election-year increase in spending is twice as large as when the government is under divided partisan control", although the effect is not statistically significant. From the point of view of the present framework, the question is how divided government impacts on the budget surplus, and government expenditures, in states where legislative authorization is required to issue debt.

4.5 Conclusions

The inability of the incumbent chief executive credibly to commit not to use debt for electoral purposes has been pointed out as being at the heart of aggregate PBCs (Shi and Svensson 2006, Alt and Lassen 2006a,b). Since this credibility problem is generated by the discretionary power of the executive, this paper models the role of legislative veto players as a possible solution to PBCs, formalizing Shucknecht's (1996) conjecture that PBCs are stronger when there are no checks and balances. Streb, Lema and Torrens (2009) provide empirical evidence that checks and balances indeed moderate PBCs in countries where compliance with the law exists.

In relation to the debate on rules versus discretion, our results are that rules are not enough to avoid PBCs. Rather, appropriate checks and balances are required in constitutional democracies as a commitment device. Under divided government in presidential

systems or coalition governments in parliamentary systems, an unaligned legislature will veto electoral changes in the budget; for this veto power to be effective, the legislature needs the oversight and enforcement capacity to insure that the head of the executive branch complies with the approved budget law. Under unified government in presidential systems or single party rule in parliamentary systems, the legislature shares the same electoral objectives as the chief executive, so it will not curb aggregate cycles in spending, taxes and debt. Actual checks and balances are endogenous and depend on voters' choices. If there is compliance with the budget law, voters may find this commitment device useful or not depending on its benefits (eliminating PBCs) and costs (less competence).

Divided government is beneficial in this setup with opportunistic political parties because it enhances the credibility of commitments. With partisan political parties, divided government has an additional role, namely to reduce potentially large policy swings from having alternating unified governments in office. The current framework could be extended to allow for parties with policy preferences, to capture the incentive of voters to favor divided government in order to have more stable policies.

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<center>**Appendix 4.1**</center>

No Optimal Borrowing Condition. The no optimal borrowing condition in Section 4.2 is given by:

$$\mathbf{E}_t \left[\frac{1}{\theta_t} \right] \leq \beta(1 + r(0))\mathbf{E}_t \left[\frac{1}{\theta_{t+1}} \right].$$

We now show this condition implies that borrowing is never optimal for a benevolent ruler.

Consider a randomly selected candidate in period $t = 0$ who remains in office forever. By quasi-linear preferences, the marginal utility of consumption is equal to one. If, in expected value, the marginal utility of the public good is equal to the marginal utility of consumption, any extra resources will be optimally used to reduce taxes.

Suppose the government resorts to one extra unit of debt in period t to reduce taxes. Expected utility increases by $\mathbf{E}_t \left[\frac{1}{\theta_t} \right]$ in period t, while utility falls by $[r'(d_t) d_t + 1 + r(d_t)] \mathbf{E}_t \left[\frac{1}{\theta_{t+1}} \right]$ in period $t+1$, when the debt is repaid. Thus, the first-order condition at an optimum is:

$$\mathbf{E}_t \left[\frac{1}{\theta_t} \right] - \beta \left[r'(d_t) d_t + 1 + r(d_t) \right] \mathbf{E}_t \left[\frac{1}{\theta_{t+1}} \right] \leq 0,$$

with strict equality if $d_t > 0$. By the no optimal borrowing condition, this first-order condition is only satisfied for $d_t = 0$.

The second-order condition at an optimum is:

$$-\beta \left[r''(d_t) d_t + 2r'(d_t) \right] \mathbf{E}_t \left[\frac{1}{\theta_{t+1}} \right] \leq 0,$$

which is satisfied for all d_t.

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The no optimal borrowing condition is relevant for very negative competence shocks. While $\mathbf{E}_t\left[\frac{1}{\theta_{t+1}}\right]$ is an unconditional expectation of the reciprocal of government competence, $\mathbf{E}_t\left[\frac{1}{\theta_t}\right]$ is strictly decreasing and convex in ε_{t-1}. Hence, $-\mathbf{E}_t\left[\frac{1}{\theta_t}\right]$ is strictly increasing and concave in ε_{t-1}. By Lemma 1 below, $-\mathbf{E}_t\left[\frac{1}{\theta_t}\right] \geq -\mathbf{E}_t\left[\frac{1}{\theta_{t+1}}\right]$ if and only if $\varepsilon_{t-1} \geq \widehat{\varepsilon}$, for $\widehat{\varepsilon} < 0 = \mathbf{E}[\varepsilon]$. Therefore, $\mathbf{E}_t\left[\frac{1}{\theta_t}\right] \leq \mathbf{E}_t\left[\frac{1}{\theta_{t+1}}\right]$ if and only if $\varepsilon_{t-1} \geq \widehat{\varepsilon}$, so $\mathbf{E}_t\left[\frac{1}{\theta_t}\right] > \mathbf{E}_t\left[\frac{1}{\theta_{t+1}}\right]$ if and only if $\varepsilon_{t-1} < \widehat{\varepsilon}$. Hence, condition (7) rules out that debt is optimal even in the bad states of the world, including the worst possible scenario, namely $\varepsilon_{t-1} = -1/2\xi$.

Lemma 4.1: *Let $Z = h(X,Y)$ be a function of two independent stochastic variables X and Y. Let $E\left[Z \mid x\right]$ be the expected value of Z conditional on x, and suppose that it is a strictly increasing and concave function of x. Then, there exists $\hat{x} \leq E\left[X\right]$ such that*

$$\mathbf{E}\left[Z \mid x)\right] \geq \mathbf{E}\left[Z\right] \text{ if and only if } x \geq \hat{x}.$$

Proof: Since $\mathbf{E}\left[Z \mid x\right]$ is concave, by Jensen's inequality it follows that $\mathbf{E}\left[Z \mid \mathbf{E}\left[X\right]\right] \geq \mathbf{E}[\mathbf{E}\left[Z \mid X\right]]$. By the law of iterated expectations, $\mathbf{E}\left[Z\right] = \mathbf{E}[\mathbf{E}\left[Z \mid X\right]]$. Hence,

$$\mathbf{E}\left[Z \mid \mathbf{E}\left[X\right]\right] \geq \mathbf{E}\left[Z\right]. \tag{A1}$$

Since $\mathbf{E}\left[Z \mid x\right]$ is strictly increasing, from simple inspection of (A1) it follows that there exists $\hat{x} \leq \mathbf{E}\left[X\right]$ such that $\mathbf{E}\left[Z \mid \hat{x}\right] = \mathbf{E}\left[Z\right]$, $\mathbf{E}\left[Z \mid x\right] > \mathbf{E}\left[Z\right]$ if $x > \hat{x}$, and $\mathbf{E}\left[Z \mid x\right] < \mathbf{E}\left[Z\right]$ if $x < \hat{x}$. ∎

Lemma 4.2: *$E_t[c_{t+1} + \alpha \ln(g_{t+1}) \mid \varepsilon_t]$ is a strictly increasing and concave function of ε_t.*

Proof: Use the definitions of c_{t+1} and g_{t+1}, then replace γ_{t+1}^u and π_{t+1}^u, apply the (conditional) expected value operator, and use $\mathbf{E}_t\left[\frac{1}{\theta_{t+1}} \mid \varepsilon_t\right] = \mathbf{E}_{t+1}\left[\frac{1}{\theta_{t+1}}\right]$:

$$\mathbf{E}_t\left[c_{t+1} + \alpha \ln(g_{t+1})\right] = y - \alpha - (1 + r_t) d_t \mathbf{E}_t\left[\frac{1}{\theta_{t+1}}\right] + \alpha \mathbf{E}_t\left[\mathbf{E}_{t+1}\left[\ln\left(\frac{\alpha \theta_{t+1}}{\mathbf{E}_{t+1}\left[\frac{1}{\theta_{t+1}}\right]}\right)\right]\right],$$

$$\mathbf{E}_t\left[c_{t+1} + \alpha \ln(g_{t+1}) \mid \varepsilon_t\right] = y - \alpha - (1 + r_t) d_t \mathbf{E}_t\left[\frac{1}{\theta_{t+1}} \mid \varepsilon_t\right] + \alpha \mathbf{E}_t\left[\ln\left(\frac{\alpha \theta_{t+1}}{\mathbf{E}_{t+1}\left[\frac{1}{\theta_{t+1}}\right]}\right) \mid \varepsilon_t\right].$$

Conditional expected utility in $t + 1$ is increasing in ε_t because of a lower expected burden of outstanding debt, a higher expected competence in the provision of the public good, and a higher expenditure on the public good:

$$\frac{\partial \mathbf{E}_t\left[c_{t+1} + \alpha \ln(g_{t+1}) \mid \varepsilon_t\right]}{\partial \varepsilon_t} = (1 + r_t) d_t \mathbf{E}_t\left[\frac{1}{\theta_{t+1}^2} \mid \varepsilon_t\right] +$$

$$+ \alpha \left(\mathbf{E}_t\left[\frac{1}{\theta_{t+1}} \mid \varepsilon_t\right] + \frac{\mathbf{E}_{t+1}\left[\frac{1}{\theta_{t+1}^2}\right]}{\mathbf{E}_{t+1}\left[\frac{1}{\theta_{t+1}}\right]}\right) > 0.$$

As to the second derivative of $\mathbf{E}_t[c_{t+1} + \alpha \ln(g_{t+1}) \mid \varepsilon_t]$, first

$$\frac{\partial^2 \mathbf{E}_t\left[c_{t+1} \mid \varepsilon_t\right]}{\partial \varepsilon_t^2} = -2 (1 + r_t) d_t \mathbf{E}_t\left[\frac{1}{\theta_{t+1}^3} \mid \varepsilon_t\right] = \frac{-2 (1 + r_t) d_t \left(\bar{\theta} + \varepsilon_t\right)}{\left(\left(\bar{\theta} + \varepsilon_t\right)^2 - \left(\frac{1}{2\xi}\right)^2\right)^2} \leq 0.$$

Note that $\frac{\partial^2 \mathbf{E}_t[c_{t+1} \mid \varepsilon_t]}{\partial \varepsilon_t^2} = 0$ only when $d_t = 0$.

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Second, using $\mathbf{E}_t \left[\frac{1}{\theta_{t+1}^2} \mid \varepsilon_t \right] = \mathbf{E}_{t+1} \left[\frac{1}{\theta_{t+1}^2} \right]$,

$$\frac{\partial^2 \mathbf{E}_t[\ln(g_{t+1}) \mid \varepsilon_t]}{\partial \varepsilon_t^2} = \frac{\mathbf{E}_{t+1}\left[\frac{1}{\theta_{t+1}^2}\right]\left(\mathbf{E}_{t+1}\left[\frac{1}{\theta_{t+1}^2}\right] - \left(\mathbf{E}_{t+1}\left[\frac{1}{\theta_{t+1}}\right]\right)^2\right) - 2\mathbf{E}_{t+1}\left[\frac{1}{\theta_{t+1}^3}\right]\mathbf{E}_{t+1}\left[\frac{1}{\theta_{t+1}}\right]}{\left(\mathbf{E}_{t+1}\left[\frac{1}{\theta_{t+1}}\right]\right)^2}.$$

Since $\left(\mathbf{E}_{t+1}\left[\frac{1}{\theta_{t+1}^2}\right] - \left(\mathbf{E}_{t+1}\left[\frac{1}{\theta_{t+1}}\right]\right)^2\right)$ is second order in relation to the following term, this derivative is negative. ∎

The Voter's Decision when there is a Trade-off between Control and Selection. In a constitutional democracy, a trade-off may arise between controlling PBCs and selecting the most competent incumbents for offices E and V. We concentrate on the median voter's decision, which can be cast as a dynamic programming problem. Let $W(i, j)$ be the expected utility of the median voter in electoral period t given that currently (that is, before elections) party i leads E, and party j, V. The voter's problem has a recursive structure which leads to the following Bellman equation, where $\hat{\varepsilon}_t^i$ is estimated using information set $\Im_t = \left(g_t, p_t, \varepsilon_{t-1}^E, \varepsilon_{t-1}^V, \hat{\omega}_t\right)$ and the control variables are $i', j' \in \{A, B\}$, which refer to the voter's choice of parties to play roles E and V:

$$W(i, j \mid \hat{\varepsilon}_t) = \max_{i',\, j' \in \{A,B\}} \left\{ \beta_t \mathbf{E}_t \left[c_{t+1}(i, j, i\prime, j\prime) + \alpha \ln g_{t+1}(i, j, i\prime, j\prime) \mid \hat{\varepsilon}_t^i \right] \right.$$
$$\left. + \beta_t^2 \mathbf{E}_t \left[c_{t+2}(i\prime, j\prime) + \alpha \ln g_{t+2}(i\prime, j\prime) + W(i', j') \right] \right\},$$

where

$$c_{t+1}(i, j, i\prime, j\prime) = y - \frac{\dfrac{\alpha}{\mathbf{E}_{t+1}\left[\frac{1}{\rho\theta_{t+1}^{i'}+(1-\rho)\theta_{t+1}^{j'}}\right]} + (1+r)\dfrac{\alpha\left(\hat{\omega}_t(i,j) - \frac{1}{\hat{\omega}_t(i,j)}\right)}{\mathbf{E}_t\left[\frac{1}{\theta_t^i}\right]}}{\rho\theta_{t+1}^{i'} + (1-\rho)\theta_{t+1}^{j'}},$$

