

Skaperdas, Stergios; Vaidya, Samarth

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Political Capitalism vs the Public Interest: Influence in the Presence of Checks and Balances

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Stergios Skaperdas, Samarth Vaidya

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**POLITICAL CAPITALISM vs THE PUBLIC INTEREST:
INFLUENCE IN THE PRESENCE OF CHECKS AND BALANCES***

By

Stergios Skaperdas
University of California, Irvine
and
Samarth Vaidya
Deakin University

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ABSTRACT: We examine how political capitalism can develop within modern states that typically have many types of checks and balances. We first discuss how this can occur through various influence channels: government executive and regulatory agencies, legislators, litigation, the press, and the public sphere more generally. We then develop a model in which a group representing the public interest competes for policy implementation with a group that seeks private advantage. A non-venal decision maker makes the policy decision based on the lobbying of the two groups, which is partly restrained by an existing, status-quo policy and by the decision maker's expertise. Because of free-rider problems but also because of a greater ability to develop a lobbying infrastructure, the group seeking private advantage has a better chance of implementing its policy even when the status quo policy is aligned with the public interest. Only when the decision maker has a high enough level of expertise and favorable status quo policy does the public interest group have a better chance of winning.

Keywords: Political capitalism, lobbying, rent-seeking, checks and balances, persuasion, political influence.

JEL codes: D72, D73, H11, P10

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INTRODUCTION

The concept of *political capitalism* has not settled into a clear widely accepted definition. This can be seen in Vahabi's (2023, Ch.4) overview of the intellectual development of the concept - first attributed to Weber (1978[1922]) - and its revival by Holcombe (2015, 2018) and others. In this paper, we consider the shaping of government policies by for-profit interests that are contrary to the public interest to be instances of political capitalism.¹ Such a conceptualization can include crony capitalism, the favorable treatment of individual capitalists who have personal connections to an authoritarian ruler. However, in this paper we are interested in how political capitalism can also exist in a modern liberal democratic state that has established checks and balances. We show with examples of political influence in the US and with a model that political capitalism can easily exist in mature democracies, whereby the openness of the checks and balances process – say through lobbying and litigation – can be used to favor politically and economically powerful constituencies. Our approach is complementary to that of Holcombe and others in the sense that political capitalism can exist even in the presence of non-venal government officials that use the regular channels of checks and balances.

How can a formally (*de jure*) democratic polity with developed checks and balances promote policies that are anti-competitive and reward small groups of capitalists? We explore an answer to this question by comparing the extent to which the political system *de facto* can favor private influence against the public interest. We first discuss the different types of conduits that private for-profit interests can employ to influence policy in their favor.

It turns out the various checks and balances that have evolved in mature modern states can also serve as important channels of private for-profit influence. The legislative part of government depends on input from its citizens, but not all citizens are equal and can have access to the legislators, with money – both in terms of campaign contributions and in terms of lobbying infrastructure – increasingly coming from those who can afford the ever-higher entry access fees to the ears of legislators.

The executive parts of governments and regulatory agencies also formally are open to input from all citizens but that can be co-opted by effective (and expensive) lobbying. As an example, we discuss the fate of the *Volcker rule* that became law after the Great Financial Crisis of 2008 but was effectively repealed in its implementation phase by the watering down of its provisions. The legal system, the press, and the public sphere – all part of the “checks and balances” of a modern state – can all lead to similar types of co-option by private, for-profit interests.

We subsequently examine a “persuasion” contest model (Skaperdas and Vaidya, 2012) in which interest groups - for and against the public interest - attempt to influence a government decision-maker. Each group acts rationally in its' own self-interest and first makes a choice about which policy to advocate and then both lobby on that basis. The further away an advocated position is from a *status quo* position, the more difficult it is to lobby for that position. The decision-maker (who can be a bureaucrat, a legislator or a judge) is assumed not to be venal but does the best they can given the input they receive from the interest groups, the accumulated experience and

¹ There are conceptualizations of political capitalism - such as in Milanovic (2019) – according to which it does not necessarily contravene the public interest. Singapore and China can be considered examples of this conceptualization, which can also be thought of as *state capitalism*.

practices that have been received from the past, as well as the biases that they might have. Following Skaperdas and Vaidya (2012), we model the decision maker to be “limited world” Bayesian, in that she determines her choice purely based on evidence and arguments put forward to her by the competing interests and her priors. She does so without taking the strategic motives of the lobby groups into account. This is because she is expected to consider the submissions from all affected parties as a matter of procedural fairness and transparency or due to a democratic norm that confers legitimacy to decisions based on adequate consultation from impacted members of the public. The decision maker is “merit-driven”, in that the odds of winning are higher for the group that is considered more persuasive. However, the decision maker’s prior perception of merit can be biased in favor of an interest group through “cultural” or cognitive capture (see, for example, Johnson and Kwak, 2010) by a gradual, long-term process of acculturation to the arguments of the group advocating private, for-profit interests.

How, under such conditions, could the for-profit group prevail against a group advocating the public interest? They could do so if they overwhelm the other side in terms of the resources they devote to lobbying and the arguments they can make to the decision-maker despite the a priori disadvantage they may have in arguing their case. Moreover, because the anti-competition group typically has much less of a free-rider problem than the pro-competition group (fewer numbers, more concentrated benefits), it also has greater access to a lobbying infrastructure: expensive lawyers and lobbyists, think-tanks, buildings, and access to politicians and the bureaucracy that can be developed for the long-term. Only if the status quo is very close to the public-interest position and the decision maker has a high level of expertise in assessing the arguments made by the two groups will the for-profit lobby moderate its advocated position and provide a better chance of the public interest prevailing. Accordingly, it is of critical importance to have a Weberian bureaucracy or a set of politicians that have a high degree of autonomy, independence, and expertise in its decision-making and is, therefore, difficult to capture, cognitively or otherwise.

Our model adapts and extends models in Skaperdas and Vaidya (2025), with the critical role of the expertise of the decision maker being the main extension. There is of course a very large Public Choice literature on how interest groups can determine policy by influencing electoral outcomes (Baron; 1994 and Grossman and Helpman; 2001) as well as influencing policy in a post-election context via policy-contingent contribution schedules (Baron and Hirsch, 2012; Helpman and Persson, 2001 and Grossman and Helpman, 2001). Typically, contrary to our approach, - in this literature, the impact of campaign and other monetary contributions on policy outcome is primarily due to venal motives – the politicians need for money to remain electorally competitive. The existing literature has also looked at the impact of lobbying on policy determination through information provision using cheap talk and costly signaling approaches. Grossman and Helpman (2001, chapters 4 and 5) provide an excellent introduction and evaluation of part of this literature. In these models, when lobbying efforts impact outcomes, it leads to better decisions on average by arming the decision maker with more credible information. As discussed earlier, our approach to informational lobbying is very different from these approaches as the decision maker acts purely on the basis of the face value of arguments presented without taking into consideration the strategic motives behind those efforts. Epstein and Nitzan (2004) has a formal model that is closest to our approach but without allowing lobbying expenditures to depend on the policy distance advocated by each group from the status quo policy.

Our approach shows how in particular instances private for-profit interests can prevail. Can you have an outcome in which for-profit interests almost always prevail against the public interest so that the whole politico-economic system can be classified as *political capitalism*, as Holcombe (2015, 2018) has argued to be the case for the US? There are sets of parameter values that our model allows for such a possibility. They would include status quo policies that are closer to the private interests, decision makers who have low autonomy and expertise, while the lobbying and advocacy of the public interest is anemic.

In the next section we discuss possible channels of influence that make political capitalism possible. We then present the model and our results. The final section concludes, while the Appendix contains the proofs of the main propositions.

