ESSAYS ON THE POLITICAL ECONOMY OF INSTITUTIONAL REFORMS

AMIR HOSSEINI

A thesis submitted to the Department of Economics of the City, University of London for the degree of Doctor of Philosophy

June 2019

CONTENTS

ACKNOWLEDGMENT ... 11

Abstract ... 12

Political Economy of Institutional Reforms - Overview ... 13

Chapter 1 - Overview ... 13

Chapter 2 - Overview ... 14

Chapter 3 - Overview ... 15

CHAPTER 1 The Effects of Regulator's Selfishness on Competition, Corruption and Social Welfare 18

1.1 Introduction ... 18

1.2 Model ... 26

1.2.1 Equilibrium ... 35

1.2.2 The First Best ... 39

1.3 Policy Effects ... 41

1.3.1 Effects of Changes in the Regulator's Level of Selfishness ... 41

1.3.2 Changes in Fixed Cost and Technology ... 42

1.4 Conclusions ... 49

1.5 References ... 50

1.6 Appendices ... 53

$dNd\alpha = -Nb + b + 2cFb2N2 + 2Fb2 + 4FbcN + Fb2 + 4Fbc + 4Fc2 - a2b - a2cN - 1 + \alpha Fb3N3 + 3Fb3 + 6Fb2cN2 + A0N + A1$ ... 53

$A0 = 3Fb3 + 12Fb2c + 12Fbc2 + a2b2 + a2bc\ A1 = Fb3 + 6Fb2c + 12Fbc2 + 8Fc3 - a2b2 - 3a2bc - 2a2c2$ ... 53

Appendix 1 Equilibrium profit is decreasing in industry size ... 53

Appendix 2 Lobby's contour ... 53

Appendix 3 Effect of a change in $\boldsymbol{\gamma}$, $\boldsymbol{F}$ and $\boldsymbol{c}$ ... 54

Appendix 4 Robusness check; Investigating Scale-Neutral Corruption and Economics Social Welfare 63

Appendix 5 The number of firms under the first best and long-run perfect competition ... 64

CHAPTER 2 The Impacts of Investments in Deregulation and Deterrence Policies on Corruption and Social Welfare ... 67

2.1 Introduction ... 67

2.1 Model ... 72

2.1.1 Firms ... 73

2.1.2 The Regulator ... 74

2.1.3 The Lobby ... 75

2.1.4 Equilibrium ... 76

2.1.5 The First Best ... 77

2.2 Policy Effects, Costless Deregulation, $\boldsymbol{\tau = 0}$ ... 80

2.3 Policy Effects, Costly Deregulation, $\boldsymbol{\tau > 0}$ ... 81

2.3.1 Deregulation ... 81

2.3.2 Improving the Detection Technology ... 89

2.4 Conclusion and Policy Recommendations ... 94

2.5 References ... 96

2.6 Appendices ... 97

Appendix 1 Regulatory Quality ... 97

Appendix 2 Rule of Law ... 100

Appendix 3 Control of Corruption ... 105

Appendix 4 Effect of a Change in $\boldsymbol{y}$ on $\boldsymbol{\pi}, \boldsymbol{\alpha}$, and $\boldsymbol{N}$; Case of $\boldsymbol{\tau > 0}$ ... 108

Appendix 5 Effect of a Change in $\boldsymbol{\eta}$ on $\boldsymbol{\pi}*, \boldsymbol{\alpha}*$ and $\boldsymbol{N}*$ ... 113

CHAPTER 3 The Political Economy of Institutional Reforms: Optimising Deregulation versus Deterrence 118

3.1 Introduction ... 118

3.2 Model ... 125

3.2.1 Firms, the Regulator and the Lobby ... 125

3.2.2 The Politician ... 125

3.2.3 Equilibrium ... 129

3.3 Policy Effects ... 132

3.3.1 Neutral Politician, $\boldsymbol{\delta = 0.5}$ ... 133

3.3.2 Effects of Politicians' Type (Changes in $\boldsymbol{\delta}$) ... 139

3.4 Conclusion ... 150

3.5 References ... 152

3.6 Appendices ... 154

Appendix 1 How $\boldsymbol{y}$ and $\boldsymbol{z}$ can affect probability of re-election ... 154