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$$\ln g_{t+1}(i, j, i\prime, j\prime) = \ln \left(\frac{\rho \theta_{t+1}^{i'} + (1 - \rho)\theta_{t+1}^{j'}}{\mathbf{E}_{t+1}\left[\frac{1}{\rho\theta_{t+1}^{i'}+(1-\rho)\theta_{t+1}^{j'}} \right]} \right) + \ln \alpha,$$

$$c_{t+2}(i\prime, j\prime) = y - \frac{\alpha}{\hat{\omega}_{t+2}\left(i', j'\right)\theta_{t+2}^{i'}\mathbf{E}_{t+2}\left[\frac{1}{\theta_{t+2}^{i'}} \right]},$$

$$\ln g_{t+2}(i\prime, j\prime) = \ln \left(\frac{\hat{\omega}_{t+2}\left(i', j'\right)\theta_{t+2}^{i'}\alpha}{\mathbf{E}_{t+2}\left[\frac{1}{\theta_{t+2}^{i'}} \right]} \right) + \varphi\left(i', j'\right)\alpha \ln \rho^2,$$

$$\hat{\omega}_t\left(i, j\right) = \begin{cases} 1 & \text{if } i \neq j \\ \omega_t^u & \text{otherwise} \end{cases}, \quad \varphi\left(i', j'\right) = \begin{cases} 1 & \text{if } i' \neq j' \\ 0 & \text{otherwise} \end{cases}.$$

Let $\Phi\left(i, j, \hat{\varepsilon}_t^i\right)$ denote the policy function that solves the voter's decision problem. We make the following conjecture, where i is the party currently in charge of E, and j is in charge of V:

$$\Phi\left(i, j, \hat{\varepsilon}_t^i\right) = \begin{cases} (i, i) & \text{if } \varepsilon_H^{i,j} \leq \hat{\varepsilon}_t^i \leq \frac{1}{2\xi}, \\ (i, \sim i) & \text{if } \hat{\varepsilon} \leq \hat{\varepsilon}_t^i < \varepsilon_H^{i,j}, \\ (\sim i, i) & \text{if } -\varepsilon_L^{i,j} < \hat{\varepsilon}_t^i < \hat{\varepsilon}, \\ (\sim i, \sim i) & \text{if } -\frac{1}{2\xi} \leq \hat{\varepsilon}_t^i \leq -\varepsilon_L^{i,j}. \end{cases} \tag{A5}$$

The symbol $\sim i$ indicates the opposition (there are only two parties). The higher and lower limits that separate the regions of divided and unified government (i.e., $\varepsilon_H^{i,j}$ and $\varepsilon_L^{i,j}$) are not symmetrical, and they also depend on whether the starting point is unified government ($i = j$) or divided government ($i \neq j$).[88] The limit value $\hat{\varepsilon}$ that separates the region of divided government ($i, \sim i$) from divided government ($\sim i, i$) is not necessarily zero, as we

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[88] The difference of starting with either unified or divided government is the burden of the debt in $t + 1$. Divided government imposes an expected loss in competence, and reduces the expected variance in competence. The two factors have opposite effects on the expected burden of the debt. When the expected loss in competence prevails, unified government becomes more attractive.

comment below. We now verify this cut-point strategy.

As to the choice between divided government (A, B), or (B, A), the only potential difference is in period $t + 1$, where expected utility can be expressed as follows:

$$\mathbf{E}_t\left[c_{t+1}(i, j, i\prime, j\prime) + \alpha \ln g_{t+1}(i, j, i\prime, j\prime) \mid \hat{\varepsilon}_t^i\right] = y - \alpha - (1 + r)d_t \mathbf{E}_t\left[\frac{1}{\rho\theta_{t+1}^{i'} + (1 - \rho)\theta_{t+1}^{j'}}\right]$$

$$+ \alpha \mathbf{E}_t\left[\ln\left(\frac{\rho\theta_{t+1}^{i'} + (1 - \rho)\theta_{t+1}^{j'}}{\mathbf{E}_{t+1}\left[\frac{1}{\rho\theta_{t+1}^{i'} + (1-\rho)\theta_{t+1}^{j'}}\right]}\right)\right] + \alpha \ln \alpha$$

Let party A control E in period t. The difference in expected utility in period $t + 1$ between having divided government (A, B), where A controls E and B, V, and divided government (B, A), where the roles are reversed, is:

$$D(AB, BA) = (1 + r)d_t \mathbf{E}_t\left[\frac{1}{\rho\theta_{t+1}^B + (1 - \rho)\theta_{t+1}^A} - \frac{1}{\rho\theta_{t+1}^A + (1 - \rho)\theta_{t+1}^B}\right]$$

$$+ \alpha \mathbf{E}_t\left[\ln\left(\frac{\left[\rho\theta_{t+1}^A + (1 - \rho)\theta_{t+1}^B\right] \mathbf{E}_{t+1}\left[\frac{1}{\rho\theta_{t+1}^B+(1-\rho)\theta_{t+1}^A}\right]}{\left[\rho\theta_{t+1}^B + (1 - \rho)\theta_{t+1}^A\right] \mathbf{E}_{t+1}\left[\frac{1}{\rho\theta_{t+1}^A+(1-\rho)\theta_{t+1}^B}\right]}\right)\right]$$

If $\rho = \frac{1}{2}$, then $D(AB, BA) = 0$ for all ε_t, so it does not matter whether the incumbent is elected to E or V. However, the relevant range is $\frac{1}{2} < \rho \le 1$. When $\rho = 1$, Corollary 1 applies, so the median voter prefers to reelect the party $i \in \{A, B\}$ that controls the executive office if and only if $\hat{\varepsilon}_t^i \ge \hat{\varepsilon}$, where $\hat{\varepsilon} \le 0$ because of the concavity of the objective function. Hence, there is an incumbency advantage for the party that controls the chief executive under divided government (better the devil you know than the devil you don't). When $\frac{1}{2} < \rho < 1$, E is still more important than V for government competence. Since

it might be useful for the voter to know something about the incumbent's competence in order to elect it to E, this might also generate an incumbency advantage in this range. At any rate, there exists an $\hat{\varepsilon}$ around the origin such that $D\left(AB, BA\right) \geq 0$ for $\hat{\varepsilon}_t^A \geq \hat{\varepsilon}$ and $D\left(AB, BA\right) < 0$ for $\hat{\varepsilon}_t^A < \hat{\varepsilon}$.

Is there vote splitting when the competence shocks are large? Again, let party A control E in period t. If $\hat{\varepsilon}_t^A \geq \hat{\varepsilon}$, the median voter picks $i' = A$, and in the Bellman equation only the controls $j' = A, B$ must be considered (if $\hat{\varepsilon}_t^A < \hat{\varepsilon}$, the median voter favors instead party B for E and similar arguments apply). If the median voter chooses divided government in period t, the impacts on the Bellman equation can be broken down into three welfare effects.

The first welfare effect is

$$\mathbf{E}_t \left[c_{t+1}(A, j, A, A) + \alpha \ln g_{t+1}(A, j, A, A) \mid \hat{\varepsilon}_t^A\right] -$$
$$\mathbf{E}_t \left[c_{t+1}(A, j, A, B) + \alpha \ln g_{t+1}(A, j, A, B) \mid \hat{\varepsilon}_t^A\right].$$

For $\hat{\varepsilon}_t^A = \hat{\varepsilon}$, the difference is second order and has to do with the effects on variance: with unified government, shock $\hat{\varepsilon}_t^A$ is known in equilibrium, whereas with divided government $\rho\hat{\varepsilon}_t^A + (1 - \rho)\varepsilon_t^B$ has a expected value of zero but a positive variance; on the other hand, in the next period, expected competence is the same, but variance is lower with divided government, since $\rho\varepsilon_{t+1}^A + (1 - \rho)\varepsilon_{t+1}^B$ has the same expected value (zero) but less dispersion than ε_{t+1}^A. These two risk effects have opposite signs. However, as $\hat{\varepsilon}_t^A$ increases, there is a competence effect that clearly favors unified government: Lemma 4.3 shows that, for $\rho < 1$, $\mathbf{E}_t \left[c_{t+1}(A, j, A, A) + \alpha \ln g_{t+1}(A, j, A, A) \mid \hat{\varepsilon}_t^A\right]$ $- \mathbf{E}_t \left[c_{t+1}(A, j, A, B) + \alpha \ln g_{t+1}(A, j, A, B) \mid \hat{\varepsilon}_t^A\right]$ is increasing in $\hat{\varepsilon}_t^A$.

Lemma 4.3: *Suppose that party A controls E in period t. If A is re-elected to control E, the difference in expected utility between having A or B control V, namely $D\left(AA, AB\right) = E_t\left[c_{t+1}(A, j, A, A) + \alpha \ln g_{t+1}(A, j, A, A) \mid \hat{\varepsilon}_t^A\right] - E_t\left[c_{t+1}(A, j, A, B) + \alpha \ln g_{t+1}(A, j, A, B) \mid \hat{\varepsilon}_t^A\right]$, is increasing in $\hat{\varepsilon}_t^A$.*

Proof: Applying the properties of operator $\mathbf{E}$ and the definitions of c_{t+1} and g_{t+1},

$$D\left(AA, AB\right) = \frac{(1 + r_t)\left(\hat{\omega}_t\left(A, j\right) - \frac{1}{\hat{\omega}_t(A,j)}\right)}{\mathbf{E}_t\left[\frac{1}{\theta_t^A}\right]}\mathbf{E}_t\left[\frac{1}{\rho\theta_{t+1}^A + (1 - \rho)\theta_{t+1}^B} - \frac{1}{\theta_{t+1}^A} \mid \hat{\varepsilon}_t^A\right] + $$

$$+ \alpha\mathbf{E}_t\left[\ln\left(\frac{\theta_{t+1}^A}{\rho\theta_{t+1}^A + (1 - \rho)\theta_{t+1}^B}\right) \mid \hat{\varepsilon}_t^A\right] + \alpha\mathbf{E}_t\left[\ln\left(\frac{\mathbf{E}_{t+1}\left[\frac{1}{\rho\theta_{t+1}^A + (1-\rho)\theta_{t+1}^B}\right]}{\mathbf{E}_{t+1}\left[\frac{1}{\theta_{t+1}^A}\right]}\right) \mid \hat{\varepsilon}_t^A\right].$$

Differentiating $D\left(AA, AB\right)$ with respect to $\hat{\varepsilon}_t^A$:

$$\frac{\partial D\left(AA, AB\right)}{\partial \hat{\varepsilon}_t^A} = \frac{(1 + r_t)\left(\hat{\omega}_t\left(A, j\right) - \frac{1}{\hat{\omega}_t(A,j)}\right)}{\mathbf{E}_t\left[\frac{1}{\theta_t^A}\right]}\frac{\partial\mathbf{E}_t\left[\frac{1}{\rho\theta_{t+1}^A + (1-\rho)\theta_{t+1}^B} - \frac{1}{\theta_{t+1}^A} \mid \hat{\varepsilon}_t^A\right]}{\partial \hat{\varepsilon}_t^A} + $$

$$+ \alpha\frac{\partial\mathbf{E}_t\left[\ln\left(\frac{\theta_{t+1}^A}{\rho\theta_{t+1}^A + (1-\rho)\theta_{t+1}^B}\right) \mid \hat{\varepsilon}_t^A\right]}{\partial \hat{\varepsilon}_t^A} + \alpha\frac{\partial\mathbf{E}_t\left[\ln\left(\frac{\mathbf{E}_{t+1}\left[\frac{1}{\rho\theta_{t+1}^A + (1-\rho)\theta_{t+1}^B}\right]}{\mathbf{E}_{t+1}\left[\frac{1}{\theta_{t+1}^A}\right]}\right) \mid \hat{\varepsilon}_t^A\right]}{\partial \hat{\varepsilon}_t^A}.$$

Note that $\hat{\omega}_t\left(A, j\right) \geq 1$, because either $\hat{\omega}_t\left(A, j\right) > 1$ with PBCs, or $\hat{\omega}_t\left(A, j\right) = 1$ without PBCs. As to the first term of $\frac{\partial D(AA, AB)}{\partial \hat{\varepsilon}_t^A}$,

$$\frac{\partial\mathbf{E}_t\left[\frac{1}{\rho\theta_{t+1}^A + (1-\rho)\theta_{t+1}^B} - \frac{1}{\theta_{t+1}^A} \mid \hat{\varepsilon}_t^A\right]}{\partial \hat{\varepsilon}_t^A} = (1 - \rho)\mathbf{E}_t\left[\frac{\left(\theta_{t+1}^B\right)^2 - \rho\left(\theta_{t+1}^A - \theta_{t+1}^B\right)^2}{\left(\rho\theta_{t+1}^A + (1 - \rho)\theta_{t+1}^B\right)^2\left(\theta_{t+1}^A\right)^2} \mid \hat{\varepsilon}_t^A\right].$$

For $\rho = 1$, this is zero, and for $\rho = 0$, this is positive. When $\rho < 1$, this is also positive,

because the second term of the numerator is second order with respect to the first term.
Therefore:

$$\frac{\partial \mathbf{E}_t \left[\frac{1}{\rho \theta^A_{t+1} + (1-\rho)\theta^B_{t+1}} - \frac{1}{\theta^A_{t+1}} \mid \hat{\varepsilon}^A_t \right]}{\partial \hat{\varepsilon}^A_t} \quad \begin{array}{l} = 0 \text{ if } \rho = 1, \\[2mm] > 0 \text{ if } \rho < 1. \end{array} \tag{A2}$$