CHANNELS OF INFLUENCE AND POLITICAL CAPITALISM

The canonical approach to the functioning of representative democracies uses a spatial framework. With voter exogenous preferences about policy outcomes as given, policy is determined through voting for representatives or parties and, in turn, through voting in legislatures given the particular institutional constraints of the electoral system (see, for example, Persson and Tabellini, 2000). The policy outcome can be that of the median voter, of the median representative, or it can be indeterminate due to problems in multiple dimensions as illustrated by Arrow's Impossibility Theorem (see Saari, 2001).

While voting provides some constraints on what legislators and other elected officials can do once in office, modern representative democracy allows politicians to “change their minds” for the policy positions they have taken during their electoral campaigns. That is an important feature that Stasavage (2020) calls “no-mandates” representative democracy – invented in England probably in the 17th century - that allows for easier centralized decision-making but can lead to eventual policy outcomes that are far away from the “will of the voters.” Thus legislatures, though restrained by the will of the voters, can typically go considerably beyond. In turn, executive government and regulatory agencies despite being restrained by the laws passed by legislatures and adopted by the executive, still have room in how the laws are implemented, especially in response to input from interested parties. Similarly, judges can have discretion in how they interpret laws and their implementation in view of the arguments made by litigants. We thus first discuss the different levels of politics in which persuasive lobbying and influence matter. They include lobbying the three traditional branches of government to influence big-picture public debates.

Lobbying the executive branch of government²

Almost all levels of the executive - presidents, prime ministers, ministers, government departments or regulatory agencies and their officials – typically have both formal and informal mechanisms that allow lobbying by interested citizens and groups. Laws passed by legislatures are typically incomplete contracts that still require further specification and clarification. Government officials and agencies often have considerable discretion in interpreting the law.

² Part of this section is adapted from section 2 of Skaperdas and Vaidya (2025).

Interested parties that have access to informal contacts and formal procedures (such as allowing for written public submissions) can play a critical role in the implementation of a law.

An example of the extent to which laws can be modified is the *Volcker Rule*, part of the Dodd-Frank Act that was enacted in the US in July 2010, in response to the events connected with the Great Financial Crisis (GFC). Named after the former Federal Reserve Chair, the Volcker Rule called primarily for the separation of trading by financial institutions on their own account (typically called "proprietary" trading) from trading on behalf of their customers. After the enactment of the legislation, the input provided to the Securities and Exchange Commission (SEC) and other concerned regulatory agencies came overwhelmingly from financial institutions. The rule first came into effect in July 2015, five years after the law was enacted, but there have been many exemptions and continual modifications made since then. The current version of the rule runs 430 pages and became effective in July 2020 (Securities and Exchange Commission, 2020).

The length and complexity of the law's interpretation runs the risk that it is very far from the intent of the original legislation and, effectively, nullifies it. As chair Volcker commented: "I'd write a much simpler bill. I'd love to see a four-page bill that bans proprietary trading and makes the board and chief executive responsible for compliance. And I'd have strong regulators. If the banks didn't comply with the spirit of the bill, they'd go after them" (Stewart, 2011). While increasing the complexity of rules and laws can be justified as a way of closing loopholes, it inevitably creates room for additional interpretations and other loopholes that highly specialized and remunerated lawyers can exploit on behalf of their clients. Effectively, the formal and informal procedures in the process of implementing a law create multiple "veto" points that can counteract or partly nullify the law for those who have the resources to do so (see Page and Gilens, 2017, and for the role of formal checks and balances in creating veto points, see Acemoglu et al., 2013).

The Dodd-Frank Act was a reaction to the type of regulation and its enforcement that precipitated the Great Financial Crisis of 2008. As Johnson and Kwak (2010) and others have argued, part of the problem was that many regulators adopted the regulatory worldview of their regulatees in what can be called "cognitive" capture. Similarly, Kwak (2013) alludes to the importance of "cultural" capture by lobbyists of agency decision making where the industry to be regulated exerts an intellectual influence over the agency to dilute the regulation in its favor. To quote Carpenter (2013), who studies interest group influence on FDA (Food and Drug Administration of USA), "Perhaps the most plausible mechanism for capture to have occurred is that of cultural capture...in so far as some of the FDA's most long-serving members (Robert Temple, Janet Woodcock, John Jenkins) have become, in recent years, more receptive to some industry arguments about [the trade-off between] drug innovation and the regulation of safety... the political organizations of the global pharmaceuticals industry have come to shape the conversation of how drugs ought to be regulated."

The main point we are trying to illustrate is that the implementation of a law can be different from the intent of the original legislation as the intervening bureaucratic process is complex, subject to the formal and informal persuasive influence of powerful actors, and government officials can favor some actors without themselves being corrupt or consciously aware of actually granting a favor.

Lobbying the legislative branch of government

The processes for lobbying legislators have similarities to those for the executive branch. Lobbyists can provide information, suggest legislation, and even draft bills through formal and informal connections with legislators and their staffers. Legislators and legislative staff - the latter often poorly paid in the US - can sometimes expect to be hired by the lobbying and law firms that are directly involved in lobbying them or by corporations that might have directly benefited from the laws that they have helped pass due to the so-called “revolving” door (see Blanes i Vidal et. al., 2012, for a clever method of assessing the monetary revolving-door rewards of staffers of key US Congressional Committees). The revolving door also holds for high officials of the executive branch and the military.

Another reality for members of legislatures and political parties is that they need funding to finance their campaigns and other political activities. The average member of the US Congress spends between thirty and seventy percent of their time fundraising (Ferguson, 2013). In other Western countries with parliamentary systems, political parties may receive a larger share of political contributions than they do in the US. The extent of influence that funders can have varies across countries (McMenamin, 2013), and it can be disputed what exactly the political contributors receive in return. At a minimum, large contributors benefit from personal access to legislators. This “access” itself - the ability to have one's voice heard, even if not heeded - is relevant in winnowing down the range of available voices. This increases the likelihood that contributor's preferences will eventually be incorporated into legislation even though legislators and their staff can be true believers in their intent to make impartial decisions on what bills to introduce and how to vote. As Page and Gilens note, “In 2012, for example, a tiny sliver of the US population - just one-tenth of one-tenth of 1 percent of Americans - provided almost half of all the money spent on Federal elections” (Page and Gilens, 2017, p.7, emphasis in the original).³ Thus campaign contributions provide another avenue through which laws can systematically deviate from the will of the voters, primarily by rationing access to individuals, businesses, and interest groups that can afford them.

Litigation and Legal Coding

Litigation is expensive and money can be an important factor in court verdicts. Beyond the possible distributional effects of a particular verdict on the litigants themselves, some verdicts can have long-lasting effects that set landmark precedents in English common law based systems. That is, law can be made through litigation. Sometimes not even much litigation is needed to essentially create a new law according to Pistor's (2019) insightful analysis. The proliferation of financial instruments and tax-haven-based trusts over the past few decades and their legal acceptance (first in New York and London, and then in much of the rest of the world) were the result of “legal coding” by expert lawyers. Even though these instruments, pioneered in Wall Street or the City of London, created enormous regulatory and legal issues (and, among

³ Ferguson et. al. (2020, p.2) found that “For every \$100,000 that Democratic representatives [who had already voted for the Dodd-Frank Act] received from finance, the odds they would break with their party's majority support for the Dodd-Frank legislation increased by 13.9 percent. Democratic representatives who voted in favor of finance often received \$200,000--\$300,000 from that sector, which raised the odds of switching by 25--40 percent.

other things, precipitated the Great Financial Crisis of 2008), they became essentially ratified by both courts and governments, as no alternatives to them were perceived.