Appendix 2 Outcomes Under Different Types of Politicians ... 154

Appendix 3 Outcomes of the model for different types of politicians ... 169

Appendix 4 Table of outcomes ... 176

Appendix 5 Numerical outcomes ... 177

List of Figures

Figure 1-1 - Lobby Objective Function as a Function of N and α 35

Figure 1-2 - Lobby Indifference Curves 35

Figure 1-3 - Reaction Function of the Regulator 36

Figure 1-4 - The Equilibrium 37

Figure 1-5 - Effect of a change in Marginal Cost on Regulator's Utility 41

Figure 1-6 - Social Welfare (sw^*) vs. the Regulator's Levels of Selfishness for different Marginal Cost 43

Figure 1-7 - Corruption vs. the Regulator's Selfishness for Different Levels of Marginal Cost 43

Figure 1-8 – Scale-neutral corruption vs. Marginal Cost for Different Levels of Regulator's Selfishness 43

Figure 1-9 - Social Welfare (sw^*) vs. the Regulator's Selfishness for Different Levels of Fixed Cost 45

Figure 1-10 - Corruption vs. the Regulator's Level of Selfishness for Different Levels of Fixed Cost 45

Figure 1-11 – Profit at Equilibrium vs. Levels of the Regulator's Selfishness for Different Fixed Costs 48

Figure 1-12 – Profit at Equilibrium vs. Fixed Cost for Different Levels of the Regulator's Selfishness 48

Figure 1-13 - Regulator's Reaction Function for Different Levels of Fixed Cost, Case of a relatively less selfish regulator ($\gamma = 0.3$) 48

Figure 1-14 - Regulator's Reaction Function for Different Levels of Fixed Cost, Case of a relatively less selfish regulator ($\gamma = 0.9$) 48

Figure 1-15 - Transfers versus the Regulator's Level of Selfishness for Different Levels of Fixed Cost 49

Figure 1-16 - Industry Size versus the Regulator's Level of Selfishness for Different Levels of the Fixed Cost 49

Figure 1-17 - Regulator's Reaction Functions for Different Level of Regulator's Selfishness 55

Figure 1-18 – Profit at Equilibrium vs. Levels of Regulator's Selfishness for Different Marginal Costs 58

Figure 1-19 – Profit at Equilibrium vs. Marginal Cost for Different Levels of Regulator's Selfishness 58

Figure 1-20 - Effect of a change in Marginal Cost on Regulator's Utility 58
Figure 1-21 - Regulator's Reaction Function for Different Levels of Marginal Cost, Case of a relati vely less selfish regulator (γ=0.3). 59
Figure 1-22 - Regulator's Reaction Function for Different Levels of Marginal Cost, Case of a relatively more selfish regulator (γ=0.9).. 59
Figure 1-23 - Transfers versus Regulator's Selfishness for c=7, c=10 and c=25 60
Figure 1-24 - Transfers versus Marginal Cost for Different Levels of the Regulator's Level of Selfishness... 61
Figure 1-25 - Industry Size versus Marginal Cost for Different Levels of the Regulator's Level of Selfishness... 62
Figure 1-26 - Social Welfare net of Transfer (swa^*) vs. the Regulator's Levels of the Regulator's Selfishness for different Marginal Cost 64
Figure 1-27 – Scale-neutral corruption vs. Marginal Cost for Different Levels of Regulator's Selfishness 64
Figure 1-28 - Social Welfare net of Transfer (swa^*) vs. the Regulator's Level od Selfishness for D ifferent Levels of Marginal Cost 64
Figure 1-29 – Scale-neutral Corruption vs. the Regulator's Level of Selfishness for Different Levels of Fixed Cost 64
Figure 2-1–Corruption vs. Deregulation for Different Levels of the Regulator's Selfishness, $c = 10, F = 20, \eta = 0.1, \phi = 0.1$.. 82
Figure 2-2 - Corruption vs. the Regulator's Selfishness for Different Levels of Deregulation, $c = 10, F = 20, \eta = 0.1, \phi = 0.1$.. 82
Figure 2-3–Scale-Neutral Corruption vs. Deregulation for Different Levels of the Regulator's Selfishness, $c = 10, F = 20, \eta = 0.1, \phi = 0.1$. 82
Figure 2-4 - Scale-Neutral Corruption vs. Levels of the Regulator's Selfishness for Different Levels of Deregulation, $c = 10, F = 20, \eta = 0.1, \phi = 0.1$ 82
Figure 2-5 - Social Welfare vs. Deregulation for Different Levels of the Regulator's Selfishness, $c = 10, f = 20, \eta = 0.1, \phi = 0.1$ 86
Figure 2-6 - Social Welfare net of Transfers vs. Deregulation for Different Levels of the Regulator's Selfishness, $c = 10, f = 20, \eta = 0.1, \phi = 0.1$ 86
Figure 2-7 - Social Welfare and Corruption for Medium and Relatively High Levels of the Regulator's Selfishness 88
Figure 2-8 – Corruption vs. Probability of apprehension for Different Levels of the Regulator's Selfishness, $c = 10, f = 20, y = 30.94, \phi = 0.1$ 91