As to the second term of $\frac{\partial D(AA, AB)}{\partial \hat{\varepsilon}^A_t}$,

$$\frac{\partial \mathbf{E}_t \left[\ln \left(\frac{\theta^A_{t+1}}{\rho \theta^A_{t+1} + (1-\rho)\theta^B_{t+1}} \right) \mid \hat{\varepsilon}^A_t \right]}{\partial \hat{\varepsilon}^A_t} = \mathbf{E}_t \left[\frac{(1-\rho)\theta^B_{t+1}}{\theta^A_{t+1} \left(\rho \theta^A_{t+1} + (1-\rho)\theta^B_{t+1} \right)} \mid \hat{\varepsilon}^A_t \right] \quad \begin{array}{l} = 0 \text{ if } \rho = 1, \\[2mm] > 0 \text{ if } \rho < 1. \end{array} \tag{A3}$$

As to the third term of $\frac{\partial D(AA, AB)}{\partial \hat{\varepsilon}^A_t}$,

$$\frac{\partial \mathbf{E}_t \left[\ln \left(\frac{\mathbf{E}_{t+1} \left[\frac{1}{\rho \theta^A_{t+1} + (1-\rho)\theta^B_{t+1}} \right]}{\mathbf{E}_{t+1} \left[\frac{1}{\theta^A_{t+1}} \right]} \right) \mid \hat{\varepsilon}^A_t \right]}{\partial \hat{\varepsilon}^A_t} = \mathbf{E}_t \left[\frac{(1-\rho)\mathbf{E}_{t+1} \left[\frac{1}{(\theta^A_{t+1})^2} \right] \mathbf{E}_{t+1} \left[\frac{1}{\rho \theta^A_{t+1} + (1-\rho)\theta^B_{t+1}} \right]}{\mathbf{E}_{t+1} \left[\frac{1}{\rho \theta^A_{t+1} + (1-\rho)\theta^B_{t+1}} \right] \mathbf{E}_{t+1} \left[\frac{1}{\theta^A_{t+1}} \right]} + \right.$$

$$\left. -\rho \frac{\mathbf{E}_{t+1} \left[\frac{1}{\left(\rho \theta^A_{t+1} + (1-\rho)\theta^B_{t+1} \right)^2} \right] \mathbf{E}_{t+1} \left[\frac{1}{\theta^A_{t+1}} \right] - \mathbf{E}_{t+1} \left[\frac{1}{(\theta^A_{t+1})^2} \right] \mathbf{E}_{t+1} \left[\frac{1}{\rho \theta^A_{t+1} + (1-\rho)\theta^B_{t+1}} \right]}{\mathbf{E}_{t+1} \left[\frac{1}{\rho \theta^A_{t+1} + (1-\rho)\theta^B_{t+1}} \right] \mathbf{E}_{t+1} \left[\frac{1}{\theta^A_{t+1}} \right]} \mid \hat{\varepsilon}^A_t \right],$$

where the first term in the numerator is positive, and the second term of the numerator is second order (since it is the difference of two products of similar magnitude). Hence,

$$\frac{\partial \mathbf{E}_t \left[\ln \left(\frac{\mathbf{E}_{t+1} \left[\frac{1}{\rho \theta^A_{t+1} + (1-\rho)\theta^B_{t+1}} \right]}{\mathbf{E}_{t+1} \left[\frac{1}{\theta^A_{t+1}} \right]} \right) \mid \hat{\varepsilon}^A_t \right]}{\partial \hat{\varepsilon}^A_t} \quad \begin{array}{l} = 0 \text{ if } \rho = 1, \\[2mm] > 0 \text{ if } \rho < 1. \end{array} \tag{A4}$$

Summing up, (A2)-(A4) imply that Lemma 4.3 is satisfied. ∎

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As to the second welfare effect, expectations about period $t+2$ are not conditional on the current competence shock, so

$$\mathbf{E}_t\left[c_{t+2}(A,A) + \alpha \ln g_{t+2}(A,A)\right] - \mathbf{E}_t\left[c_{t+2}(A,B) + \alpha \ln g_{t+2}(A,B)\right] =$$

$$\mathbf{E}_t\left[\frac{\alpha\left(1 - \frac{1}{\omega_{t+2}^u}\right)}{\theta_{t+2}^{i\prime}\mathbf{E}_{t+2}\left[\frac{1}{\theta_{t+2}^{i\prime}}\right]} + \alpha \ln\left(\frac{\omega_{t+2}^u}{\rho^2}\right)\right],$$

which is nonnegative because $\omega_{t+2}^u \geq 1$ and $\rho \leq 1$. In period $t+2$ there will be an efficiency loss with divided government due to the break down in coordination between E and V. Furthermore, there will be no cycle under divided government. Both effects tends to reduce utility in period $t+2$ compared to a situation with unified government (no PBCs imply more taxes and less public goods in period $t+2$).

The third welfare effect is:

$$\mathbf{E}_t\left[W\left(A,A\right)\right] - \mathbf{E}_t\left[W\left(A,B\right)\right] < 0.$$

The voter prefers to begin with divided government because there is no debt to repay in the future. Formally, the result follows from a direct inspection of the Bellman equation.

While the second and third welfare effects are fixed costs and benefits, by Lemma 4.3 the first welfare effect is increasing in $\hat{\varepsilon}_t^A$. Hence, if for some $\hat{\varepsilon}_t^A \geq \hat{\varepsilon}$ the median voter prefers unified government (A,A) to divided government (A,B), then for $\hat{\varepsilon}_t^{A\prime} > \hat{\varepsilon}_t^A$ the voter will also prefer (A,A) to (A,B); and if for $\hat{\varepsilon}_t^A \geq \hat{\varepsilon}$ the median voter prefers (A,B) to (A,A), then for $\hat{\varepsilon} \leq \hat{\varepsilon}_t^{A\prime} < \hat{\varepsilon}_t^A$ the voter will also prefer (A,B) to (A,A). Thus, the policy function is a cut-point strategy as conjectured in (A5).

Chapter 5: The Political Coase Theorem: Experimental Evidence[89]

Abstract

The Political Coase Theorem (PCT) states that, in the absence of transaction costs, agents should agree to implement efficient policies regardless of the distribution of bargaining power among them. This paper uses a laboratory experiment to explore how commitment problems undermine the validity of the PCT. Overall, the results support theoretical predictions. In particular, commitment issues matter, and the existence of more commitment possibilities leads to better social outcomes, even when a redistribution of political power is required to take advantage of those possibilities. However, we also find that at low levels of commitment there is more cooperation than strictly predicted by our parameterized model while the opposite is true at high levels of commitment, and only large improvements in commitment opportunities have a significant effect on the social surplus, while small changes do not.

5.1 Introduction

The Coase Theorem (Coase 1960), as applied to politics (hereinafter referred to as the Political Coase Theorem or simply the PCT), states that, in the absence of transaction costs, agents should agree to implement efficient policies regardless of the distribution of bargaining power among them, which should only affect the distribution of gains. Since inefficient policies are pervasive, a fundamental issue in political economy has been to identify the crucial transaction costs in the political system (North 1990). Commitment problems have been considered to be one of the fundamental sources of transaction costs in politics

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[89]This essay is a joint work with Sebastian Galiani and Maria Lucia Yanguas.

(North and Weingast 1989). This is due to one of the key differences between economic and political transactions, inasmuch as, in politics, agents cannot rely on contracts being enforced by a third party, since powerful players are, by definition, the ones who have the power to enforce agreements. As a consequence, powerful agents face a commitment problem which may restrict the scope of the agreements that they can reach with other agents. In this paper, we explore how commitment problems may affect social outcomes employing a randomized laboratory experiment.

The importance of the PCT cannot be overemphasized. On the substantive front, there is hardly a more relevant issue in the social sciences than the identification of sources of inefficient policies and institutions. From a theoretical perspective, most formal political economy models now simply assume that the PCT is not valid. This is the end result of a shift in the literature on institutions and institutional change away from a tacit acceptance of the PCT and toward a more explicit rejection of this theorem. Early works in institutional economics suggested that institutional changes were efficient adjustments in response to innovations, implicitly accepting the PCT. Conversely, the identification of the specific transaction costs that block efficient outcomes has been a paramount issue in new institutional economics (North, 1981, 1990). However, only Acemoglu (2003) presents a formal political economy model in which social conflict and limited commitment are the factors that undermine the validity of the PCT.

Even though experiments are becoming more common, both in economics and political science (see, among others, Druckman, Green, Kuklinski and Lupia, 2011; and Gerber and Green 2012), the range of causes that researchers can manipulate experimentally is still limited. Thus, laboratory experiments remain the gold standard for research into the causal relationships existing among a broad set of issues (Friedman and Sunder, 1994). This is particularly the case when dealing with strategic interactions under different institutional

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arrangements that are unlikely to be easily manipulated by researchers (see, among others, Camerer 2003 and Palfrey 2009).

Additionally, the experiment can help us to determine where we should focus our attention in order to improve our understanding of institutions and institutional change. For example, the literature on institutional economics has shown that commitment problems can be solved by a redistribution of political power. In our laboratory experiment we test this hypothesis. Indeed, in one of our treatments new commitment possibilities lead to a higher social surplus only if subjects first agree to a series of moves that can be interpreted as a reallocation of political power. We also explore the long-standing debate about the relative virtues of gradual and radical reforms by looking at the effects of small versus large changes in commitment opportunities (see, among others, Popov 2000 and Roland 2000). Though there are many dimensions to this debate, our evidence suggests that large changes may be needed to produce measurable results.

To test the validity of the PCT, we begin by adapting the model developed by Acemoglu (2003) for use in a laboratory environment. The original model is a repeated taxation game between a ruler and a citizen in which the unique sub-game perfect Nash equilibrium of the stage game leads to a very inefficient outcome. The citizen does not work hard because he knows that the ruler will tax all his income, and the ruler does not have any way to credibly commit herself to refraining from expropriating the citizen's property. Repeated interactions open the door to some commitment opportunities and, hence, to better social outcomes. Our adaptation is simpler in the sense that we consider a two-period game in which promises are only partially binding. Specifically, there is some probability that a player must keep her promises and some probability that promises are not binding at all. Clearly, by changing these probabilities we are inducing different levels of commitment. Subjects in the laboratory were asked to play our simplified version of this model, in which

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there were differing levels of probability that their promises were binding.

We conducted this experiment between August and November 2012 in a computer laboratory at the Universidad de San Andrés, Argentina. Participants were graduate and undergraduate students who had differing fields of study and differing degrees of familiarity with game theory. In all, we conducted 10 sessions with 16 subjects each, for a total of 160 participants, who were first randomly assigned to one of two roles - player 1 (the ruler) or player 2 (the citizen)- and then to four different treatments. Each treatment differs only in terms of commitment opportunities: in Treatment 1, neither player 1 nor player 2 can credibly commit (promises are not binding at all); in Treatment 2, player 1 has a slight commitment opportunity (with a probability equal to 0.25 that her promises are binding), while player 2 has none; in Treatment 3, player 1 has significant commitment opportunities (with a probability equal to 0.75 that her promises are binding), while player 2 has none; and, last, in Treatment 4, player 1 has no commitment opportunities while player 2 has full credibility (her promises are binding). Subjects played 6 rounds of the same game, with the caveat that they would never play two consecutive rounds with the same subject. The first two rounds were for practice, while the last four rounds were played for a monetary reward.

Overall, the results of this experiment support the hypothesis that commitment issues matter and that the existence of more commitment opportunities leads, on average, to better social outcomes. Indeed, we find that this link is valid even when a reallocation of political power is required to take advantage of new commitment opportunities. However, we also find that at low levels of commitment there is more cooperation than would, strictly speaking, be predicted by our parameterized model while the opposite is true at high levels of commitment. Furthermore, only large improvements in commitment opportunities have a significant effect on the social surplus, while small changes do not.

The rest of this paper is organized as follows: Section 5.2 summarizes the theoretical framework, beginning with a general but informal presentation of the PCT. The section continues with a brief review of a repeated game that formalizes when the PCT applies and finishes with a description of a simplified version of the model that has been specially adapted for use in our laboratory experiment. Section 5.3 describes the laboratory experiment. Section 5.4 shows that subjects understood the game and the randomization was balanced. Section 5.5 presents the main results of the experiment. Section 5.6 discusses the departures from theoretical predictions. Finally, Section 5.7 concludes.

5.2 Theoretical Framework

In this section we review our theoretical framework. First, we begin with a general statement about the main link between commitment opportunities and social outcomes. Second, we briefly summarize an infinite-horizon repeated game developed by Acemoglu (2003) that captures this link. Finally, we develop a simpler two-period game that adapts Acemoglu's model to a laboratory environment and then fully characterize its equilibrium.

5.2.1 The PCT and Commitment

As we mentioned in the introduction, if we apply Coase's ideas to politics, we must conclude that, in the absence of transaction costs in political bargaining, society should reach an agreement that yields an efficient social outcome. Given that inefficient policies and institutions are pervasive, a fundamental issue in political economy and institutional economics has been the identification of crucial transaction costs in the political system.

Since the seminal work of North and Weingast (1989), commitment problems have been considered to be one of the primary transaction costs in politics. There are two reasons for this. First, political transactions are usually inter-temporal in the sense that one party

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offers something today in exchange for a promise of something in the future. Second and more fundamentally, in the political arena, parties cannot rely on contracts being enforced by a third party because powerful agents are, by definition, the ones who wield the power needed to enforce agreements. Thus, powerful agents face a commitment problem which may restrict the nature of the agreements they can reach with other agents.