Legal coding by expert lawyers that then becomes law extends beyond finance proper:

“Global capitalism as we know it ... is built around two domestic legal systems, the laws of England and those of New York State, complemented by a few international treaties, and an extensive network of bilateral trade and investments regimes, which themselves are centered around a handful of advanced economies.” (Pistor, 2019, p.132)

Moreover, “Asset holders do not need to capture the state directly, much less win class struggles or revolutions; all they need is the right lawyers on their side who code their assets in law... As the code of capital has become portable, it has taken over the space that was once occupied by the invisible hand. The creeping erosion of the legitimacy of states and their laws in the face of growing inequality is a direct result of this structural bias that is rooted in legal code of capital.” (Pistor, 2019, p. 22)

Along the same lines, for nearly two centuries the nature and extent of legal personhood for corporations has been litigated in US courts, with the 2010 landmark case of Citizens United vs Federal Election Commission providing “free speech” rights to corporate entities (and their right for unlimited political campaigning). Therefore, resources expended on litigation and legal coding can have important effects on politics and the direction that economic and other policies take.

Thus, lobbying and money influence decision-making on policy formation and implementation in all three branches of government that are supposed to providing “checks” and “balancing” one another. This can lead to the implemented policy deviating systematically from the public interest. Money matters in different ways: in obtaining the right to be heard, either through campaign contributions or hiring firms that specialize in gaining such access; in hiring the professionals who will make the arguments to politicians, judges, or government officials; and in having access to an infrastructure of policy think tanks and professionals who specialize in providing off-the-shelf arguments that can be refined and adapted by the actual lobbyists. Whereas venality and corruption could be a factor in how government officials, legislators, and even judges make their decisions, there is no need to invoke them. Persuasion, the weighing of evidence in view of prevailing attitudes and constraints could well explain the deviations from the public interest as we will show in the remainder of this paper.

Lastly, we should briefly mention that lobbying the three branches of government takes place within a public sphere that conditions both the beliefs of all participants and the eventual policy outcomes. The media, policy think tanks, academia and prevailing ideological trends influence both the influencers and the decision-makers in government by setting the parameters of acceptable debate and what is considered a mainstream viewpoint.

While the media has gone through significant, even radical, transformation in the West and policy think tanks have proliferated profusely over the past half century, this is not the space to even summarize such changes except to point out a change in what is considered mainstream policy over the past fifty years. Piketty (2020, pp.453-4) shows how dramatic was the reversal of

dominant views on income and estate taxation - going from top marginal tax rates of 90% in the 1950s to top marginal tax rates in the mid-30% range, and even those lower rates can be avoided as the law is filled with loopholes that permits wide-spread legal tax avoidance. Whereas New Deal policies that expanded the welfare state and recognized a central role of government in economic matters and distribution were in the mainstream up to about the late 1970s, since then the mainstream default view is the “Washington Consensus” view that emphasizes deregulation, privatization, and retreat of government in economic matters. That perspective also conditions the judgment, the “priors” so to speak, that policymakers have when lobbied by different groups and helps determine the policies that are eventually adopted.

MODELING INFLUENCE VS THE PUBLIC INTEREST

Two interest groups A and B engage in competitive policy advocacy to influence a decision maker who is responsible for choosing a one-dimensional policy variable $t \in [0,1]$. The relevant decision maker can be a pivotal member in the legislative body, a judge, or an agency head responsible for design and implementation of the policy. The decision maker is assumed to be predisposed towards implementing the *default or status quo* position $\tilde{t} \in [0,1]$ unless she is persuaded to do otherwise considering the arguments presented by the competing interest groups. In the case of the Volcker rule that we discussed in the previous section, the default position could be the most reasonable interpretation of the passed legislation by a neutral observer or expert lawyers at the SEC. In the case of competition policy, the status quo position could be the one that is currently followed by the agency as a result of past legislative, executive, or judicial decisions (that might well include past lobbying for arriving at those decisions). The decision-maker is assumed to be service-oriented (that is, not corrupt or venal). She does the best she can given the input she receives from the interest groups, the accumulated experience and practices that have been received from the past, as well as her own biases that she might have. She – as a public servant - accepts what the starting point is (the status quo) and tries to implement it subject to the requirement of “public input,” the formal lobbying that modern checks and balances allow for.

Let $t = 0$ be the level of policy that is in the “public interest,” and this is also the preferred position of group A . For the sake of concreteness, we will think of the group advocating for a perfectly competitive market in a particular industry but of course many other interpretations are possible (such as the dimension that the Volcker rule could fit in). Group B comprises of “special interests” or a “minority” and its most preferred position is $t = 1$. The group could consist of “political capitalists” who advocate for gaining monopoly rights in a particular industry that is against the public interest (or members of the financial industry who want to neuter the Volcker rule). If policy were to be set at $t = 1$, it can be thought of a case of monopoly rights without any constraints on how monopoly could be exercised. Values of t lower than 1 but close to it could indicate monopoly rights with increasing constraints and regulation. As t becomes smaller, some competition might be allowed and so on until the ideal of perfect competition at $t = 0$.

The preferences of the two groups are as follows:

$$V_i(t) = \begin{cases} -at & \text{for } i = A, a > 0 \\ -b(1-t) & \text{for } i = B, b > a \end{cases} \quad (1)$$

As implied by (1), each group $i = A, B$ has single-peaked preferences over the policy variable t . As stated earlier, group A 's utility is highest at $t = 0$ and falls as t increases. Group B 's utility is highest at $t = 1$ and falls as t decreases. As interest group A (which is aligned with public interest), is likely to represent a large section of the public with dispersed interests as opposed to group B (which represents a minority (fewer numbers, more concentrated benefits)), the per-capita benefit from policy gain is likely to be smaller for A . Accordingly, we assume $b > a$.⁴

The sequence of moves in the influence game between the two interest groups is as follows:

- Stage 1: The two interest groups simultaneously choose the policy positions they will advocate, $t_i \in [0, 1]$, $i = A, B$.
- Stage 2: Each interest group chooses lobbying expenditures, $R_i \geq 0$, $i = A, B$ to persuade the decision-maker to implement its advocated position over that of the rival group.

The marginal cost of R_i is $c_i > 0, i = A, B$ and it is allowed to vary across the two groups and represents transaction costs associated with lobbying. The cost can be thought of as inversely related to the lobbying “infrastructure” of each group, which can consist of the office and internet presence of the interest group, the accumulated human capital and connections of its employees and ready access to research and other related investments that have been inherited from the past. By drawing upon Olson (1965), we can expect the public interest group, which comprises of more diffuse interests, to have a weaker lobbying infrastructure relative to the minority group. Hence, we assume that $c_A > c_B$.

The probability of winning for each interest group is then determined by both the Stage 1 choice of policy positions and Stage 2 choice of resource expenditures as follows:

$$P_i(t_i, t_j, R_i, R_j) = \frac{\lambda_i R_i}{\lambda_i R_i + \lambda_j R_j} \text{ for } i, j = A, B, i \neq j \text{ and } R_A, R_B \text{ both not equal to } 0 \quad (2)$$

As long as $P_i > 0$ for at least one interest group, one of the advocated positions will be implemented with odds of success as per (2) above.⁵

⁴ For example, one can think of $a = \frac{V_A}{N_A}$ and $b = \frac{V_B}{N_B}$ where group A comprises of N_A members and group B comprises of N_B members with $N_A \gg N_B$. V_A denotes the public benefit of the position and V_B the private benefit to the political capitalist group. We assume that the difference in numbers is sufficiently large so as $b > a$.

⁵ The win probability specification in (1) represents an asymmetric version of the well-known “lottery” Tullock contest success function which has been widely used in the literature to model outcomes of conflict and rent-seeking. Skaperdas and Vaidya (2012) derive such a function in a persuasion setting as an outcome of Bayesian reasoning by a decision-maker who subjectively assesses the evidence presented by either side. See Corchon (2007) and Konrad (2009) for an overview of contests and their applications, and Denter (2020) for a model of persuasion in political campaigns.