Figure 2-9 – Corruption vs. the Regulator's Level of Selfishness for different Levels of Probability of apprehension, $c = 10, f = 20, y = 30.94, \phi = 0.1$ 91
Figure 2-10 - Scale-Neutral Corruption vs. Probability of apprehension for Different Levels of the Regulator's Selfishness, $c = 10, f = 20, y = 30.94, \phi = 0.1$ 92
Figure 2-11 - Scale-Neutral Corruption vs. the Regulator's Level of Selfishness for different Levels of Probability of apprehension, $c = 10, f = 20, y = 30.94, \phi = 0.1$ 92
Figure 2-12 - Social Welfare vs. Probability of Apprehension for Different Levels of the Regulator's Selfishness 93
Figure 2-13 - Social Welfare net of Transfers vs. Probability of Apprehension for Different Levels of the Regulator's Selfishness 93
Figure 2-14 - The Effect of a Change in Deregulation on the Regulator's Reaction Function, $c = 10,\ f = 20,\ \eta = 0.1, \phi = 0.1$ 109
Figure 2-15 - The Effect of a Change in the Regulator's Level of Selfishness (γ) on the Regulator's Reaction Function, $\eta = 0.1, \phi = 0.1, y = 100$ 110
Figure 2-16 - The Effect of a Change in State of Bureaucratic Process on the Regulator's Reaction Function, $\eta = 0.1, \phi = 0.1, \gamma = 0.5$ 110
Figure 2-17 - The Effect of a Change in State of Bureaucratic Process on the Regulator's Reaction Function, $\eta = 0.1, \phi = 0.1, \gamma = 0.9$ 110
Figure 2-18 - Equilibrium Transfer vs. Deregulation for Different Levels of the Regulator's Selfishness, $c = 10, f = 20, \eta = 0.1, \phi = 0.1$ 111
Figure 2-19–Industry size vs. Deregulation for Different Levels of the Regulator's Selfishness, $c = 10, f = 20, \eta = 0.1, \phi = 0.1$ 113
Figure 2-20 - Profit vs. Probability of Apprehension for Different Levels of The Regulator's Level of Selfishness, $c = 10, f = 20, \phi = 0.1, y = 30.94$ 114
Figure 2-21 - Profit vs. The Regulator's Level of Selfishness for Different Levels of Probability of Apprehension, $c = 10, f = 20, \phi = 0.1, y = 30.94$ 114
Figure 2-22 - The Regulator's Reaction Function for Different Levels of Detection Probability (η) 115
Figure 2-23 - Transfer vs. Probability of apprehension, $c = 10, f = 20, \phi = 0.1, y = 30.94$ 117
Figure 2-24–Industry Size vs. Probability of apprehension, $c = 10, f = 20, \phi = 0.1, y = 30.94$ 117
Figure 3-1 - Investment on Deregulation vs. Regulator's Level of Selfishness, case of $\delta = 0.5$ 134