In order to demonstrate the importance of commitment problems and the link between the ability to commit and social outcomes, let us suppose that powerful agents can somehow commit to a course of action: say, to repay loans or not expropriate others' investments. Then, less powerful agents will be willing to lend to powerful agents and start investment projects because they know that their property will not be expropriated. When only agents that actually do not have political power can commit, the situation may become more complicated, and reaching an efficient outcome will probably require a change in the distribution of political power. Conversely, when agents cannot commit, it will be very difficult to reach efficient outcomes that involve inter-temporal transactions. In general, we can summarize the link between commitment opportunities and social outcomes as follows.

The PCT and Commitment: *When parties **can make binding promises**, i.e., when a commitment technology is available, social outcomes will be **efficient** regardless of how much bargaining power the parties have or what the original distribution of political rights was like, since this only affects the distribution of the social surplus. We say that the **PCT applies**. When parties **cannot make binding promises** social outcomes will be **inefficient** and the bargaining power of the parties and the original distribution of political rights will influence the distribution as well as the size of the social surplus. In this case, we say that the **PCT does not apply**.*

5.2.2 A Formal Model to Test the PCT

Acemoglu (2003) develops a political economy model that formally illustrates why we should not expect the Coase Theorem to apply to politics. The model is a game between a ruler and a citizen. The citizen can work in the formal or the informal sector. In the formal sector the production function is $Y_F = e^{1-\alpha} + R$, where e is the effort level, $0 < \alpha < 1$ and $R > 0$ represents an exogenous source of income, such as the rents from natural resources. In the informal sector the production function is $Y_I = b^\alpha e^{1-\alpha}$, where $0 < b < 1$. There are two differences between the formal and informal sectors. Productivity is lower in the informal sector than it is in the formal sector $(b < 1)$. However, only the income that comes from the formal sector can be taxed. The utility function for the citizen is $Y - (1 - \alpha) e$, where Y is the citizen's income. The timing of events is as follows. First, the ruler decides to relinquish power $(r = 1)$ or not $(r = 0)$. If the ruler relinquishes, then the citizen selects a transfer to the ruler $S(Y_F)$, and he decides in which sector he is going to work $(m = 1$ for the formal sector and $m = 0$ for the informal sector) and how much effort he is going to put into that work. If the ruler does not relinquish, then the citizen selects the sector that he is going to work in and decides how much effort he is going to devote to his work; the ruler then selects a tax schedule $T(Y_F)$.

It is not difficult to prove that the unique sub-game perfect Nash equilibrium for this game is $r = 0$, $m = 0$, $e = b$, and $T(Y_F) = Y_F$, which is an inefficient outcome. But suppose for a moment that, before any player had made a decision, parties were able to sign an enforceable contract. In that case, it is not difficult to see that they would reach an efficient outcome. In other words, the parties would first agree to maximize the total surplus: the citizen would work in the formal sector $(m = 1)$ and he would devote the most efficient level of effort $(e = 1)$ to his work, generating a surplus of $Y = \alpha + R$. Then, taxes $T(Y_F)$ or transfers $S(Y_F)$ would be set in order to distribute this surplus between the ruler and the citizen.

The problem with this solution is that the contract will not be a credible agreement. The citizen knows that the ruler will not have any incentive to keep her original promise once the citizen has set $m = e = 1$ and the ruler has the chance to set $T(Y_F)$. In fact, the only reasonable expectation is that the ruler will appropriate all the income, i.e., $T(Y_F) = Y_F$, and, hence, the citizen will prefer to work in the informal sector ($m = 0$ and $e = b$). Alternatively, the ruler knows that the citizen will not have any incentive to keep his original promise once she relinquished. In fact, the only reasonable thing for her to expect is that, after she relinquishes, the citizen will set $S(Y_F) = 0$. Thus, the only possible equilibrium when the parties cannot commit to their promises is the inefficient outcome $r = 0$, $m = 0$, $e = b$, which yields a total surplus of $\alpha b + R$.

In order to escape from this outcome, Acemoglu (2003) considers an infinite-horizon repeated game whose stage game is the one just described. He finds that repeated interactions open the door to credible agreements and better, although not necessarily efficient, outcomes. Indeed, for intermediate levels of the common discount factor, he shows that the size of the equilibrium surplus depends on the bargaining power of the parties. Thus, in general, the Coase Theorem does not apply to politics because powerful parties can only partially commit to respect agreements.

Although simple repeated games have been implemented in the laboratory, we believe that it is better to begin testing the PCT with a simpler model. In the next section, we consider a two-period model that is designed to capture most of the key issues in Acemoglu's infinite-horizon model. The crucial simplification is that promises are only partially enforceable, in the sense that there is some probability agents can ignore them.

5.2.3 A Simple Model with Limited Commitment

Consider a simple game with only two players: a citizen and a ruler, denoted by C

and R, respectively. The citizen has an endowment of one unit of effort that he can use to produce a private good. The production function is given by:

$$Y = \frac{1}{2} + 2e,$$

where $e \in [0, 1]$ is the effort level. The citizen values the private good and leisure. The payoff function for the citizen is given by:

$$v_C = Y_d + \frac{1 - e^2}{2}, \tag{82}$$

where Y_d is his disposable income, i.e., his income after taxes and/or transfers.

The ruler has the power to tax the citizen but she can relinquish this power in exchange for a transfer. Thus, the payoff function for the ruler is given by:

$$v_R = rS + (1 - r)T, \tag{83}$$

where T indicates taxes, S indicates the transfer that she gets if she relinquishes and $r \in \{0, 1\}$ is her relinquish decision. Note that disposable income is gross income minus taxes or transfers, i.e., $Y_d = Y - rS - (1 - r)T$. Moreover, since only the private good can be taxed and used for transfers, it must be the case that $T \leq Y$ and $S \leq Y$.

The timing of events is as follows.

1. C selects the transfer S.

2. R decides to relinquish ($r = 1$) or not ($r = 0$).

   (a) If R relinquishes, then nature decides if S is enforceable (with a probability ρ that it is enforceable).

    i. If S is enforceable, then C selects e.

    ii. If S is not enforceable, then C selects e and has the chance to reset S.

(b) If R does not relinquish, then R selects T. C observes T and decides e. Nature decides if T is enforceable or not (with a probability π that it is enforceable).

    i. If T is not enforceable, then R decides on a new T.

    ii. Otherwise, the promised T applies.

This model can be represented as an extensive game with perfect information and random moves (see Osborne and Rubinstein, 1994). The appropriate notion of equilibrium for such games is the sub-game perfect Nash equilibrium. The following proposition formally characterizes the equilibrium of the game.

Proposition 5.1: *The simple model with limited commitment has a unique sub-game perfect Nash equilibrium which is given by:*

1. *Suppose that $\rho = 0$. Then the ruler does not relinquish ($r = 0$). Moreover:*

    (a) *If $\pi < \frac{1}{2}$, then the ruler promises to levy a tax equal to $T = \frac{1}{2} + 2\pi$ and the citizen works $e = 2\pi$;*

    (b) *If $\pi \geq \frac{1}{2}$, then the ruler promises to levy a tax equal to $T = 2.5 - \frac{1}{2\pi}$ and the citizen works $e = 1$.*

2. *Suppose that $\rho = 1$. Then the ruler relinquishes ($r = 1$) and the citizen works $e = 1$. Moreover:*

    (a) *If $\pi < \frac{1}{2}$, then the citizen promises $S = \frac{1}{2} + 4\pi - 2\pi^2$;*

    (b) *If $\pi \geq \frac{1}{2}$, then the citizen promises $S = 2$.*

Proof: See Appendix 5.1. ■

It is easy to see that the first best allocation is $e = 1$ and $Y = 1.5$, which yields a total social surplus equal to $TSur = 2.5$. The following corollary summarizes the total social surplus and the division of it for each equilibrium in Proposition 5.1.

Corollary 5.1: *Under the assumptions of Proposition 5.1.*

1. *Suppose that $\rho = 0$. Then:*

   (a) *If $\pi < \frac{1}{2}$, then the equilibrium outcome is Pareto inefficient. Moreover, the expected payoff for the ruler is $E[v_R] = \frac{1}{2} + 4\pi - 2\pi^2$; the expected payoff for the citizen is $E[v_C] = \frac{1}{2}$ and the total social surplus is $TSur = 1 + 4\pi - 2\pi^2 < 2.5$.*

   (b) *$\pi \geq \frac{1}{2}$, then the equilibrium outcome is Pareto efficient. Moreover, the expected payoffs for the ruler and the citizen are $E[v_R] = 2$ and $E[v_R] = \frac{1}{2}$, respectively.*

2. *Suppose that $\rho = 1$. Then, the equilibrium outcome is Pareto efficient. Moreover,*

   (a) *If $\pi < \frac{1}{2}$, then the expected payoffs of the ruler and the citizen are $E[v_R] = \frac{1}{2} + 4\pi - 2\pi^2$ and $E[v_C] = 2 - 4\pi + 2\pi^2$, respectively.*

   (b) *If $\pi \geq \frac{1}{2}$, then the expected payoffs of the ruler and the citizen are $E[v_R] = 2$ and $E[v_C] = \frac{1}{2}$, respectively.*

Proof: Straightforward deduction from Proposition 5.1. ■

The key issue in this game is commitment. The citizen would like to put in more effort, but he knows that the ruler will tax his income. The ruler knows this and she will be better off if she signs a credible agreement to restrict taxation. But, the problem is that she is the ruler and, hence, only she has the power to enforce agreements. Thus, her ability

to make a credible promise to limit taxation depends on her ability to tie her hands and commit herself to that. The probability $\pi \in [0,1]$ is a measure of the strength of this commitment. Another alternative is that she relinquishes her position in exchange for a payment. The problem. here again, is commitment. Once the citizen has the power, he will not be willing to keep his promise and the ruler will get nothing. The citizen would like to commit himself to paying the ruler if she relinquishes, but, here again, his ability to tie his hands is limited. The probability $\rho \in \{0,1\}$ is a measure of this ability. When neither the ruler nor the citizen can find a way to commit the outcome of the game is very inefficient. However, when either the ruler or the citizen can partially commit, it is possible to support more cooperative outcomes.

5.3 The Laboratory Experiment

In this section we describe our laboratory experiment. First, we provide a general description of the experiment, including its monetary payoffs, number of sessions and rounds, and the matching procedure. Second, we summarize the treatments and compute the corresponding predicted outcomes of Proposition 5.1 and Corollary 5.1.

5.3.1 General Description of the Experiment

The experiment was conducted between August and November 2012 at the Universidad de San Andrés, Argentina. We recruited graduate and undergraduate students from any field of study and regardless of how familiar they were with game theory. We conducted 10 sessions with 16 subjects each, totalling 160 participants. Subjects were allowed to participate in only one session.[90] Every session included the four treatments. In each

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[90]There was only one case in which a person who already had participated took the place of another subject who had to leave prior to the end of a session. We control for this case in the regressions.

treatment, subjects were asked to play a simple game involving limited commitment, as explained in section 2.3, for a specific value of π and ρ.[91] The experiment was programmed and conducted using z-Tree software (Fischbacher, 2007).

Before each session began, subjects were randomly assigned to computer terminals. After the 16 subjects were at their terminals, they received general instructions and, then, the rules of the game were explained using a PowerPoint presentation. Footnote The PowerPoint presentation can be found at.... Instructions and explanations were always presented to the subjects using neutral words. In particular, subjects were never told that they will be playing a political game and ruler and citizen were always denoted as player 1 and 2, respectively. In order to check whether participants understood the rules of the game, we asked them to take a five-question quiz. The quiz was administered after we had given the instructions, but before the rounds began. Subjects were paid approximately US\$ 0.81 per correct answer. Subjects then began playing rounds, during which they interacted solely through a computer network using z-Tree software. Finally, just before leaving the laboratory, all the subjects were asked to complete a questionnaire, which was designed to enable us to test the balance across experimental groups and to control for their characteristics in the econometric analysis presented below. For more details, please see Appendix 2, which contains the script of the general instructions, the five questions included in the quiz, a sample of the first three screens, along with the rules of the game, and the questionnaire itself.

Each session lasted approximately 90 minutes, and subjects earned, on average. US\$ 22.50, which included a US\$ 2.07 show-up fee, US\$ 0.81 per correct answer on the quiz, and US\$ 5.18 for each point they received during the paid rounds of the experiment.[92] All

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[91]Information about π and ρ was provided in the first three screens of each round and in a " help " box that was available at all times. The screen also contained a calculator.

[92]All payments were made in Argentine currency; at the time, US\$22.50 was equivalent to A\$ 108.

subjects were paid privately, in cash, after the experiment.[93]

In each session, subjects were first randomly assigned to one of two different roles -player 1 (the ruler) or player 2 (the citizen)- and then to four distinct treatments. All pairings were done through the computer. After each round, subjects were re-matched with another partner for the next round. No player knew the identity of the player with whom she was currently paired or the history of decisions made by any of the other players. Due to the fact that subjects maintained their treatment and role, there were only two possible partners for each subject.

Subjects played six rounds of the same game, with the caveat that they would never play two consecutive rounds with the same subject. The first two rounds were for practice, and the last four rounds were for pay. Subjects received a summary of the decisions taken by both themselves and their partners at the end of every round, including payoffs per round, their own accumulated payoffs for paid rounds, effort level, promises, total income before taxes, and nature's decision (when applicable); they were also reminded of the payoff functions of the game.