If $R_A = R_B = 0$, so that neither party invests any resources towards arguing for its advocated position, we assume that the status quo position prevails given the pre-disposition of the decision maker to do so, and neither group wins. In this case, A 's payoff is $-a\tilde{t}$ and B 's payoff is $-b(1-\tilde{t})$.⁶

In (2), $\lambda_i, i = A, B$ represent the biases in the decision-making process and they assume the following functional form:

$$\lambda_A(t_A) = \frac{\lambda}{d|t_A - \tilde{t}| + 1} \quad \text{for } 0 < \lambda \leq 1 \text{ and } d > 0 \quad (3)$$

$$\lambda_B(t_B) = \frac{1}{d|t_B - \tilde{t}| + 1}$$

As is apparent from (3), the bias factor of each group is adversely affected as the distance between its advocated position and the status quo position increases. The strength of this effect is modulated by the parameter d . d reflects the inherent expertise of the decision maker to implement the status quo position and creates a centripetal force that incentivizes the interest groups to choose positions closer to the status quo position. The higher is d , the harder it is to justify a proposed deviation from the status quo position.

The parameter λ captures an inherent bias in the decision making towards the arguments presented by B relative to A that is independent of the advocated positions. This is because, when $0 < \lambda < 1$, $\lambda_B(t_B) > \lambda_A(t_A)$ even when $t_A = t_B$. As discussed in the previous section, there can be many sources of such an inherent bias towards the minority group B . When the decision maker is an agency head, such a bias could be due to “cultural capture” where factors such as group identification, status or relationship networks can lead to the regulator's decision-making being swayed towards a better organized, narrowly based, wealthy minority interest group. It could also be due the minority group having greater “access” to the decision maker due to its ability to offer the “revolving door” or because of campaign contributions. Such a bias in agency decision making may also arise via the appointments made within the bureau and the mandatory procedures an agency is required to follow in shaping the regulation. These can open agency decision-making to scrutiny by favored constituencies and “stack the deck” in the direction intended by the legislature or the president as noted in McCubbins et al. (1987). When the decision maker is a pivotal legislator, the minority group could leverage greater access through its capacity to make campaign donations. Such a bias could also be due to party affiliation or ideological pre-disposition of the relevant legislator. In the limiting case when $\lambda = 1$, the decision maker is inherently neutral towards either group.

⁶ The results of the paper do not rely on this assumption. We could specify another outcome or have a probability of each advocated position to be implemented when both lobbying efforts are zero and still all our propositions would hold. However, for the settings that we seek to model, implementing the status quo position in the absence of any lobbying seems natural to us. The key role of the status quo position is as a centripetal force in possibly restraining the advocated positions by the lobbies, as discussed below.

These properties of the lobbying process taken together imply that the win probability of each group is influenced by the following factors: (i) the location of the status quo position; (ii) the location of each group's advocated position relative to the status quo position; (iii) the amount of resources invested by the competing groups towards evidence production; and (iv) the degree of bias exhibited by the decision-maker.⁷

Equilibrium choice of resource expenditures, policy positions and the “fate” of public interest

To identify the Subgame Perfect Nash equilibrium choices of resources and policy positions, we begin with the choice of resources in Stage 2 with Stage 1 choices of policy positions as given. Hence, given the utility functions specified in (1), the win probability in (2) and the bias functions in (3), each group's expected payoff in Stage 2 is as follows:

$$\begin{aligned}\pi_A(t_A, t_B, R_A, R_B) &= P_A \Delta V_A(t_A, t_B) - at_B - c_A R_A \\ \pi_B(t_A, t_B, R_A, R_B) &= (1 - P_A) \Delta V_B(t_A, t_B) - b(1 - t_A) - c_B R_B\end{aligned}\quad (4)$$

In the above expression, given (1), it follows that:

$$\begin{aligned}\Delta V_A(t_A, t_B) &= a(t_B - t_A) \\ \Delta V_B(t_A, t_B) &= b(t_B - t_A)\end{aligned}\quad (5)$$

Suppose that $t_B > t_A$ so that $\Delta V_i(t_A, t_B) > 0, i = A, B$. This implies that each group has an incentive to expend positive quantities of resources towards lobbying thus ensuring that the Stage 2 resource competition is non-trivial.⁸

Recalling that P_A is specified by (2), the first order conditions involving stage 2 choice of resources along an interior optimum are:

$$\begin{aligned}\frac{\partial \pi_A}{\partial R_A} &= \frac{\lambda_A \lambda_B R_B \Delta V_A}{(\lambda_A R_A + \lambda_B R_B)^2} - c_A = 0 \\ \frac{\partial \pi_B}{\partial R_B} &= \frac{\lambda_A \lambda_B R_A \Delta V_B}{(\lambda_A R_A + \lambda_B R_B)^2} - c_B = 0\end{aligned}\quad (6)$$

Accordingly, the stage 2 equilibrium choice of resources can be shown to be the following:

⁷ We could allow for a “compromise” position to be implemented based on bargaining given the probabilities of winning established from the choices made in stages 1 and 2. That will not change the equilibrium advocated positions and lobbying expenditures but, partly for expositional purposes, we will be employing the probabilistic interpretation of the model.

⁸ As we'll show subsequently, in equilibrium we will always have $t_B^* > t_A^*$. Skaperdas and Vaidya (2025) show that such a non-convergence property also holds in a more general setting than the one examined here.

$$R_A^*(t_A, t_B) = \frac{\lambda_A \lambda_B c_B \Delta V_B \Delta V_A^2}{(\lambda_A c_B \Delta V_A + \lambda_B c_A \Delta V_B)^2} \quad (7)$$

$$R_B^*(t_A, t_B) = \frac{\lambda_A \lambda_B c_A \Delta V_A \Delta V_B^2}{(\lambda_A c_B \Delta V_A + \lambda_B c_A \Delta V_B)^2}$$

We now turn to stage 1 choice of policy positions. We can substitute for (3), (5), and (7) in (2) to see how the choice of policy positions impacts the stage 1 win probability of group A (and thereby also B) both directly through $\lambda_i, i = A, B$ as well as through the choice of resources in the second stage. With the above substitutions, the stage 1 win probability of group A becomes:

$$P_A(t_A, t_B) = \frac{\frac{\frac{a}{bc} \lambda}{d|\tilde{t} - t_A| + 1}}{\frac{\frac{a}{bc} \lambda}{d|\tilde{t} - t_A| + 1} + \frac{1}{d|\tilde{t} - t_B| + 1}} \quad (8)$$

As the expression reveals, one of the determinants of $P_A(t_A, t_B)$ is $\frac{a}{bc} \lambda$. The term $\frac{a}{bc}$

captures both group A's stake relative to B ($\frac{a}{b}$) as well as its marginal cost of mobilizing

resources relative to B ($c \equiv \frac{c_A}{c_B}$). As stated earlier, since we expect A to have a smaller relative

stake ($\frac{a}{b} < 1$) and a cost disadvantage $c > 1$, $\frac{a}{bc} < 1$ and works against A. Observe from (7) that

$\frac{R_A^*}{R_B^*} = \frac{a}{bc}$. Hence when $\frac{a}{bc} < 1$, group B is incentivized to spend more resources relative to A in

stage 2. However as can be seen from (8), the term $\frac{a}{bc}$ appears multiplicatively with λ and therefore influences $P_A(t_A, t_B)$ in the same way as the bias parameter λ .