Figure 3-2 - Investment on Anti-Corruption vs. Regulator's Level of Selfishness, case of $\delta = 0.5$ 134
Figure 3-3 - Total Expenditures on Institutional Reforms vs. Regulator's Level of Selfishness, case of $\delta = 0.5$. 134
Figure 3-4 - The Regulator's Reaction Function for Different Levels of the Regulator's Selfishness 136
Figure 3-5 - The Regulator's Reaction Function for Different Levels of Total Tax........ 136
Figure 3-6 - Changes of Reaction Function of the Regulator, when $\gamma < 0.91$. 137
Figure 3-7 - Changes of Reaction Function of the Regulator, when $\gamma > 0.91$. 137
Figure 3-8 - Equilibrium Industry Size and Transfer, $\gamma < 0.91$ 138
Figure 3-9 - Equilibrium Industry Size and Transfer, The case of extremely selfish regulator, $\gamma > 0.91$ 138
Figure 3-10 - Equilibrium Transfer vs. the Regulator's Level of Selfishness for Different Levels of Total Tax; ($\mu = 0.8, \phi = 0.7$) 139
Figure 3-11 - Equilibrium Transfer vs. Total Tax for Different Levels of the Regulator's Selfishness; ($c = 100, F = 100, \phi = 0.7$) 139
Figure 3-12 - Corruption vs. the Regulator's Level of Selfishness for Different Values of the Politician's Level of Populism 143
Figure 3-13 - Scale-neutral Corruption vs. the Regulator's Level of Selfishness for Different Values of the Politician's Level of Populism 145
Figure 3-14 - Equilibrium Social Welfare vs. the Regulator's Level of Selfishness for Different Types of the Politician 147
Figure 3-15 - Equilibrium Social Welfare Net of Transfers vs. the Regulator's Level of Selfishness for Different Types of the Politician 147
Figure 3-16 - Probability of Re-election vs. the Regulator's Level of Selfishness for Different Values of the Politician's Level of Populism 148
Figure 3-17 - Probability of Re-election vs. Total Tax and Share of Deregulation, given $\gamma 1$ and $\delta 1$ 154
Figure 3-18 - Probability of Re-election vs. Total Tax and Share of Deregulation, given $\gamma 2$ and $\delta 2$ 154
Figure 3-19 - Contours of Probability of Re-election vs. Total Tax and Share of Deregulation, given $\gamma 1$ and $\delta 1$ 154
Figure 3-20 - Contours of Probability of Re-election vs. Total Tax and Share of Deregulation, given $\gamma 2$ and $\delta 2$ 154

Figure 3-21 - The Regulator's Reaction Function for Different Levels of γ and the corresponding y and z 157
Figure 3-22 - Investment in Deregulation vs. Regulator's Level of Selfishness, Oligarchic Politician 159
Figure 3-23 - Investment in Anti-corruption vs. Regulator's Level of Selfishness, Oligarchic Politician 159
Figure 3-24 - Total Tax vs. Regulator's Level of Selfishness, Oligarchic Politician 159
Figure 3-25 - Transfer vs. Regulator's Level of Selfishness, Oligarchic Politician 159
Figure 3-26 - Industry Size vs. Regulator's Level of Selfishness, Oligarchic Politician 159
Figure 3-27–Social Welfare vs. Regulator's Level of Selfishness, Oligarchic Politician........ 160
Figure 3-28 - Probability of Re-election vs. Regulator's Level of Selfishness, Oligarchic Politician 160
Figure 3-29 - Corruption vs. Regulator's Level of Selfishness, Oligarchic Politician........ 160
Figure 3-30 - Equilibrium Profit vs. Regulator's Level of Selfishness, Oligarchic Politician 160
Figure 3-31 - Equilibrium Probability of Apprehension vs. Regulator's Level of Selfishness, Oligarchic Politician 160
Figure 3-32 - Investment in Deregulation vs. Regulator's Level of Selfishness, Semi-oligarchic Politician 163
Figure 3-33 - Investment in Anti-corruption vs. Regulator's Level of Selfishness, Semi-oligarchic Politician 163
Figure 3-34 - Total Transfer vs. Regulator's Level of Selfishness, Semi-oligarchic Politician 163
Figure 3-35 - Transfer vs. Regulator's Level of Selfishness, Semi-oligarchic Politician........ 164
Figure 3-36 - Industry size vs. Regulator's Level of Selfishness, Semi-oligarchic Politician 164
Figure 3-37 - Social Welfare vs. Regulator's Level of Selfishness, Semi-oligarchic Politician 164
Figure 3-38 - Probability of Re-election vs. Regulator's Level of Selfishness, Semi-oligarchic Politician 164
Figure 3-39 - Corruption vs. Regulator's Level of Selfishness, Semi-oligarchic Politician. 164
Figure 3-40 - Equilibrium Profit vs. Regulator's Level of Selfishness, Semi-oligarchic Politician 165
Figure 3-41 - Equilibrium Probability of Apprehension vs. Regulator's Level of Selfishness, Semi-oligarchic Politician 165