5.3.2 Treatments and Predicted Outcomes

The experiment consisted of four different treatments. The first treatment represents a scenario of no commitment opportunities ($\pi = \rho = 0$); the second, a scenario of low commitment opportunities for the ruler ($\pi = 0.25$ and $\rho = 0$); the third, a scenario of high (but not full) commitment opportunities for the ruler ($\pi = 0.75$ and $\rho = 0$); and the fourth, a scenario of full commitment opportunities for the citizen ($\pi = 0$ and $\rho = 1$). Employing Proposition 1 and Corollary 1, we can compute the outcome predicted by our parameterized model for all these treatments. Table 1 below depicts our four treatments

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[93]After the experiment was completed, a password appeared on each subject's screen. The subjects then had to present this password to the person who was running the experiment in order to receive their payoffs.

and the corresponding predicted outcomes. (Recall that e is effort, r is the relinquish decision, $\mathbf{E}\left[v_C\right]$ is the expected payoff for the citizen, $\mathbf{E}\left[v_R\right]$ is the expected payoff foe the ruler and $TSur$ is the total social surplus).

Please see Table 5.1: Treatments and Predicted Outcomes

As shown in Table 5.1, we should expect that the social surplus, defined as the sum of the individual payoffs for the players matched in each session and period, should be 1 for T1, 1.875 for T2, and 2.5 for T3 and T4. Rulers are expected to relinquish in T4 and do not to relinquish in the other treatments. Effort should be 0 in T1, 0.5 in T2, and 1 in T3 and T4. As for the distribution of the surplus, in T1, T2, and T3 the citizen should obtain an expected payoff of 0.5 and the ruler should receive 0.5, 1.375 and 2, respectively. Thus, in T1, T2 and T3, the ruler should keep all the increase in the social surplus due to the rise in commitment opportunities. Conversely, in T4, the ruler should receive an expected payoff of 0.5 and the citizen should obtain a payoff of 2, collecting all the increase in surplus due to the rise of commitment opportunities.

Our limited-commitment model is much simpler than the repeated game developed by Acemoglu (2003). Still, it is a multistage game in which any departure from the equilibrium path in one node of the game can easily induce changes in predicted outcomes, even if subjects play rationally in successive nodes. Altruism can also affect equilibrium outcomes, which are deduced implicitly based on the assumption that agents are selfish. Finally, subjects may not evaluate risky prospects based on a comparison of the expected utility of (83) and (82). Therefore, we should not expect that subjects in the laboratory can perfectly replicate the parameterized model predictions summarized in Table 5.1.[94] A less

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[94]For a more detailed methodological discussion of what we can learn from experiments about economic primitives and theoretical models, see Smith (2010), Friedman (2010) and Levine (2009).

demanding test for the model would be to check if laboratory results are consistent with the comparative statics predicted by it. For example, we should expect that the total surplus in T3 and T4 will be higher than in T1 for a wide range of levels of altruism. In other words, only extremely altruistic subjects could induce a sharp enough rise in the total surplus in T1 to make the difference between T3 and T1 negligible.

From Table 5.1 we can easily deduce the following three key comparative static predictions:

1. **Total Social Surplus**: The social surplus should increase when commitment opportunities rise. More precisely $TSur(j)$ indicates the total surplus in treatment Tj:

$$TSur(4) = TSur(3) > TSur(2) > TSur(1).$$

2. **Reallocation of Political Power**: As the citizen gains access to more commitment opportunities, the ruler should relinquish more. More precisely, $(\mathbf{Pr}(r = 1)(j)$ denotes the proportion of rulers that relinquish):

$$\mathbf{Pr}(r = 1)(4) > \mathbf{Pr}(r = 1)(3) = \mathbf{Pr}(r = 1)(2) = \mathbf{Pr}(r = 1)(1).$$

3. **Distribution of the Surplus**: The payoff for a player should increase with his/her own commitment opportunities and does not vary as a function of the other player's commitment opportunities. More precisely, $\mathbf{E}\left[v_i\right](j)$ denotes the expected payoff for player $i = C, R$ in treatment Tj):

$$\mathbf{E}\left[v_C\right](4) > \mathbf{E}\left[v_C\right](3) = \mathbf{E}\left[v_C\right](2) = \mathbf{E}\left[v_C\right](1),$$

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and

$$\mathbf{E}\left[v_R\right](3) > \mathbf{E}\left[v_R\right](2) > \mathbf{E}\left[v_R\right](1) = \mathbf{E}\left[v_R\right](4).$$

5.4 Understanding of the Game and Randomization Balance

Table 5.2 shows that on average subjects understood the rules of the game. Indeed, from a maximum in the quiz grade of 12 points, subjects scored on average 10.91 points. 89% of the subjects correctly answered question 1, 81% question 2, 89% question 3, and 78% question 4. It seems that subjects found that question 5 was more complicated and only 28% of them correctly answered it.

Table 5.2 also shows the randomization balance across player roles (citizen vs. ruler). Note that all characteristics and understanding of the rules of the game are perfectly balanced across roles, as the mean difference between citizens and rulers is not significantly different from zero either for subject characteristics or for their understanding of the game.

Please see Table 5.2: Balance Across Players (Rulers vs. Citizens)

Tables 5.3 and 5.4, show that in the comparisons among the four treatments, all characteristics and levels of understanding of the game were perfectly balanced between T1 and T2 and between T3 and T4. In some of the other cases, there is a slight imbalance in gender and nationality, mostly at a 10% significance level. Nevertheless, it was only in less than 10% of the tests that we rejected the null hypothesis at the 10% level of statistical significance. Moreover, the imbalance in nationality is probably due to the fact that there were very few foreigners in the sample (92.5% of the subjects were Argentines).

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5.5 Main Results: Comparative Statics

In this section we present the main results of the experiment. Overall, we find support for the hypothesis that greater commitment opportunities lead, on average, to better social outcomes. We first provide a descriptive analysis of the decisions taken by the subjects, and then present the econometric results obtained when testing the comparative statics.

5.5.1 Descriptive Analysis

Table 5.5 shows descriptive statistics for the main decisions taken by the subjects. These include effort (e), relinquish decision (r), promises about T and S, selected T and S in the event of no enforcement (decided values), and the final values actually charged and transferred. We also present the payoffs for the ruler (v_R) and the citizen (v_C), as well as the total combined surplus ($TSur$).

Total Social Surplus: Figure 5.1 shows the mean social surplus and its standard deviation across treatments. As predicted by the model, the mean surpluses for T3 and T4 are greater than for T1 and T2. Though the mean surplus in T4 is slightly larger than in T3, the difference is very small. Even though the exact magnitudes of the surpluses are not replicated empirically, the relative magnitudes tend to support the predictions of the model. Since the social surplus is an increasing function of effort, essentially the same

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pattern can be seen in the effort decisions. Indeed, the average effort level is 0.32 in T1, 0.33 in T2, 0.62 in T3 and 0.66 in T4. Thus, as predicted by the model, effort is higher in T3 and T4 than in T1 and T2. However, average effort levels are lower than theoretical predictions for all treatments except T1.

Note that the mean surplus is concentrated at two points (around 1.5 and around 2). Subjects appear to act similarly when the probability of enforcement is zero or very close to zero (namely, 25%). In these situations, the social surplus is rather small, as citizens decide to reduce their effort in the hope of preventing the ruler from confiscating their income. As the probability of enforcement rises to 75%, the results begin to cluster around a total surplus of about 2 points, as commitment opportunities now allow for more socially efficient results. Figure 5.2 shows that the mean social surplus fluctuates considerably across rounds of the experiment, especially for T1 and T3, but there is no clear pattern.

Please see Figure 5.1: Total Social Surplus, by Treatment

Please see Figure 5.2: Total Social Surplus, by Experimental Round

Reallocation of Political Power: Regarding the decision to relinquish power or not, approximately 10% of rulers relinquished power in T1, 3.7% in T2, 2.5% in T3, and 51% in T4. As predicted by the model, the percentage increases considerably from T1, T2, and from T3 to T4; nonetheless, the difference is not as large as theoretical predictions suggested (rulers should never relinquish in T1, T2 or T3 and always relinquish in T4).

Distribution of the Surplus: As predicted by the model, the payoff for citizens is, on average, higher in T4 (0.903) than in T1 (0.573), T2 (0.494), or T3 (0.722), while the payoff for rulers is, on average, higher in T3 (1.236) than in T2 (1.037) and higher in T2 than in T1 (0.94). However, the distribution of the social surplus between rulers and citizens does

not exactly coincide with theoretical predictions. In T1, citizens earned an average of 0.573 points and rulers an average of 0.903. Thus, approximately 80% of the 0.513 extra points with respect to theoretical predictions went to rulers. In T2, rulers earned an average of 1.037 points and citizens an average of 0.494. Thus, on average, citizens obtained the payoff predicted by the model, while rulers obtained 0.3 points less. In T3, rulers earned an average of 1.236 points and citizens an average of 0.722, rather than the 2 and 0.5 points predicted by the model, respectively. Last, in T4, rulers earned an average of 1.109 points rather than the 0.5 points predicted by the model, while citizens received only 0.903 points rather than the 2 points predicted by the model.

5.5.2 Regression Analysis

We now formally test our three comparative static results using regression analysis.

Total Social Surplus: In order to formally test the hypotheses that more commitment opportunities lead to better social outcomes (a larger social surplus) we use the following regression model:

$$TSur_{gps} = \alpha + \beta_1 \mathrm{DT} + \beta_2 X_{gps} + \sum_{s=1}^{9} \beta_{3s}\theta_s + \beta_{4s}Q_{gps} + \epsilon_{gps}, \tag{84}$$

where g indexes a particular pairing of subject partners, $p = 1, 2, ..., 4$ indexes experimental rounds, and $s = 1, 2, ..., 10$ indexes experimental sessions. There are 32 pairings of subject partners in the data set, but only 16 of them will figure in each estimated regression.

Total surplus per group, session and round ($TSur$) is the dependent variable. $TSur$ is computed as the sum of the payoffs for the citizen and the ruler in each group, session and paid round. Therefore, each observation corresponds to a given pair of subjects in a particular session and round. The explanatory variable of interest is DT, a dummy

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variable indicating treatment status (T2, T3 or T4). In some specifications we also include control variables. We control for individual characteristics X_{gps} (for both subjects in group g we control for gender, age, nationality, whether s/he is a native English speaker, for racial group, for whether s/he has ever taken a course in game theory, for whether s/he is a graduate or a junior or senior undergraduate student),[95] for the subjects' level of understanding of the game as measured by their answers to the quiz questions Q_{gps} (mean quiz-mark per group and quiz-mark of the citizen in each group), and for fixed effects by session (θ_s).

According to our theoretical predictions, we should expect β_1 to be positive when comparing T2 to T1, T3 to T2, T3 to T1 and T4 to T1, while we should expect β_1 to be zero when contrasting T4 with T3.

Table 5.6 summarizes the results of regressing the total surplus in each of the treatments separately without controls. Clustered standard errors at the corresponding unit of analysis are shown in parentheses. Each unit of analysis is a given pair of subjects in a certain session and in all the rounds they participate in, while each observation in the regression corresponds to a given pair of subjects in a certain session and round. The total surplus in T2 is not significantly different from the total surplus in T2, though the coefficient associated with the treatment is indeed positive, in keeping with the model prediction. Operating under the parameters in T3 (or T4) rather than under T2 (or T1) induces a significant rise in the total surplus which ranches from 0.426 to 0.499 points, which is an increase of approximately 30% over the counterfactual. Thus, as predicted by our model, higher commitment opportunities tend to lead to better social outcomes. Finally, total surpluses in T3 and T4 are not significantly different, which suggests that the subjects understood that, in order to take advantage of the citizen's commitment opportunities, in

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[95]For a more detailed description of the questionnaire used to collect information about individual characteristics, see Appendix 2

T4 the ruler must relinquish.

Please see Table 5.6: Regression Analysis (Without Controls): Total Surplus

In Table 5.7, we report the results when the same analysis is performed once the entire set of controls, as described above, was included. As the reader will see, the results did not change in any meaningful way.[96]

Please see Table 5.7: Regression Analysis (Including Controls): Total Surplus

To sum up: Large improvements in commitment opportunities (from T1 to T3 or T4) have a significant positive effect on the social surplus, while a small change (from T1 to T2) has no more than a small positive (and statistically non-significant) effect.

Reallocation of Political Power: In order to formally test the hypothesis that the probability of a reallocation of political power is higher when the citizen has more commitment opportunities, we use the following regression model:

$$r_{gps} = \alpha + \beta_1 \mathrm{DT} + \beta_2 X_{gps} + \sum_{s=1}^{9} \beta_{3s}\theta_s + \beta_{4s}Q_{gps} + \epsilon_{gps}, \tag{85}$$

where g indexes a particular pairing of subject partners, $p = 1, 2, ..., 4$ indexes experimental rounds, and $s = 1, 2, ..., 10$ indexes experimental sessions. Relinquish (r) is the dependent variable. Explanatory and control variables are the same as in the regression model (84).

According to our theoretical predictions, we should expect β_1 to be positive when comparing T4 to T1, T2 or T3, while we should expect β_1 to be zero when contrasting T1 with T2, or T3 and T1 with T2.

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[96]Including the controls by round within each session does not alter the results either.

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Table 5.8 summarizes the results of a regression analysis of the decision to relinquish power in each of the treatments separately. Clustered standard errors at the corresponding unit of analysis are shown in parentheses. As predicted by our model, operating under the parameters in T4 rather than in T1, T2 or T3 induces a positive and statistically significant increase in the decision to relinquish power. The proportions of rulers that relinquish power is not significantly different in T1 than in T2, or in T2 than in T3. Although the proportion of rulers who relinquish power is significantly higher in T1 than in T3, the magnitude of the difference is very low.