Accordingly, let $\bar{\lambda}$ denote $\frac{a}{bc} \lambda$, a summary measure of overall advantage (for one side, disadvantage for the other) in determining each side's probability of winning. Since we assume that $0 < a < b$, $c > 1$, and $0 < \lambda \leq 1$, it follows that $0 < \bar{\lambda} < 1$. Hence, the net effect of stake and cost asymmetries and cognitive bias is to lower the win probability of group A and therefore create an advantage for group B which is independent of the advocated positions. The other component impacting $P_A(t_A, t_B)$ are the positions of t_A and t_B relative to \tilde{t} . The closer is t_A to \tilde{t} and the farther is t_B to \tilde{t} the greater is $P_A(t_A, t_B)$. Exactly analogous arguments also apply to group B's win probability. By substituting (7) into (4) and re-arranging, the stage 1 expected payoffs to the two groups are:

$$\pi_A(t_A, t_B) = (P_A(t_A, t_B))^2 \Delta V_A(t_A, t_B) - at_B \quad (9)$$

$$\pi_B(t_A, t_B) = (1 - P_A(t_A, t_B))^2 \Delta V_B(t_A, t_B) - b(1 - t_A)$$

Given (8), (9), and the specification of $\Delta V_i, i = A, B$ as per (5), it follows immediately that the equilibrium choice of policy position by group A , t_A^* will lie in the interval $[0, \tilde{t}]$. In other words, A is strictly better off with $t_A = \tilde{t}$ relative to $t_A > \tilde{t}$. This is because, $t_A = \tilde{t}$ is associated with a higher $P_A(t_A, t_B)$ (through its effect on λ_A), and also a higher ΔV_A relative to $t_A > \tilde{t}$. From this, it also follows that if $\tilde{t} = 0$, then $t_A^* = 0$. For exactly analogous arguments, the equilibrium choice of policy position by group B , t_B^* , will lie in the interval $[\tilde{t}, 1]$ and if $\tilde{t} = 1$, then $t_B^* = 1$. Suppose that $0 < \tilde{t} < 1$. Then, by substituting (5), and (8) in (9), the first stage expected payoff for each group is:

$$\pi_A(t_A, t_B) = a \left\{ \frac{\bar{\lambda}^2 (d(t_B - \tilde{t}) + 1)^2 (t_B - t_A)}{(d\bar{\lambda}t_B - dt_A + d\tilde{t}(1 - \bar{\lambda}) + \bar{\lambda} + 1)^2} - t_B \right\} \quad (10)$$

$$\pi_B(t_A, t_B) = b \left\{ \frac{(d(\tilde{t} - t_A) + 1)^2 (t_B - t_A)}{(d\bar{\lambda}t_B - dt_A + d\tilde{t}(1 - \bar{\lambda}) + \bar{\lambda} + 1)^2} - (1 - t_A) \right\} \quad (11)$$

A sufficient condition for the strict concavity of π_A with respect to t_A (i.e. $\frac{\partial^2 \pi_A(t_A, t_B)}{\partial t_A^2} < 0$) is,

$$0 < d < \frac{2(1 + \bar{\lambda})}{3 - 2\bar{\lambda}} \quad (12)$$

A sufficient condition for $\frac{\partial \pi_A(t_A, t_B)}{\partial t_A} \leq 0$ at $t_A = 0$ is,

$$0 < d < \frac{1 + \bar{\lambda}}{2 - \bar{\lambda}} \quad (13)$$

It turns out that under our assumption of $0 < \bar{\lambda} < 1$, (13) binds relative to (12). Hence, when (13) holds, we know that $t_A^* = 0$.

A sufficient condition for the strict concavity of π_B with respect to t_B (i.e. $\frac{\partial^2 \pi_B(t_A, t_B)}{\partial t_B^2} < 0$) is,

$$0 < d < \frac{2(1 + \bar{\lambda})}{\bar{\lambda}} \quad (14)$$

A sufficient condition for $\frac{\partial \pi_B(t_A, t_B)}{\partial t_B} \geq 0$ at $t_B = 1$ is,

$$0 < d < \frac{1 + \bar{\lambda}}{\bar{\lambda}} \quad (15)$$

As (15) is binding over (14), it follows that when (15) holds we have, $t_B^* = 1$. Further, observe that since, by assumption, $0 < \bar{\lambda} < 1$, it is apparent that when (13) holds, (15) is also satisfied. This leads us to Proposition 1.

Proposition 1: *Suppose that $0 < \tilde{t} < 1$, the overall bias in the decision-making process favors group B ($0 < \bar{\lambda} < 1$), and that the decision-maker resistance or expertise is relatively low ($0 < d < \frac{1 + \bar{\lambda}}{2 - \bar{\lambda}}$). In this case,*

$$0 < d < \frac{1 + \bar{\lambda}}{2 - \bar{\lambda}}. \text{ In this case,}$$

(i) *Each group advocates for its preferred position in equilibrium so that group A chooses the public interest position ($t_A^* = 0$) while group B chooses the minority preferred position ($t_B^* = 1$).*

(ii) *The equilibrium stage 1 win probability of the public interest group A is*

$$P_A(t_A^*, t_B^*) = \frac{d\bar{\lambda}(1 - \tilde{t}) + \bar{\lambda}}{d\bar{\lambda}(1 - \tilde{t}) + d\tilde{t} + 1 + \bar{\lambda}}.$$

(iii) *The equilibrium win probability of the public interest group A decreases as (a) $\bar{\lambda}$ decreases (b) the status quo position \tilde{t} increases (c) d increases when the status quo position is closer to the minority group B ($\frac{1}{2} < \tilde{t} < 1$).*

(iv) *The equilibrium win probability of the public interest group A increases as decision-maker expertise d increases when the status quo position is closer to the public interest position ($0 < \tilde{t} < \frac{1}{2}$).*

Part (i) implies that group A is not deterred from advocating for the public interest position even when facing a decision-making process favoring group B as long as the status quo pull is relatively low. Under these circumstances, there is a positive chance of the public interest group A succeeding in getting its preferred position implemented. Of key interest then is how the win probability of group A responds to changes in overall bias ($\bar{\lambda}$), the status quo position (\tilde{t}), and the decision-maker expertise (d). As part (iii) indicates, the lower is $\bar{\lambda}$, and therefore the greater is the bias against group A, the lower is the probability of public interest prevailing. A lowering of $\bar{\lambda}$, for example, can be due to an increase in the stake asymmetry between the two groups or a greater cost disadvantage to group A due to a stronger organizational strength of group B. These factors discourage group A's equilibrium resource spending towards persuasion relative to group B and result in a lower win probability. An increase in \tilde{t} represents the status quo position becoming farther from A's chosen position. This lowers λ_A and increases λ_B thus lowering group A's win probability. Essentially, A faces a higher "penalty" from deviating from the status quo relative to B as \tilde{t} increases. As Proposition 1 reveals, the effect of an increase in expertise parameter d on A's win probability is ambiguous and depends on the location of the status quo position. If $\tilde{t} \in (\frac{1}{2}, 1)$ so that the status quo position is closer to B's preferred position, an increase

in d disadvantages A more relative to B . Hence A 's win probability falls. The opposite is true when $\tilde{t} \in (0, \frac{1}{2})$. In this case the status quo position is closer to A 's preferred position and hence an increase in d results in an advantage to A .

Since the preferences of the two groups are assumed to be risk-neutral, if the implemented position was determined non-stochastically through a ‘‘compromise’’ arrived at via bargaining, the equilibrium stage 1 advocated policy positions and stage 2 resource expenditures would be identical to those presented in the analysis. The implemented position would however be deterministic and equal to group B 's win probability. Hence, all the comparative static properties described in Proposition 1 would carry forward to the equilibrium compromise position.⁹

We'll now examine a situation where the status quo position is the same as the public interest position so that $\tilde{t} = 0$. In this case the bureau's expertise (d) to reinforce the status quo also furthers the cause of public interest. Hence, as explained earlier, in this case, $t_A^* = 0$. We will now investigate the factors that will influence Group B 's response to this alignment of decision-maker expertise with public interest. As shown in Proposition 2 below, Group B 's choice of policy position may depend on both d as well as $\bar{\lambda}$.