Figure 3-42 - Investment in Deregulation vs. Regulator's Level of Selfishness, Semi-populist Politician 166
Figure 3-43 - Investment in Anti-corruption vs. Regulator's Level of Selfishness, Semi-populist Politician 166
Figure 3-44 - Total Transfer vs. Regulator's Level of Selfishness, Semi-populist Politician 166
Figure 3-45 - Transfer vs. Regulator's Level of Selfishness, Semi-populist Politician 166
Figure 3-46 - Industry Size vs. Regulator's Level of Selfishness, Semi-populist Politician 166
Figure 3-47 - Social Welfare vs. Regulator's Level of Selfishness, Semi-populist Politician 167
Figure 3-48 - Probability of Re-election vs. Regulator's Level of Selfishness, Semi-populist Politician 167
Figure 3-49 - Corruption vs. Regulator's Level of Selfishness, Semi-populist Politician ... 167
Figure 3-50 - Equilibrium Profit vs. Regulator's Level of Selfishness, Semi-populist Politician 167
Figure 3-51 - Equilibrium Probability of Apprehension vs. Regulator's Level of Selfishness, Semi-populist Politician 167
Figure 3-52 - Investment on Deregulation vs. Regulator's Level of Selfishness for Different Politicians 170
Figure 3-53 - Investment on Deregulation vs. Politician's Level of Populism for Different Levels of Regulator's Selfishness 170
Figure 3-54 - Equilibrium Level of Investment on Anti-corruption vs. the Regulator's Level of Selfishness for Different Types of Politicians 170
Figure 3-55 - Investment on Anti-corruption vs. Politician's Level of Populism for Different Levels of Regulator's Selfishness 170
Figure 3-56 - Equilibrium Total Expenditure vs. the Regulator's Level of Selfishness for Different Types of Politicians 172
Figure 3-57 - Equilibrium Total Expenditure vs. Politician's Level of Populism for Different Levels of Regulator's Selfishness 172
Figure 3-58 - Equilibrium Transfers vs. the Regulator's Level of Selfishness for Different Values of the Politician's Level of Populism 174
Figure 3-59 - Equilibrium Industry Size vs. the Regulator's Level of Selfishness for Different Values of the Politician's Level of Populism 174
Figure 3-60 - Equilibrium Profit vs. the Regulator's Level of Selfishness for Different Values of the Politician's Level of Populism 174

Figure 3-61 - Equilibrium Consumer Surplus vs. Regulator's Level of Selfishness for Different Types of Politicians 175
Figure 3-62 - Equilibrium Producer Surplus vs. Regulator's Level of Selfishness for Different Types of Politicians 175

ACKNOWLEDGMENT

I am extremely grateful to my supervisors Saqib Jafarey and Tommoso Gabrienli for all their support and encouragement through my PhD. Without their help and guidance the chapters of this thesis would not have been possible. I am sincerely thankful to Department of Economics, City University of London, for their support during the program, especially with regards to the special circumstances I experienced. I would like to express my appreciation to examiners, Amrita Dhillon and Klaus Zauner, for their precious comments and recommendations.

I found writing the acknowledgment the most difficult part of the theses as I cannot find a proper framework to show my gratitude to my family and friends the way they deserve. I am incredibly grateful to my parents and my family (Matin, Mona, Ali, Rosha and Hana) for supporting me spiritually throughout writing this thesis and my life in general. My deepest thanks goes to Farnaz, Ata, Emad, Mohammad, Sadegh, Mojgan, AmirAli, Maryam, Atlas, Shariat, Dr. Fanaei and Dr. Ajdehfar.