Please see Table 5.8: Regression Analysis: Reallocation of Political Power

Distribution of the Surplus: In order to formally test the hypotheses that the payoff for a player increases with his/her own commitment opportunities and does not vary or decrease in line with the other player's commitment opportunities, we use the following regression model:

$$v_{igps} = \alpha + \beta_1 \mathrm{DT} + \beta_2 X_{gps} + \sum_{s=1}^{9} \beta_{3s}\theta_s + \beta_{4s}Q_{gps} + \epsilon_{gpsi}, \tag{86}$$

where g indexes a particular pairing of subject partners, $p = 1, 2, ..., 4$ indexes experimental rounds, $s = 1, 2, ..., 10$ indexes experimental sessions. The payoff for player i (v_i) is the dependent variable. Explanatory and control variables are the same as in the regression model (84).

According to our theoretical predictions for the ruler, we should expect β_1 to be positive when comparing T3 to T1, T2 or T4 and when comparing T2 to T1 or T4, while we should expect β_1 to be zero when contrasting T1 with T4. For the citizen, we should expect β_1 to be positive when comparing T4 to T1, T2 or T3, while we should expect β_1 to be zero when contrasting T1 with T2 or T3.

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Tables 5.9 and 5.10 summarize the results of regressing the payoffs for rulers and citizens, respectively, in each of the different treatments. Clustered standard errors for the corresponding unit of analysis are shown in parentheses. As predicted by our model, operating under the parameters in T3 rather than in T1, T2 or T4 induces a positive and statistically significant effect on the payoff for rulers (one-tailed test). Contrary to what is suggested by our model, however, operating under the parameters in T4 rather under T1 or T2 induces a positive and statistically significant effect on the payoff for rulers. As predicted by our model theory, operating under the parameters in T4 rather than in T1, T2 or T3 also induces a positive and statistically significant rise in the payoff for citizens, while operating under the parameters in T1 rather than in T2 has no effect on citizens' payoff. Contrary to our model, operating under the parameters of T3 induces a positive and statistically significant increase in the payoff for citizens.

Please see Table 5.9: Regression Analysis: Payoff of the Ruler

Please see Table 5.10: Regression Analysis: Payoff of the Citizen

5.6 Beyond Comparative Statics

As mentioned in section 5.3, we should not expect subjects in the laboratory to exactly replicate equilibrium outcomes. It is very interesting to identify departures from the benchmark provided by our model and to explore how and why they occur.

A comparison of Tables 5.1 and 5.5 clearly shows that, for low levels of commitment (T1), there is more cooperation than predicted by our calibrated model, while the opposite is true for high levels of commitment (T2, T3 and T4). Big improvements in commitment opportunities (from T1 to T3 or T4) have a significant effect on the social surplus, while smaller changes (from T1 to T2) do not. It is also evident that rulers do not always

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relinquish in T1, T2, and T3 and only 51% of the rulers relinquish in T4. Nor is the distribution of the surplus exactly as predicted. Sometimes one of the players systematically obtained more or less than theoretical predictions would indicate.

Next, we can take an even closer look at the study of subjects' behavior by exploring their decisions at key nodes of the game. Table 5.11 breaks down the results shown in Table 5.5 into the relevant nodes. When the ruler relinquishes, there are no promises made or decisions taken about tax T, and therefore no observations appear in those columns. Similarly, when the ruler does not relinquish, decisions about S are left blank.

Please see Table 5.11: Beyond Comparative Statics

Under T1, the total surplus is, on average, larger than the amount predicted by the theory (1.513 points versus 1 point). In part, this difference is accounted for by a small fraction of rulers who wrongly selected $r = 1$. As Table 5.11 shows, in T1 rulers relinquished 8 times, which accounts for 10% of the observations. Note that, conditional on $r = 1$, it is optimal for the citizens to select the maximum possible level of effort, i.e., $e = 1$, inducing a total surplus of 2.5 points. Indeed, we can observe from Table 5.11 that, within this group, the average level of effort was 0.95 and the average surplus was 2.445 points. However, contrary to theoretical predictions, citizens did not keep all the surplus for themselves. The average payoff for the rulers was 0.594 points. Thus, it seems that citizens are being altruists in their dealings with the rulers.[97]

Not all of the difference between the predicted and actual total surpluses under T1 can be attributed to rulers who wrongly selected $r = 1$. Indeed, as Table 5.11 shows, the average total surplus for the 72 observations in which rulers selected $r = 0$ is 1.409 points,

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[97]Note that this is not an ultimatum game. The citizen can appropriate the entire surplus or can share a portion of it with the ruler, but the ruler does not have the opportunity to accept or reject the distribution selected by the citizen.

while the average level of effort is 0.257. Thus, citizens are putting in more effort than they should (0.257 versus 0) and, as a consequence, they are losing on average 0.069 points since they achieved an average of 0.431 points, whereas they could have obtained 0.5 points by selecting $e = 0$. This generates an average extra payoff of 0.478 points for the rulers. On average, they received 0.978 points when they could have obtained 0.5 points if $e = 0$. Summing up, on average, citizens are giving up 0.069 points and rewarding the rulers with 0.478 points. Again, it seems that citizens are being altruists.

Similar effects have been found to exist in previous laboratory experiments. Andreoni and Miller (1993) find stable levels of cooperation of around 10%-15% when the model predicted no cooperation and they attribute this to altruism. Camerer and Weigelt (1988) estimate that the subjective prior that an opponent would play cooperatively is about 17% and McKelvey and Palfrey (1992) estimate that the proportion of altruists is between 5% and 10%. Keeneth and Martin (2001) investigate how fairness concerns influence individual behavior in social dilemmas using a sequential prisoner's dilemma experiment. They also find that the proportion of altruists is between 12.5% and 26%.[98]

Finally, it is important to note that rulers who selected $r = 1$ obtained, on average, a lower payoff (0.594 points) than those that selected $r = 0$ (0.978 points). However, wrongly relinquishing does not appear to be the result of comprehension problems. (Actually, the average quiz grade is higher for those who selected $r = 1$). Rather, we posit that such behavior could be explained by the fact that some rulers were acting out of a desire to see how altruistically their citizens would behave.

Under T2, the total surplus is, on average, lower than predicted (1.531 versus 1.875 points). As in the case of T1, there are some rulers who wrongly selected $r = 1$ (only

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[98]More generally, Andreoni and Miller 2002 find that subjects exhibit a consistent preference for altruism, while Charness and Haruvy (2002) test competing theories of non-pecuniary motives. They find that reciprocity, fairness, and altruism all play an important role in subjects' decisions.

3 observations, in this case), which marginally increases the average total surplus. If we focus on the 77 observations in which rulers selected $r = 0$, the average total surplus is 1.508 points. Why was the total surplus lower than predicted (1.508 versus 1.875 points)? The answer is that citizens put in less effort than they should have. The average e was 0.322, whereas it should have been 0.5. As a consequence, citizens lost an average of 0.053 points while rulers had an average of 1.061 when they could have obtained 1.375 points. But the real problem is the fact that some of the rulers promised too high a tax. As Table 5.11 shows, the average $T_{promised}$ was 1.128 points, when it should have been 1.

As in the case of T2, under T3 the average surplus is also lower than predicted. On average, the total surplus was 1.957 points for all the observations and 1.943 points when rulers selected $r = 0$, versus a prediction of 2.5 points.[99] Why is the total surplus lower than predicted? As in the case of T2, under T3 citizens also put in less effort than they should have. The average e was 0.618 but should have been 1. However, this time the problem is not that the rulers promised too high a tax. On the contrary, they promised a tax that was lower than predicted. As Table 5.11 shows, on average $T_{promised}$ is 1.424 versus a prediction of 1.83. The key problem is that citizens put in too little effort. As a consequence, rulers obtained less than predicted (an average of 1.267 points versus a prediction of 2 points), and citizens obtained more (an average of 0.678 points versus a prediction of 0.5 points).

Under T4, the total surplus is, on average, lower than predicted (2.012 points versus 2.5). Most of the difference is accounted for by rulers that took the wrong relinquish decision. Indeed, if we focus on the 51% (41 observations) of the rulers who selected the right relinquish decision, i.e., $r = 1$, then the total surplus is, on average, 2.480 points and the average e is 0.99. Rulers that selected $r = 1$ obtained, on average, more than predicted

[99]Under T3 there are only two observations in which the rulers wrongly selected $r = 1$

(1.191 points versus 0.5 points), while citizens obtained less (1.298 points versus 2 points). The only possible explanation for this outcome is that citizens are altruistic.

If the ruler wrongly decided that $r = 0$ (this happened in 39 observations, i.e., 49% of the time), then the subsequent game is as in T1 when $r = 0$. If subjects believe that the game will be played as in T1, then rulers and citizens should expect to obtain an average of 0.978 and 0.431 points, respectively. In reality, they obtained an average of 1.023 and 0.487 points, respectively. Thus, it seems that rulers realized that citizens were being altruistic and internalized this preference in their relinquish decision. Indeed, when rulers selected $r = 1$, citizens offered an average of 1.191 points, whereas, when rulers selected $r = 0$, citizens offered an average of 0.732 points. In other words, this suggests that rulers relinquished only when citizens offered a transfer S that takes into account the fact that citizens will behave altruistically. Note that it is also possible that the logic of the ultimatum game applies here.[100] If a citizen shows that s/he is too greedy by offering a very low S, then the ruler will punish her or him by selecting $r = 0$ which will significantly reduce the payoff for the citizen. Indeed, rulers are not losing a great deal when they take the wrong relinquish decision, while citizens are paying the total cost when rulers relinquish.

5.7 Conclusions

In this paper we have developed a simple model with limited commitment and have tested it by means of a laboratory experiment. Overall, the experiment provides support for the hypothesis that more commitment opportunities lead to better social outcomes. Indeed, we find that this link is valid even when a reallocation of political power is required to take

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[100]There are numerous papers that report results from ultimatum games. See, for example, Forsythe, Horowitz, Savin and Sefton (1994); Hoffman, McCabe, Shachat, Smith (1994); Hoffman, McCabe and Smith (1996); and Slonim and Roth (1998).

advantage of new commitment opportunities. However, we also find that, at low levels of commitment, there is more cooperation than strictly predicted by our model, while the opposite is true at high levels of commitment. We also find that only large improvements in commitment opportunities have a significant effect on the social surplus, while small changes do not. It seems that the presence of altruism accounts for a great deal, but not all, of these differences.

Although further research is needed, our results have very interesting implications for the political economy of reforms. Indeed, if a society begins with low levels of commitment, we should not expect to see major gains in the social surplus as commitment opportunities gradually expand (as a result of, for example, gradual institutional improvements). Instead, only a large change in commitment opportunities will significantly influence the social surplus. This suggests that gradual reforms may not be very effective and that only more radical reforms (or possibly a progressive accumulation of institutional improvements) will bring about an observable social change. The good news is that we find that subjects understand that in some cases, in order to take advantage of new commitment opportunities, political power must be reallocated to the agents who can credibly commit. This suggests that, under the right circumstances, the identity of the agents who develop new commitment opportunities is not an overwhelmingly crucial factor.

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Table 5.1: Treatments and Predicted Outcomes

Treatment (π, ρ)	e	r	v_R	v_C	$Sprom$	$Tprom$	Y	$\mathbf{E}[v_R]$	$\mathbf{E}[v_C]$	$TSur$
T1 (0,0)	0.00	0	0.50	0.50	-	0.500	0.500	0.500	0.500	1.000
T2 (0.25,0)	0.50	0	$v_R(T2)$	$v_C(T2)$	-	1.000	1.500	1.375	0.500	1.875
T3 (0.75,0)	1.00	0	$v_R(T3)$	$v_C(T3)$	-	1.830	2.500	2.000	0.500	2.500
T4 (0,1)	1.00	1	0.50	2.00	0.500	-	2.500	0.500	2.000	2.500

where:

$$v_R(T2) = \begin{pmatrix} 1.000 & \mathbf{Pr} = 0.25 \\ 1.500 & \mathbf{Pr} = 0.75 \end{pmatrix}$$

$$v_C(T2) = \begin{pmatrix} 0.875 & \mathbf{Pr} = 0.25 \\ 0.375 & \mathbf{Pr} = 0.75 \end{pmatrix}$$

$$v_R(T3) = \begin{pmatrix} 1.833 & \mathbf{Pr} = 0.75 \\ 2.500 & \mathbf{Pr} = 0.25 \end{pmatrix}$$

$$v_C(T2) = \begin{pmatrix} 0.667 & \mathbf{Pr} = 0.75 \\ 0.000 & \mathbf{Pr} = 0.25 \end{pmatrix}$$

Table 5.2: Balance Across Players (Rulers vs. Citizens)

| | Complete Sample | | | | Ruler | | | Citizen | | | |
	N	Mean	S.d	N	Mean	S.d	N	Mean	S.d	Mean	p
Characteristics											
Gender (male=1)	160	0.61	0.49	80	0.66	0.48	80	0.56	0.50	0.10	0.197
Age	160	20.53	2.43	80	20.44	2.49	80	20.61	2.37	-0.17	0.650
Nationality (Argentine=1)	160	0.93	0.26	80	0.93	0.27	80	0.93	0.27	0.00	1.000
Fluent in English (=1)	160	0.99	0.08	80	1.00	0.00	80	0.99	0.11	0.01	0.319
Race (White=1)	160	0.75	0.43	80	0.73	0.45	80	0.78	0.42	-0.05	0.468
Studied Game Theory (=1)	160	0.51	0.50	80	0.48	0.50	80	0.55	0.50	-0.07	0.346
Undergraduate Studies (=1)	160	0.47	0.50	80	0.51	0.50	80	0.43	0.50	0.08	0.270
Graduate Studies (=1)	160	0.01	0.11	80	0.03	0.16	80	0.00	0.00	0.03	0.157
Understanding											
Quiz-Mark	160	10.91	2.96	80	11.06	2.97	80	10.76	2.97	0.30	0.523
Answered correctly: question 1	160	0.89	0.31	80	0.90	0.30	80	0.89	0.32	0.01	0.799
Answered correctly: question 2	160	0.81	0.40	80	0.84	0.37	80	0.78	0.42	0.06	0.320
Answered correctly: question 3	160	0.89	0.31	80	0.89	0.32	80	0.90	0.30	-0.01	0.799
Answered correctly: question 4	160	0.78	0.42	80	0.81	0.39	80	0.74	0.44	0.07	0.259
Answered correctly: question 5	160	0.27	0.44	80	0.25	0.44	80	0.29	0.46	-0.04	0.595

*Significant at 10%; **significant at 5%; ***significant at 1%.