Proposition 2: *Suppose that the status quo is aligned with the public interest so that $\tilde{t} = 0$, the overall bias in the decision-making process favors group B ($0 < \bar{\lambda} < 1$), and let $0 < d < \frac{2(1+\bar{\lambda})}{\bar{\lambda}}$.*

In this case,

(i) *Group A always chooses the public interest position ($t_A^* = 0$) regardless of the value of $\bar{\lambda}$ or d .*

(ii) *Group B chooses the minority preferred position ($t_B^* = 1$) as long as $0 < d \leq \frac{(1+\bar{\lambda})}{\bar{\lambda}}$. It*

chooses $0 < t_B^ = \frac{(1+\bar{\lambda})}{d\bar{\lambda}} < 1$ when $\frac{(1+\bar{\lambda})}{\bar{\lambda}} < d < \frac{2(1+\bar{\lambda})}{\bar{\lambda}}$. In this case, t_B^* is decreasing in both $\bar{\lambda}$ and d .*

(iii) *When, $t_B^* = 1$, the equilibrium probability of the public interest position getting implemented is increasing in both $\bar{\lambda}$ and d .*

(iv) *When, $t_B^* = \frac{(1+\bar{\lambda})}{d\bar{\lambda}}$, the equilibrium probability of the public interest position getting implemented is increasing in $\bar{\lambda}$. Group A 's equilibrium payoff is increasing in both $\bar{\lambda}$ and d .*

⁹ A more formal treatment can be found in Section 3.4 of Skaperdas and Vaidya (2025). The ‘‘compromise’’ approach can facilitate a discrete time dynamic version of the model where the previous period's chosen policy becomes the current period's status quo. Hence resource expenditures in each period not only influence the policy adopted in that period, but they also influence the policy trajectory in the future by changing the status quo. This can accentuate the minority group to compete even harder compared to the static model. We intend to explore this approach further in a future work.

Proposition 2 shows how the level of bias $\bar{\lambda}$, and the inherent expertise of the decision maker towards defending the status quo (d) play a role in the minority group's choice of position. When the bias in favor of the minority group is strong (say, due to stake and cost asymmetries that induce it to compete more aggressively in the stage 2 resource competition), the range of d over which it actively advocates for its favored position expands. This can be seen from (ii) given that $\frac{(1+\bar{\lambda})}{\bar{\lambda}}$ increases as $\bar{\lambda}$ falls.¹⁰ This happens even when the public interest group is advantaged by the status quo position's alignment with its preferred position. This suggests that decision-making expertise d may fail to restrain the minority group from advocating an extreme position when there is sufficient bias in its favor. Like Proposition 1, a stronger bias also lowers the win-probability of the public interest group.

When the bias in favor of B is not sufficiently strong so that the interval $\frac{(1+\bar{\lambda})}{\bar{\lambda}} < d < \frac{2(1+\bar{\lambda})}{\bar{\lambda}}$ is well-defined and bounded, a higher decision maker expertise (d) can induce the minority group to pursue a less extreme position $0 < t_B^* = \frac{(1+\bar{\lambda})}{d\bar{\lambda}} < 1$ as stated in (ii). When this is the case, the position advocated by the minority group B gets more moderate, the lower is the bias and the higher is d . As a higher d induces group B to moderate and choose a position closer to 0, it also increases the expected payoff to group A . This is because group A experiences an increase in its utility even when group B wins.

Collectively, Propositions 1 and 2 suggest that a greater degree of autonomy and expertise of the decision maker (as in the case of a Weberian bureaucracy), can weaken the scope for political capitalism and tilt the system in favor of the public interest, when the status quo (and therefore the initial conditions) are aligned with public interest. However, an efficient bureaucracy, that is ingrained to defend a status quo favoring the minority, can make achievement of public interest harder.

CONCLUDING REMARKS

We have examined a setting in which a lobby that favors the public interest competes against a “political capitalist” lobby that is in favor of monopoly rights for itself or for anything else that can enhance its private profits but is against the public interest. We have seen how the small numbers along with greater resources and, possibly, structural factors such as “cognitive” or “cultural” capture of decision makers can promote political capitalism. As Proposition 1 reveals, the probability of public interest prevailing keeps falling, the greater is the bias in favor of the minority group and the farther is the status quo from the public interest position. The greater bias could be due to higher stake asymmetry between the two groups or a greater cost advantage of the minority group due to its organizational strength. These factors cause the public interest group to compete less aggressively relative to the minority group and result in a lower win

¹⁰ Observe that as $\bar{\lambda}$ approaches 0, the interval $0 < d \leq \frac{(1+\bar{\lambda})}{\bar{\lambda}}$ becomes infinitely large.

probability. Similarly, the farther is the status quo, the greater is the penalty for advocating for public interest position, and lower is the win-probability of the public interest group. An increase in bureaucratic expertise also appears to be a two-sided sword. If the status quo is closer to public interest, an increase in expertise improves the odds of public interest prevailing. However, if the status quo is sufficiently far from public interest, an increase in expertise can make matters worse. Proposition 2 allows us to identify conditions under which there is best hope for the defense of public interest from political capitalism. It highlights the importance of status quo alignment with public interest, low bias (high $\bar{\lambda}$, closer to 1) and relatively high decision-making expertise. It can be thought of as identifying conditions conducive to the emergence of an enlightened “Weberian” bureaucracy.

Having public-interested civil servants, politicians, and judges along with an active civil society that can sustain lobbying against private interests is not an easy task. It is more of an ideal that one can aspire to rather than a reality that can be sustained for long periods of time. Gilens and Page (2014) have provided evidence that actual policies in the US are those that are favored by small segments of the population who are rich. The dilution of Volcker Rule through a litany of exemptions and continual modifications in the face of intense lobbying by the finance sector is another case in point.

If some form of political capitalism is the norm rather than the exception, then that has implications not just for politics but importantly for economics as well. In particular, the workhorse model of competitive markets that is widely used as the default model for research, teaching, and policy purposes could hardly be a credible model for understanding the economy, when the actual economy deviates systematically from the fundamental assumptions of the model.

Appendix

Proof of Proposition 1. We'll first identify a sufficient condition for the strict concavity of $\pi_A(t_A, t_B)$ as specified in (10) with respect to t_A . From (10), it follows that

$$\frac{\partial^2 \pi_A(t_A, t_B)}{\partial t_A^2} = \frac{2ad\bar{\lambda}^2(1+dt_B-d\tilde{t})^2(dt_B(3-2\bar{\lambda})-2d\tilde{t}(1-\bar{\lambda})-dt_A-2(1+\bar{\lambda}))}{(d\bar{\lambda}t_B-dt_A+d\tilde{t}(1-\bar{\lambda})+\bar{\lambda}+1)^4} \quad (\text{A1})$$

It is apparent from (A1), that the sign of $\frac{\partial^2 \pi_A(t_A, t_B)}{\partial t_A^2}$ will be determined by the sign of the numerator term $dt_B(3-2\bar{\lambda})-2d\tilde{t}(1-\bar{\lambda})-dt_A-2(1+\bar{\lambda})$. Observe that this term is decreasing in t_A and \tilde{t} , and since $0 < \bar{\lambda} < 1$, this term is increasing in t_B . Hence its highest feasible value $d(3-2\bar{\lambda})-2(1+\bar{\lambda})$ is attained when $t_A = 0$, $t_B = 1$, and \tilde{t} arbitrarily close to 0. Hence, if $0 < d < \frac{2(1+\bar{\lambda})}{(3-2\bar{\lambda})}$, then it is sufficient to conclude that the numerator term

$dt_B(3-2\bar{\lambda})-2d\tilde{t}(1-\bar{\lambda})-dt_A-2(1+\bar{\lambda})$ will always be negative and hence $\frac{\partial^2 \pi_A(t_A, t_B)}{\partial t_A^2} < 0$.