The last but not the least, this thesis is dedicated to my teacher, mentor, and brother, Reza, as I owe him the greatest debt of gratitude for all his supports and encouragements throughout my life.

ABSTRACT

This theses consists of three chapters. In chapter one, firms collude in a lobby which takes the initiative of a game by transferring money to a regulator who is in charge of determining the industry size. Transfers are intended to influence the regulator to limit the industry size relative to the case of unregulated entry. The regulator's objective function weights both personal welfare and social welfare, with a greater weight on the former indicating a higher degree of selfishness and less concern about societal expectations. Chapter one investigates the effects of varying this weight as well as the effects of changes in the technology and the fixed cost. The model shows that corruption turns out to be non-monotonic in the regulator's level of selfishness. This implies that higher level of the regulator's selfishness may, counter intuitively, end to lower corruption. The model suggests that in both the case of a very high cost technology and the case of a high fixed cost of entry, both corruption and social welfare are (1) lower in magnitude and (2) less sensitive to the regulator's level of selfishness. Therefore, lowering entry cost or marginal costs can increase corruption. Chapter two introduces the probability of apprehension which can punish both the regulator and the lobby for bribery. The model investigates the effect of implementing two policies: deregulation by means of lowering entry costs and deterrence by improving the detection technology. The results suggest that enhancing the detection technology may not necessarily decrease corruption. The effect of the detection technology on corruption might be different for different levels of the regulator's selfishness. In addition, reducing bureaucratic entry costs may only lead to an increase in social welfare and a decrease in corruption for a certain range of values for the regulator's selfishness. Hence, the regulator's type plays a key role in determining the economic outcomes. Chapter three presents a three-tier hierarchical model, comprising of three players: a politician, a regulator, and a lobby. The politician's problem is to optimize the combination of two policy reforms of deregulation and deterrence in order to maximize his chance of re-election, which is positively influenced by a modified measure of social welfare, in which producer versus consumer surplus can play asymmetric roles in increasing the re-electability of the politician. By letting the type of the politician and the regulator to be varied in a continuous range, the model enables us to have a more detailed picture of the comparative statics of changes in policymakers' type on outcomes of the model. An incumbent politician can be categorized into four different types: oligarchic, semi-oligarchic, semi-populist and populist depending on the relative importance of producer as opposed to consumer surplus in increasing electability. Moreover, based on parameters of the model and namely the level of the politician's populism, the regulator may receive zero-bribe or positive-bribe, depending on his own selfishness type. The model shows that an increase in the regulator's selfishness may only harm semi-populist and populist politicians' chance of success, not that of oligarchic and semi-oligarchic politicians. Comparative statics of the model also show that the players' characteristics are of lower importance when parameters of the model lie in extreme values. Therefore, the regulator's level of selfishness has almost no effect on relatively highly populist or relatively highly oligarchic politicians. Policymakers of extreme values, whether the politician or the regulator, decides more independent of other parameters of the model. The model predicts that in two similar economies, the one with a higher level of the politician's populism may involve a wider range of regulators in the bribery process. Moreover, a politician with a higher level of populism is more sensitive to the level of the regulator's selfishness. Therefore, the type of the politician matters as it determines the sensitivity of other variables of interest to the regulator's type. Whether having a more populist politician in the office ends up in lower corruption or not, depends on other parameters of the model, namely the regulator's level of selfishness.

POLITICAL ECONOMY OF INSTITUTIONAL REFORMS - OVERVIEW

CHAPTER 1 - OVERVIEW

This theses consists of three chapters. In chapter one, firms collude in a lobby which takes the initiative of a game by transferring money to a regulator who is in charge of determining the industry size. Transfers are intended to influence the regulator to limit the industry size relative to the case of unregulated entry in which firms do not need any licence to become operational. The regulator's objective function weights both personal welfare and social welfare, with a greater weight on the former indicating a higher degree of selfishness and less concern about societal expectations. In developing countries with weak political institutions, for instance, in absence of checks-and-balances, the policy makers' character or preferences or priorities become very significant. The key theme of chapter one is to investigate the role that the regulator's type can play in determining the outcome of the model. By regulator's type, here I mean the regulator's level of selfishness.