Table 5.3: Balance Across Treatments I

		Complete Sample		T1		T2		T3		T4	
	N	Mean	S.d	Mean	S.d	Mean	S.d	Mean	S.d	Mean	S.d
Characteristics											
Gender (male=1)	160	0.61	0.49	0.73	0.45	0.70	0.46	0.50	0.51	0.53	0.51
Age	160	20.53	2.43	20.90	2.77	20.20	1.99	20.63	2.68	20.38	2.22
Nationality (Argentine=1)	160	0.93	0.26	0.88	0.33	0.88	0.33	0.98	0.16	0.98	0.16
Fluent in English (=1)	160	0.99	0.08	0.98	0.16	1.00	0.00	1.00	0.00	1.00	0.00
Race (White=1)	160	0.75	0.43	0.68	0.47	0.80	0.41	0.83	0.38	0.70	0.46
Studied Game Theory (=1)	160	0.51	0.50	0.57	0.50	0.50	0.51	0.40	0.50	0.57	0.50
Undergraduate Studies (=1)	160	0.47	0.50	0.40	0.50	0.55	0.50	0.43	0.50	0.50	0.51
Graduate Studies (=1)	160	0.01	0.11	0.03	0.16	0.00	0.00	0.03	0.16	0.00	0.00
Understanding											
Quiz-Mark	160	10.91	2.96	10.5	2.88	10.80	3.52	11.18	2.72	11.18	2.72
Answered correctly: question 1	160	0.89	0.31	0.93	0.27	0.90	0.30	0.90	0.30	0.85	0.36
Answered correctly: question 2	160	0.81	0.40	0.75	0.44	0.88	0.33	0.78	0.42	0.83	0.38
Answered correctly: question 3	160	0.89	0.31	0.88	0.33	0.85	0.36	0.93	0.27	0.93	0.27
Answered correctly: question 4	160	0.78	0.42	0.70	0.46	0.73	0.45	0.85	0.36	0.83	0.38
Answered correctly: question 5	160	0.27	0.44	0.25	0.44	0.25	0.44	0.28	0.45	0.30	0.46

There were 40 observations of each of these characteristics in all treatments.

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Table 5.4: Balance Across Treatments II

	T1/T2	T2/T3	T3/T4	T1/T3	T1/T4	T2/T4
Characteristics						
Gender (male=1)	0.808	0.069*	0.826	0.039**	0.066*	0.111
Age	0.198	0.423	0.650	0.653	0.352	0.711
Nationality (Argentine=1)	1.000	0.092*	1.000	0.092*	0.092*	0.092*
Fluent in English (=1)	0.320	1.000	1.000	0.320	0.320	1.000
Race (White=1)	0.209	0.778	0.194	0.124	0.812	0.308
Studied Game Theory (=1)	0.507	0.375	0.120	0.120	1.000	0.507
Undergraduate Studies (=1)	0.148	0.269	0.507	0.823	0.375	0.659
Graduate Studies (=1)	0.320	0.320	0.320	1.000	0.320	1.000
Understanding						
Quiz-Mark	0.678	0.595	1.000	0.284	0.284	0.595
Answered correctly: question 1	0.697	1.000	0.505	0.697	0.294	0.505
Answered correctly: question 2	0.156	0.245	0.582	0.796	0.419	0.537
Answered correctly: question 3	0.749	0.294	1.000	0.462	0.462	0.294
Answered correctly: question 4	0.808	0.176	0.765	0.111	0.194	0.290
Answered correctly: question 5	1.000	0.802	0.808	0.802	0.622	0.622

*Significant at 10%; **significant at 5%; ***significant at 1%.

Table 5.5: Decisions Across Treatments (Descriptive Statistics)

	e	r	T Prom.	S Prom.	T Decid.	S Decid.	T	S	v_R	v_C	$TSur$
T1	80	80	72	80	72	8	72	8	80	80	80
	0.326	0.100	0.887	7.650	1.771	0.594	1.771	0.594	0.940	0.573	1.513
	0.420	0.302	0.736	28.797	1.992	0.696	1.992	0.696	0.735	0.532	0.642
T2	80	80	77	80	58	3	77	3	80	80	80
	0.338	0.038	1.128	1.625	1.835	0.417	1.658	0.417	1.037	0.494	1.531
	0.421	0.191	0.630	0.737	1.274	0.722	1.168	0.722	0.794	0.410	0.639
T3	80	80	78	80	24	2	78	2	80	80	80
	0.628	0.025	1.424	1.561	2.138	0.000	1.656	0.000	1.236	0.722	1.957
	0.453	0.157	0.389	0.730	0.646	0.000	0.595	0.000	0.731	0.550	0.679
T4	80	80	39	80	39	0	39	41	80	80	80
	0.664	0.513	1.367	0.970	1.612	-	1.612	1.191	1.109	0.903	2.012
	0.440	0.503	3.918	0.404	1.110	-	1.110	0.302	0.545	0.496	0.657

Missing values appear in $SDecided$ for T4 because promises of citizens are enforceable with certainty.

Figure 5.1: Total Social Surplus, by Treatment
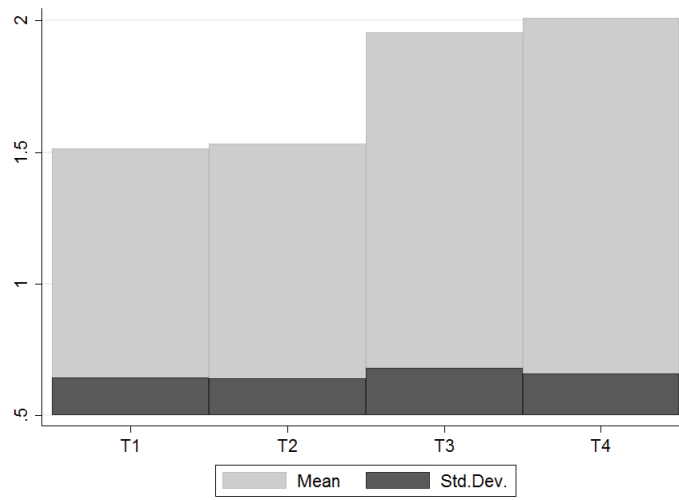
Figure 5.2: Total Social Surplus, by Experimental Round
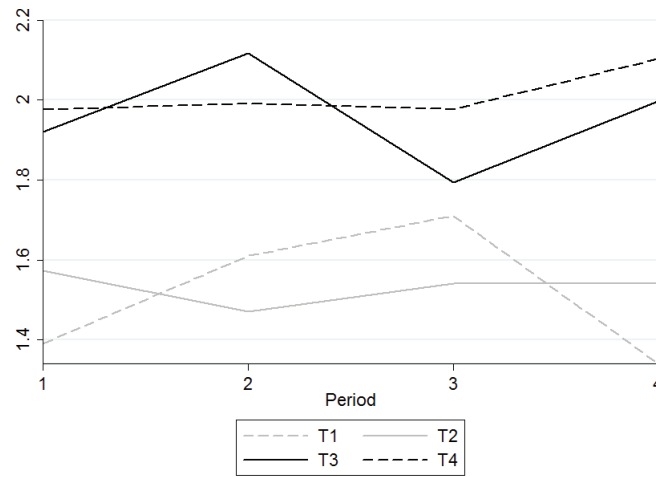
Table 5.6: Regression Analysis (Without Controls): Total Surplus

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Treatment 1 (=0) vs Treatment 2 (=1)	0.018[a]					
	(0.114)					
Treatment 1 (=0) vs Treatment 3 (=1)		0.444***				
		(0.124)				
Treatment 1 (=0) vs Treatment 4 (=1)			0.499***			
			(0.109)			
Treatment 2 (=0) vs Treatment 3 (=1)				0.426***		
				(0.123)		
Treatment 2 (=0) vs Treatment 4 (=1)					0.481***	
					(0.107)	
Treatment 3 (=0) vs Treatment 4 (=1)						0.054
						(0.118)
Controls	NO	NO	NO	NO	NO	NO
N	160	160	160	160	160	160
R-squared	0.000	0.103	0.130	0.096	0.122	0.002

Clustered standard errors are shown in parentheses.

*Significant at 10%; **significant at 5%; ***significant at 1%.

[a] Not significant in a one-sided test either.

Table 5.7: Regression Analysis (Including Controls): Total Surplus

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Treatment 1 (=0) vs Treatment 2 (=1)	0.012[a]					
	(0.127)					
Treatment 1 (=0) vs Treatment 3 (=1)		0.473***				
		(0.160)				
Treatment 1 (=0) vs Treatment 4 (=1)			0.530***			
			(0.127)			
Treatment 2 (=0) vs Treatment 3 (=1)				0.402***		
				(0.143)		
Treatment 2 (=0) vs Treatment 4 (=1)					0.636***	
					(0.131)	
Treatment 3 (=0) vs Treatment 4 (=1)						0.105
						(0.127)
Controls	YES	YES	YES	YES	YES	YES
N	160	160	160	160	160	160
R-squared	0.130	0.201	0.292	0.282	0.291	0.136

Clustered standard errors are shown in parentheses.

*Significant at 10%; **significant at 5%; ***significant at 1%.

[a] Not significant in a one-sided test either.

Table 5.8: Regression Analysis: Reallocation of Political Power

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Treatment 1 (=0) vs Treatment 2 (=1)	-0.037					
	(0.0452)					
Treatment 1 (=0) vs Treatment 3 (=1)		-0.097**				
		(0.0447)				
Treatment 1 (=0) vs Treatment 4 (=1)			0.425***			
			(0.0738)			
Treatment 2 (=0) vs Treatment 3 (=1)				-0.0250		
				(0.0226)		
Treatment 2 (=0) vs Treatment 4 (=1)					0.520***	
					(0.0790)	
Treatment 3 (=0) vs Treatment 4 (=1)						0.571***
						(0.0495)
Controls	YES	YES	YES	YES	YES	YES
N	160	160	160	160	160	160
R-squared	0.142	0.229	0.318	0.295	0.366	0.434

Clustered standard errors are shown in parentheses.

*Significant at 10%; **significant at 5%; ***significant at 1%.

Table 5.9: Regression Analysis: Payoff of the Ruler

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Treatment 1 (=0) vs Treatment 2 (=1)	0.088					
	(0.152)					
Treatment 1 (=0) vs Treatment 3 (=1)		0.295*^{a}				
		(0.174)				
Treatment 1 (=0) vs Treatment 4 (=1)			0.187^b			
			(0.138)			
Treatment 2 (=0) vs Treatment 3 (=1)				0.195^b		
				(0.141)		
Treatment 2 (=0) vs Treatment 4 (=1)					0.218^b	
					(0.142)	
Treatment 3 (=0) vs Treatment 4 (=1)						-0.152^b
						(0.116)
Controls	YES	YES	YES	YES	YES	YES
N	160	160	160	160	160	160
R-squared	0.157	0.211	0.211	0.247	0.176	0.184

Clustered standard errors are shown in parentheses.

*Significant at 10%; **significant at 5%; ***significant at 1%.

^{a} Significant at the 0.05 level in a one-sided test.

^{b} Significant at the 0.1 level in a one-sided test.

Table 5.10: Regression Analysis: Payoff of the Citizen

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Treatment 1 (=0) vs Treatment 2 (=1)	-0.076					
	(0.0682)					
Treatment 1 (=0) vs Treatment 3 (=1)		0.178**				
		(0.0850)				
Treatment 1 (=0) vs Treatment 4 (=1)			0.343***			
			(0.0920)			
Treatment 2 (=0) vs Treatment 3 (=1)				0.207***		
				(0.0676)		
Treatment 2 (=0) vs Treatment 4 (=1)					0.418***	
					(0.0919)	
Treatment 3 (=0) vs Treatment 4 (=1)						0.258***
						(0.0746)
Controls	YES	YES	YES	YES	YES	YES
N	160	160	160	160	160	160
R-squared	0.144	0.153	0.216	0.240	0.204	0.124

Clustered standard errors are shown in parentheses.

*Significant at 10%; **significant at 5%; ***significant at 1%.

[a] Not significant in a one-sided test either.