We now examine the possibility of $\frac{\partial \pi_A(t_A, t_B)}{\partial t_A} \leq 0$ at $t_A = 0$. From (10), it follows that

$$\frac{\partial \pi_A(t_A, t_B)}{\partial t_A} = -\frac{a\bar{\lambda}^2(1+dt_B-d\tilde{t})^2(1+\bar{\lambda}+d\tilde{t}(1-\bar{\lambda})+dt_A-dt_B(2-\bar{\lambda}))}{(1+d(\tilde{t}-t_A)+\bar{\lambda}(1+d(t_B-\tilde{t})))^3} \quad (\text{A2})$$

As $t_A \leq \tilde{t}$, and $t_B \geq \tilde{t}$, the denominator of the above expression is always positive. Hence the sign of $\frac{\partial \pi_A(t_A, t_B)}{\partial t_A}$ will be determined by the term $1+\bar{\lambda}+d\tilde{t}(1-\bar{\lambda})+dt_A-dt_B(2-\bar{\lambda})$ in the

numerator. If this term is non-negative, we will have $\frac{\partial \pi_A(t_A, t_B)}{\partial t_A} \leq 0$. We check for this

possibility at $t_A = 0$ where the term reduces to $1+\bar{\lambda}+d\tilde{t}(1-\bar{\lambda})-dt_B(2-\bar{\lambda})$. As $0 < \bar{\lambda} < 1$, it follows that this term is increasing in \tilde{t} and decreasing in t_B . Hence it attains its lowest feasible value of $1+\bar{\lambda}-d(2-\bar{\lambda})$ when $t_B = 1$ and \tilde{t} arbitrarily close to 0. Hence if $1+\bar{\lambda}-d(2-\bar{\lambda}) \geq 0$ or

$0 < d \leq \frac{1+\bar{\lambda}}{2-\bar{\lambda}}$, the numerator term we are examining is always non-negative and hence

$\frac{\partial \pi_A(t_A, t_B)}{\partial t_A} \leq 0$ at $t_A = 0$. Since $0 < \bar{\lambda} < 1$, we have $\frac{1+\bar{\lambda}}{2-\bar{\lambda}} < \frac{2(1+\bar{\lambda})}{3-2\bar{\lambda}}$. Thus, when $0 < d \leq \frac{1+\bar{\lambda}}{2-\bar{\lambda}}$

, we can be assured that $\pi_A(t_A, t_B)$ is strictly concave with respect to t_A , and $\frac{\partial \pi_A(t_A, t_B)}{\partial t_A} \leq 0$ at $t_A = 0$. Hence, we can conclude that $t_A^* = 0$.

From (11) we can deduce that,

$$\frac{\partial^2 \pi_B(t_A, t_B)}{\partial t_B^2} = \frac{2bd\bar{\lambda}(1+d\tilde{t}-dt_A)^2(\bar{\lambda}dt_B+dt_A(2-3\bar{\lambda})-2d\tilde{t}(1-\bar{\lambda})-2(1+\bar{\lambda}))}{(d\bar{\lambda}t_B-dt_A+d\tilde{t}(1-\bar{\lambda})+\bar{\lambda}+1)^4} \quad (\text{A3})$$

It is apparent from (A3), that the sign of $\frac{\partial^2 \pi_B(t_A, t_B)}{\partial t_B^2}$ will be determined by the sign of the numerator term $\bar{\lambda}dt_B+dt_A(2-3\bar{\lambda})-2d\tilde{t}(1-\bar{\lambda})-2(1+\bar{\lambda})$. Observe that this term is increasing in t_B and decreasing in \tilde{t} . Suppose that $\frac{2}{3} < \bar{\lambda} < 1$. Then this term is also decreasing in t_A . Hence its highest feasible value $\bar{\lambda}d-2(1+\bar{\lambda})$ is attained when $t_A = 0$, $t_B = 1$, and \tilde{t} arbitrarily close to 0. Hence, if $\frac{2}{3} < \bar{\lambda} < 1$, and $0 < d < \frac{2(1+\bar{\lambda})}{\bar{\lambda}}$, then it is sufficient to conclude that the numerator term $\bar{\lambda}dt_B+dt_A(2-3\bar{\lambda})-2d\tilde{t}(1-\bar{\lambda})-2(1+\bar{\lambda})$ will always be negative and hence

$$\frac{\partial^2 \pi_B(t_A, t_B)}{\partial t_B^2} < 0.$$

Suppose now that $0 < \bar{\lambda} \leq \frac{2}{3}$. In this case, the numerator term is increasing in both t_B and t_A . Hence it will assume its highest feasible value when $t_A = \tilde{t}$ and $t_B = 1$. For these values, the numerator term simplifies to $\bar{\lambda}d-\bar{\lambda}d\tilde{t}-2(1+\bar{\lambda})$. As this term is decreasing in \tilde{t} , it assumes its highest value when \tilde{t} is arbitrarily close to 0, which is $\bar{\lambda}d-2(1+\bar{\lambda})$. Hence it again follows that if $0 < d < \frac{2(1+\bar{\lambda})}{\bar{\lambda}}$, then the highest value of the numerator term is negative, and we have

$$\frac{\partial^2 \pi_B(t_A, t_B)}{\partial t_B^2} < 0. \text{ Hence we can conclude that for } 0 < d < \frac{2(1+\bar{\lambda})}{\bar{\lambda}}, \text{ and } 0 < \bar{\lambda} < 1, \pi_B(t_A, t_B) \text{ is}$$

strictly concave with respect to t_B .

From (11), we can deduce that,

$$\frac{\partial \pi_B(t_A, t_B)}{\partial t_B} = -\frac{b(1+d\tilde{t}-dt_A)^2(\bar{\lambda}dt_B-d\tilde{t}(1-\bar{\lambda})-dt_A(2\bar{\lambda}-1)-(1+\bar{\lambda}))}{(1+d(\tilde{t}-t_A)+\bar{\lambda}(1+d(t_B-\tilde{t})))^3}$$

As explained earlier, it is always the case that the denominator in the above expression is positive. Hence the sign of $\frac{\partial \pi_B(t_A, t_B)}{\partial t_B}$ will be determined by the sign of the numerator term

$(\bar{\lambda} dt_B - d\tilde{t}(1 - \bar{\lambda}) - dt_A(2\bar{\lambda} - 1) - (1 + \bar{\lambda}))$. We evaluate $\frac{\partial \pi_B(t_A, t_B)}{\partial t_B}$ at $t_B = 1$ so that the numerator term reduces to $(\bar{\lambda} d - d\tilde{t}(1 - \bar{\lambda}) - dt_A(2\bar{\lambda} - 1) - (1 + \bar{\lambda}))$. Suppose that $\frac{1}{2} < \bar{\lambda} < 1$. Then this term is decreasing in t_A and \tilde{t} . Hence its highest feasible value $\bar{\lambda} d - (1 + \bar{\lambda})$ is attained when $t_A = 0$ and \tilde{t} arbitrarily close to 0. Hence, if $\frac{1}{2} < \bar{\lambda} < 1$, and $0 < d \leq \frac{(1 + \bar{\lambda})}{\bar{\lambda}}$, then it is sufficient to conclude that the numerator term $\bar{\lambda} dt_B + dt_A(2 - 3\bar{\lambda}) - 2d\tilde{t}(1 - \bar{\lambda}) - 2(1 + \bar{\lambda})$ will always be non-positive and hence $\frac{\partial \pi_B(t_A, t_B)}{\partial t_B} \geq 0$ at $t_B = 1$.