The main result of chapter 1 is that corruption is non-monotonic in regulator's level of selfishness; first increasing and then decreasing. The policy implication of this result is that by having a less selfish regulator, we can end up with a higher level of corruption. Intuitively, the reason is that it becomes costlier for the lobby to protect the industry, because the regulator requires a greater compensation for deviating from higher social welfare. Perotti and Volpin (2004) show the same insight using a different framework. Hence, the policy implication would be that fighting with corruption may not necessarily reduce corruption, given that the economy faces with high fixed cost and high-cost technology.

The model also suggests that in both the case of a very high cost technology and the case of a high fixed cost of entry, both corruption and social welfare are (1) lower in magnitude and (2) less sensitive to the regulator's level of selfishness. Therefore, lowering entry cost or marginal costs can increase corruption.

In light of the results of the model, a change in a parameter of the model can end up in higher industry size, higher corruption and lower social welfare. This is in contrast to Straub's (2009) conclusion that more competition always enhances social welfare. Moreover, by taking into account the role of regulator's selfishness, the model reveals conditions where more competition can lead to either an increase or a decrease in corruption. This result is in line with empirical studies in the literature (Straub, 2009; Pieroni and d'Agostino, 2013).

CHAPTER 2 - OVERVIEW

Policymakers are faced with a package of goals, encompassing corruption reduction and social welfare enhancement. Implementing different institutional reforms may have different effects on each of the desired goals. This chapter provides a framework to investigate the outcome of institutional reforms in more detail. The setting of the model is based on the same entry game introduced in chapter one.

The main contribution of chapter two is to investigate the effects of deterrence or *anti-corruption policies* and *deregulation* as two potential policy instruments on social welfare and corruption along with distinguishing the different types of regulators according to their preference towards personal welfare as opposed to social welfare. Two new state variables for the quality of two institutions are introduced in this chapter: (1) Institutional reform, or deregulation, or state of bureaucratic process; (2) Deterrence, which determines probability of apprehension.

Chapter two paves the way to answer the problem raised by Jain's (2001, p. 102) in privatization on comparing 'marginal utilities of efforts to fight corruption versus reduction in the role of industrial policies'. Which one is more effective: reducing the government's role in the economy or implementing anti-corruption activities?

To check the robustness of the results, chapter two investigates comparative statics under two scenarios: (1) costless reform, which is a simpler case and (2) costly reform. The case of costless reform is basically the same as chapter one. The difference is that in the new model in chapter two, implementing deregulation is the same as reducing the fixed cost in chapter one. Therefore, the model still shows non-monotonic corruption in regulator's level of selfishness for different levels of fixed cost. This implies the adverse consequences of implementing a reform in terms of inducing higher corruption in certain circumstances. In other words, it might be the case that depending on parameters of the model, a less selfish regulator provokes more efforts from the lobby and consequently more total transfer from them.

In either cases of costless and costly reform, the model shows both 'grease-the-wheels' and 'sand-in-the-wheels' effects, depending on parameters of model. 'Grease-the-wheels' effect refers to a case of simultaneous increase in both social welfare and corruption and 'sand-in-the-wheels' describes the case of simultaneous decline those two. This suggests that for an economy, higher social welfare can be achieved at the price of obtaining higher corruption. The ultimate effect of a policy depends on two opposing effects: (1) *profit-enhancing effect* and (2) *welfare-enhancing effect*. One policy implication of this is the confirmation of the results of Bardhan and Mookherjee (2006) that corruption minimisation may not be part of optimal policy design. This is so because there would be too much of sacrifice of other welfare goals, namely social welfare to reach to lower corruption.

Moreover, corruption turns out to be (1) non-monotonic in deregulation and (2) less sensitive in deregulation for high values of regulator's selfishness. We can conclude that unlike some general results in the literature (for example Djankov et al. (2002) and Emerson (2006)), (1) regulation does not necessarily increase corruption, and (2) higher competition does not necessarily decrease corruption, which confirms the result we had in chapter one. Hence, the model is more consistent with Pieroni and d'Agostino (2013) who show that there would be a more complex correlation among competition and corruption.