Table 5.11: Beyond Comparative Statics (T1 and T2)

	e	S_P	T_P	S_D	T_D	S	T	v_R	v_C	$TSur$	Y	Q_C	Q_R
T1													
All	80	80	80	80	72	80	80	80	80	80	1.153	80	80
	0.326	7.649	0.798	0.798	1.770	0.059	1.593	0.94	0.572	1.512		11.55	9.45
	0.419	28.797	0.747	0.747	1.992	0.273	1.963	0.734	0.532	0.642		2.574	2.746
$r=0$	72	72	72	-	72	-	72	72	72	72	1.014	72	72
	0.257	8.320	0.887	-	1.771	-	1.771	0.978	0.431	1.409		9.375	11.375
	0.383	30.301	0.736	-	1.992	-	1.992	0.734	0.236	0.591		2.801	2.564
$r=1$	8	8	-	8	-	8	-	8	8	8	2.400	8	8
	0.950	1.616	-	0.594	-	0.594	-	0.594	1.851	2.445		10.125	13.125
	0.093	0.397	-	0.696	-	0.696	-	0.696	0.749	0.102		2.232	2.232
T2													
All	80	80	80	80	58	80	80	80	80	80	1.175	80	80
	0.337	1.625	1.087	1.086	1.835	0.015	1.596	1.036	0.494	1.531		10.8	10.8
	0.420	0.736	0.654	0.654	1.273	0.139	1.188	0.794	0.410	0.638		3.622	3.361
$r=0$	77	77	77	-	58	-	77	77	77	77	1.144	77	77
	0.322	1.607	1.128	-	1.835	-	1.658	1.061	0.447	1.508		10.831	10.831
	0.415	0.736	0.630	-	1.274	-	1.168	0.792	0.319	0.631		3.412	3.679
$r=1$	3	3	-	3	-	3	-	3	3	3	1.967	3	3
	0.733	2.083	-	0.417	-	0.417	-	0.417	1.710	2.127		10.000	10.000
	0.462	0.722	-	0.722	-	0.722	-	0.722	0.687	0.647		1.732	1.732

Where there are no observations for a specific variable, no value is given.

In T3 and T4, S is never enforceable.

Table 5.11: Beyond Comparative Statics (T3 and T4)

	e	S_P	T_P	S_D	T_D	S	T	v_R	v_C	$TSur$	Y	Q_C	Q_R
T3													
All	80	80	80	80	24	80	80	80	80	80	1.755	80	80
	0.627	1.560	1.388	1.388	2.137	0	1.614	1.23	0.721	1.957		10.65	11.7
	0.453	0.730	0.444	0.444	0.645	0	0.642	0.730	0.550	0.679		3.089	2.113
$r = 0$	78	78	78	-	24	-	78	78	78	78	1.736	78	78
	0.618	1.524	1.424	-	2.138	-	1.656	1.267	0.676	1.943		11.769	10.846
	0.455	0.702	0.389	-	0.646	-	0.595	0.712	0.476	0.682		2.095	2.870
$r = 1$	2	2	-	2	-	2	-	2	2	2	2.500	2	2
	1.000	3.000	-	0.000	-	0.000	-	0.000	2.500	2.500		9.000	3.000
	0.000	0.000	-	0.000	-	0.000	-	0.000	0.000	0.000		0.000	0.000
T4													
All	80	80	80	80	39	80	80	80	80	80	1.8275	80	80
	0.663	0.970	0.666	0.666	1.612	0.610	0.786	1.109	0.902	2.011		11.25	11.1
	0.440	0.403	2.802	2.802	1.109	0.636	1.118	0.544	0.495	0.657		2.313	3.033
$r = 1$	41	41	-	-	-	41	-	41	41	41	2.480	41	41
	0.990	1.191	-	-	-	1.191	-	1.191	1.298	2.489		11.415	10.756
	0.044	0.302	-	-	-	0.302	-	0.302	0.273	0.048		2.863	2.596
$r = 0$	39	39	39	-	39	-	39	39	39	39	1.141	39	39
	0.321	0.738	1.367	-	1.612	-	1.612	1.023	0.487	1.510		10.769	11.769
	0.407	0.368	3.918	-	1.110	-	1.110	0.712	0.293	0.625		3.207	1.870

Appendix 5.1: Proof of Proposition 5.1

Suppose that $r = 1$. Then, the citizens optimal choice is $e = 1$ and, therefore, the payoffs of the citizen and the ruler will be $v_C = 2.5 - \rho S$ and $v_R = \rho S$, respectively.

Suppose that $r = 0$. In that case, we have to distinguish between two possible situations. If $\pi < \frac{1}{2}$, then the optimal choice for the citizen is $e = 2\pi$. The expected payoffs for the citizen and for the ruler, as a function of the T promised by the ruler, are therefore given by:

$$\mathbf{E}\left[v_C\right] = \begin{cases} \pi\left(\frac{1}{2} + 4\pi - T\right) + \frac{1-4\pi^2}{2} & \text{if } T \le \frac{1}{2} + 2\pi, \\ \frac{1}{2} & \text{if } T > \frac{1}{2} + 2\pi, \end{cases}$$

and

$$\mathbf{E}\left[v_R\right] = \begin{cases} \pi T + (1-\pi)\left(\frac{1}{2} + 4\pi\right) & \text{if } T \le \frac{1}{2} + 2\pi, \\ \frac{1}{2} & \text{if } T > \frac{1}{2} + 2\pi, \end{cases}$$

respectively. Hence, the ruler prefers to promise $T = \frac{1}{2} + 2\pi$, and we therefore have $\mathbf{E}\left[v_R\right] = \frac{1}{2} + 4\pi - 2\pi^2$ and $\mathbf{E}\left[v_C\right] = \frac{1}{2}$. If $\pi \ge \frac{1}{2}$. In this case, the optimal choice for the citizen is $e = 1$. The expected payoff for the citizen and for the ruler -as a function of the T promised by the ruler- are therefore given by:

$$\mathbf{E}\left[v_C\right] = \begin{cases} \pi\left(2.5 - T\right) & \text{if } T \le 2.5 - \frac{1}{2\pi}, \\ \frac{1}{2} & \text{if } T > 2.5 - \frac{1}{2\pi}, \end{cases}$$

and

$$\mathbf{E}\left[v_R\right] = \begin{cases} T\pi + (1-\pi)\,2.5 & T \le 2.5 - \frac{1}{2\pi}, \\ \frac{1}{2} & \text{if } T > 2.5 - \frac{1}{2\pi}, \end{cases}$$

respectively, Hence, the ruler prefers to promise $T = 2.5 - \frac{1}{2\pi}$ and, therefore, $\mathbf{E}\left[v_R\right] = 2.0$ and $\mathbf{E}\left[v_C\right] = \frac{1}{2}$.

Finally, we must consider the ruler's relinquish decision. If $\pi < \frac{1}{2}$, the ruler prefers to relinquish if and only if $\rho S > \mathbf{E}[v_R] = \frac{1}{2} + 4\pi - 2\pi^2$. Therefore, if $\rho = 0$, then $r = 0$, $T = \frac{1}{2} + 2\pi$, $e = 2\pi$, $\mathbf{E}[v_R] = \frac{1}{2} + 4\pi - 2\pi^2$ and $\mathbf{E}[v_R] = \frac{1}{2}$; while if $\rho = 1$, then $r = 1$, $S = \frac{1}{2} + 4\pi - 2\pi^2$, $e = 1$, $v_R = \frac{1}{2} + 4\pi - 2\pi^2$ and $v_C = 2 - 4\pi + 2\pi^2$. If $\pi \geq \frac{1}{2}$, the ruler prefers to relinquish if and only if $\rho S > \mathbf{E}[v_R] = 2$. Therefore, if $\rho = 0$, then $r = 0$, $T = 2.5 - \frac{1}{2\pi}$, $e = 1$, $\mathbf{E}[v_R] = 2$ and $\mathbf{E}[v_R] = \frac{1}{2}$; while if $\rho = 1$, then $r = 1$, $S = 2$, $e = 1$, $v_R = \frac{1}{2}$ and $v_C = 2$. This completes the proof of Proposition 5.1. ∎

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Appendix 5.2: Script, Quiz, and Screens[101]

In this appendix we present the script for the general instructions, the quiz, and a sample of the rules of the game as observed by the subjects.

Script for General Instructions

We would like to welcome everyone to this experiment. This is an experiment in decision making, and you will be paid for your participation in cash, at the end of the experiment. Different subjects may earn different amounts. What you earn depends partly on your decisions, partly on the decisions of others, and partly on chance.

The entire experiment will be conducted through computer terminals, and all inter-action between participants will take place through the computers. Partitions between workstations ensure your anonymity. It is important for you not to talk or to try in any way to communicate with other subjects during the experiments.

In your workstation you will find a pencil, a paper with equations, a paper with a decision tree, and scratch paper. During the experiment you can use the scratch paper to make calculations. You will also find a receipt that we will use to pay you at the end of the experiment.

We will now start with a brief instruction period. During the instruction period, you will be given a complete description of the experiment. If you have any questions during the instruction period, please raise your hand and your question will be answered so everyone can hear. If any difficulties arise after the experiment has begun, raise your hand, and an one of the persons conducting the experiment will come and assist you.

You are one of 16 students who have been randomly assigned to one of two groups. As you can see, all students have been assigned a computer. Each member of Group 1 will be randomly matched with a member of Group 2.

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[101]Translated from Spanish.

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In each round, each pair of students will play the computer game that will appear on the screen, with the member of Group 1 playing the role of player 1 and the member of Group 2 playing the role of player 2. You will be told what your player number is, as it will appear on the screen at the beginning of the game. The matching-up of partners will be repeated after each game is played, so that you will play every round with a different person. At the beginning of each round, the rules of the game will appear on the screen, as well as the timing and payoffs.

The experiment you are participating in is broken down into two unpaid practice rounds and four separate paid rounds. At the end of the last round, you will be paid the total amount you have accumulated during the course of the last four rounds. Everyone will be paid in private and you are under no obligation to tell others how much you earned. Your earnings are denominated in POINTS. Your PESO earnings are determined by multiplying your earnings in points by a conversion rate. In this experiment, the conversion rate is 25 to 1.[102]

Please turn your attention to the screen at the front of the room. We will explain the rules of the game.

---

[102]25 Argentine pesos were equivalent to approximately 5.18 U.S dollars at the time.

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The Quiz

After a general explanation of the rules of the game provided with the help of a PowerPoint presentation, subjects take the following quiz in order to make it possible to judge their understanding of the rules of the game.

1. Player 2's [citizen] income (Y) before taxes is at least: [5 options]

2. Which of the following levels of effort maximizes player 2's payoff? (not to be confused with income) [5 options]

3. What is the maximum possible payoff for player 1 [ruler]? [5 options]

4. Suppose player 1 has not relinquished her right to impose a tax T and has decided to impose $T = min\{3, Y\}$. Which of the following levels of effort maximizes player 2's payoff? [5 options]

5. Suppose player 1 has not relinquished and has pledged to charge a tax $T = min\{0.4, Y\}$. This promise must be fulfilled with a probability equal to $1/4 = 0.25$. Which of the following maximizes player 2's payoff? [5 options]

On-Screen Sample of the Rules of the Game

Once they finish the quiz, the subjects direct their attention to their computers and proceed to play the first round of the session. The first three screens present the rules of the game. Similar prompts appear on-screen before every round. The following depiction provides a sample of the rules as seen by a subject in the role of the ruler (first practice round, treatment 1).

SCREEN 1

You are about to play a game with another player. Player 1 (yourself) has the power to select taxes, and Player 2 (your partner) decides what level of effort to put into his or her work.

Player 2's monetary income is given by: $Y = 0.5 + 2e$,

where e is the effort level chosen.

Effort can take any of the following values: 0, 0.2, 0.5, 0.8 or 1.

The game also has another important feature: players are able to make promises about taxes and/or transfers.

SCREEN 2

The game has four stages:

Stage 1: Promise about S.

Your partner (Player 2) selects and promises to set a value of S (transfer). This promise will be relevant in the last stage of the round in case you have decided to give up your power in order to impose a tax T. In this case, your partner decides what amount to transfer in the last stage. *Her promise is not enforceable.*

Stage 2: Relinquish Decision.

You decide whether to relinquish $(r = 1)$ or not $(r = 0)$ your power to impose a tax T.

If you relinquish, your partner will make you a transfer S at the end of the round. Otherwise, your partner will pay tax T.

If you do not relinquish, you also *select and promise to set a value of T* (tax). This promise will be relevant in the last stage of the round.

In this situation, two things can happen:

i) with a probability $= 1/4 = 0.25$, your partner will be charged the amount T that you have promised, or

ii) with a probability $= 3/4 = 0.75$, you will be asked to select a new tax T to charge your partner in the last stage.

Stage 3: Working Decision.

If you decide to relinquish $(r = 1)$, then your partner will select a level of effort (e) and a new transfer $S = min\{S_0, Y\}$ which will be issued in the last stage.

If you decide not to relinquish $(r = 0)$, then your partner will select a level of effort (e). Then we will let you know whether your promise is enforceable or you will be asked to select a new tax $T = min\{T_0, Y\}$ that will be charged to your partner.

Stage 4: Payments.

Player 1: $rS + (1 - r)T$

Player 2: $Y - rS - (1 - r)T + \frac{1-e^2}{2}$

SCREEN 3

You are about to play **practice round 1 of 2 (unpaid)**

PROBABILITY OF ENFORCEMENT:

Promises about T: 0.25

Promises about S: 0

The Questionnaire

Thank you for participating in this experiment! Please complete the following questionnaire before leaving.

Gender (male/female)

Age (in years)

Nationality

Native English-Speaker (Yes/No)

Racial Group (White/Black/White (Hispanic)/Asian)

Have you ever taken a course in game theory / microeconomics? (Yes/No)

Current Studies (Graduate/Undergraduate)

Current Studies (Junior/Senior)