Suppose now that $0 < \bar{\lambda} \leq \frac{1}{2}$. In this case, the numerator term is increasing in t_A . Hence it will assume its highest feasible value when $t_A = \tilde{t}$. For this value, the numerator term simplifies to $\bar{\lambda} d(1 - \tilde{t}) - (1 + \bar{\lambda})$. As this term is decreasing in \tilde{t} , it assumes its highest value $\bar{\lambda} d - (1 + \bar{\lambda})$ when \tilde{t} is arbitrarily close to 0. Hence it again follows that if $0 < d \leq \frac{(1 + \bar{\lambda})}{\bar{\lambda}}$, then the highest value of the numerator term is non-positive, and we have $\frac{\partial \pi_B(t_A, t_B)}{\partial t_B} \geq 0$ at $t_B = 1$. Thus, when

$0 < d \leq \frac{1 + \bar{\lambda}}{\bar{\lambda}}$, we can be assured that $\pi_B(t_A, t_B)$ is strictly concave with respect to t_B , and

$\frac{\partial \pi_B(t_A, t_B)}{\partial t_B} \geq 0$ at $t_B = 1$. Hence, we can conclude that $t_B^* = 1$. Since $\frac{1 + \bar{\lambda}}{2 - \bar{\lambda}} \leq \frac{1 + \bar{\lambda}}{\bar{\lambda}}$ when

$0 < \bar{\lambda} < 1$, it follows that for $0 < d \leq \frac{1 + \bar{\lambda}}{2 - \bar{\lambda}}$, we have both $t_A^* = 0$ and $t_B^* = 1$. This proves part (i).

Part (ii) follows directly from substituting $t_A^* = 0$ and $t_B^* = 1$ in (8) and noting that $\frac{a}{bc} \lambda \equiv \bar{\lambda}$.

Now $\frac{\partial P_A(t_A^*, t_B^*)}{\partial \bar{\lambda}} = \frac{1 + d + d^2 \tilde{t}(1 - \tilde{t})}{(d\bar{\lambda}(1 - \tilde{t}) + d\tilde{t} + 1 + \bar{\lambda})^2} > 0$ as $\tilde{t} \in [0, 1]$. This proves part (iii) (a). Now,

$\frac{\partial P_A(t_A^*, t_B^*)}{\partial \tilde{t}} = -\frac{d(2 + d)\bar{\lambda}}{(d\bar{\lambda}(1 - \tilde{t}) + d\tilde{t} + 1 + \bar{\lambda})^2} < 0$ as d and $\bar{\lambda}$ are both positive. This proves part (iii)

(b). $\frac{\partial P_A(t_A^*, t_B^*)}{\partial d} = \frac{\bar{\lambda}(1 - 2\tilde{t})}{(d\bar{\lambda}(1 - \tilde{t}) + d\tilde{t} + 1 + \bar{\lambda})^2}$. If $\tilde{t} \in (\frac{1}{2}, 1)$, this is negative. This proves (iii) (c). If

$\tilde{t} \in (0, \frac{1}{2})$ then this is positive. This proves part (iv). *Q.E.D.*

Proof of Proposition 2: Part (i) follows from the observation that both $P_A(t_A, t_B)$ as in (8) and $\Delta V_A(t_A, t_B)$ as in (5) are strictly decreasing in t_A regardless of the value of $\bar{\lambda}$ or d when $\tilde{t} = 0$. Hence it follows that $\pi_A(t_A, t_B)$ as in (9) is also strictly decreasing in t_A so that $t_A^* = 0$.

By substituting $\tilde{t} = 0$ and $t_A^* = 0$ in (5), (8), and (9), we get,

$$\pi_B(0, t_B) = b \left(\frac{t_B}{(\bar{\lambda} d t_B + 1 + \bar{\lambda})^2} - 1 \right). \text{ From this, it follows that,}$$

$$\frac{\partial^2 \pi_B(0, t_B)}{\partial t_B^2} = \frac{2bd\bar{\lambda}(d\bar{\lambda}t_B - 2(1 + \bar{\lambda}))}{(d\bar{\lambda}t_B + 1 + \bar{\lambda})^4} \quad (\text{A4})$$

By inspecting (A4), it is clear that the sign of $\frac{\partial^2 \pi_B(0, t_B)}{\partial t_B^2}$ is determined by the sign of the numerator term $(d\bar{\lambda}t_B - 2(1 + \bar{\lambda}))$. The maximum value of this term is achieved when $t_B = 1$ which is $(d\bar{\lambda} - 2(1 + \bar{\lambda}))$. Hence as long as this term is negative, which requires $0 < d < \frac{2(1 + \bar{\lambda})}{\bar{\lambda}}$, (A4) is always negative and the second-order sufficient condition for utility maximization is satisfied. Suppose this is the case. We next examine,

$$\frac{\partial \pi_B(0, t_B)}{\partial t_B} = \frac{b(1 + \bar{\lambda} - d\bar{\lambda}t_B)}{(\bar{\lambda} d t_B + 1 + \bar{\lambda})^3} \quad (\text{A5})$$

By inspecting (A5), it is clear that the sign of $\frac{\partial \pi_B(0, t_B)}{\partial t_B}$ is determined by the sign of the numerator term $1 + \bar{\lambda} - d\bar{\lambda}t_B$. This term assumes its least value when $t_B = 1$ which is $1 + \bar{\lambda} - d\bar{\lambda}$. Hence it follows that if $d \leq \frac{1 + \bar{\lambda}}{\bar{\lambda}}$, then $\frac{\partial \pi_B(0, t_B)}{\partial t_B} > 0$ for $t_B < 1$. Hence it follows that $t_B^* = 1$.

Suppose now that $\frac{(1 + \bar{\lambda})}{\bar{\lambda}} < d < \frac{2(1 + \bar{\lambda})}{\bar{\lambda}}$. In this case, $\frac{\partial \pi_B(0, t_B)}{\partial t_B} < 0$ at $t_B = 1$. It is also clear that $\frac{\partial \pi_B(0, t_B)}{\partial t_B} > 0$ at $t_B = 0$. Further, given the continuity and strict concavity of $\pi_B(0, t_B)$ with

respect to t_B , it follows that, t_B^* is given by the first order condition $\frac{\partial \pi_B(0, t_B)}{\partial t_B} = 0$, and hence,

$t_B^* = \frac{1 + \bar{\lambda}}{d\bar{\lambda}}$. By inspection of this term, it is apparent that as d increases, the denominator of the

right-hand side term gets larger and t_B^* decreases. Similarly, $\frac{\partial t_B^*}{\partial \bar{\lambda}} = -\frac{1}{d\bar{\lambda}^2} < 0$. This proves part (ii).

By substituting $t_A^* = 0$ and $t_B^* = 1$ in (8), we get, $P_A(0, 1) = \frac{\bar{\lambda}d + \bar{\lambda}}{\bar{\lambda}d + 1 + \bar{\lambda}}$. From this, we infer that

$$\frac{\partial P_A(0, 1)}{\partial \bar{\lambda}} = \frac{1 + d}{(\bar{\lambda}(d + 1) + 1)^2} > 0 \text{ and } \frac{\partial P_A(0, 1)}{\partial d} = \frac{\bar{\lambda}}{(\bar{\lambda}(d + 1) + 1)^2} > 0. \text{ This proves (iii).}$$

By substituting $t_A^* = 0$ and $t_B^* = \frac{1+\bar{\lambda}}{d\bar{\lambda}}$ in (8), we get, $P_A(t_A^*, t_B^*) = \frac{1+2\bar{\lambda}}{2(1+\bar{\lambda})}$. Hence

$\frac{\partial P_A(t_A^*, t_B^*)}{\partial \bar{\lambda}} = \frac{1}{2(1+\bar{\lambda})^2} > 0$. By substituting $t_A^* = 0$ and $t_B^* = \frac{1+\bar{\lambda}}{d\bar{\lambda}}$ in (5), (8), and (9), we get,

$\pi_A(t_A^*, t_B^*) = -\frac{a(3+4\bar{\lambda})}{4d\bar{\lambda}(1+\bar{\lambda})}$. By inspecting this expression, it is clear that $\pi_A(t_A^*, t_B^*)$ increases as

d increases. Further, $\frac{\partial \pi_A(t_A^*, t_B^*)}{\partial \bar{\lambda}} = \frac{a(3+6\bar{\lambda}+4\bar{\lambda}^2)}{4d\bar{\lambda}^2(1+\bar{\lambda})^2} > 0$. This proves part (iv). *Q.E.D.*

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