Depending on the regulator's level of selfishness, corruption may turn out to be non-monotonic in probability of apprehension. This shows that probability of apprehension may not necessarily be taken as a barrier to wrongdoing which is in line with the finding of Mookherjee and Png (1995). As Banerjee et al. (2012) state: 'Greater corruption in one country could simply be a reflection of a greater willingness to fight corruption in that country.'

CHAPTER 3 - OVERVIEW

Following Acemoglu et al. (2005) we need to work on economics of institutions to understand the mechanics of emergence of institutions by considering the political processes behind them. Following the main motivation on finding a proper answer to the Jain's (2001) problem, the model will help us in finding the marginal effect of different institutional reforms. In the real world, the economy deals with a hierarchy of policymakers with different objective functions. Hence, chapter three introduces a new player called 'the politician' and of a higher rank in the hierarchy of policymakers.

Chapter three presents a three-tier hierarchical model, comprising of three players: a politician, a regulator, and a lobby. The politician's problem is to optimize the combination of two policy reforms of deregulation and deterrence in order to maximize his chance of re-election, which is positively influenced by a modified measure of social welfare, in which producer versus consumer surplus can play asymmetric roles in increasing the re-electability of the politician. By letting the type of the politician and the regulator to be varied in a continuous range, the model enables us to have a more detailed picture of effects of changes in policy-makers' type on outcomes of the model.

This chapter investigates the policy effects in two cases:

(1) Neutral politician: who assigns equal weights on producer surplus and consumer surplus.
(2) Non-neutral politicians: in which the politician assigns different weight to consumer surplus and producer surplus. Based on behaviours of social welfare and amount of investment on deterrence, the politician could be categorised into four groups: (1) Oligarchic, (2) Semi-oligarchic, (3) Semi-populist, and (4) Populist. It should be noted that there is no fixed range of the politician's level of populism for each of these four groups. In other words, the range of the politician's populism corresponding to each group may change as other parameters of the model change.

Chapter three finds that in order to have zero corruption, we do not need to have a completely benevolent regulator in the office. Moreover, politician's type changes those who would be involved in the bribery process. In other words, the politician's type determines whether the regulator may involve in the bribery or not.

The interesting result of chapter three is that regulator's selfishness can help the politician to achieve higher probability of re-election. However, that would be the case only for oligarchic and semi-oligarchic politicians. Hence, these two types of the politician look for their complementary regulators, i.e. more selfish regulators, to achieve their goals. That means that the regulator's selfishness can be a danger only for populist and semi-populist politicians.

Two other general lessons from chapter three are

(1) As in the case of chapter two, given the setting of the model which is inspired by the real world, there is no simple and generic pattern for variables of interest, i.e. corruption, industry size and social welfare.
(2) Comparative statics of the model also show that the players' characteristics are of lower importance when other parameters of the model lie in extreme values. For instance, as the politician becomes more populist, probability of re-election is less sensitive to the regulator's level of selfishness. One policy implication is that a populist politician makes decisions less dependent on the regulator's level of selfishness.

In other words, parameters of the model are of a lower impact when policymakers are of extreme types, whether the politician or the regulator.

CHAPTER 1

THE EFFECTS OF REGULATOR'S SELFISHNESS ON COMPETITION, CORRUPTION AND SOCIAL WELFARE

Abstract

In this model, firms collude in an association that later, by collecting a membership fee, forms a lobby. The lobby takes the initiative of a game by transferring some money to the second player, the regulator who is in charge of issuing licences and, hence, determining the industry size. Transfers are to make more personal welfare for the regulator and therefore to prevent any outcome close to that of the unregulated entry. This model investigates the effects of the regulator's type or preference, in the game between the lobby and the regulator. The main result of the model is that corruption turns out to be non-monotonic in regulator's level of selfishness which implies that having a more selfish regulator in the office, who is prone to be corruptible, does not necessarily lead to higher corruption in an economy. The model also suggests that in both the case of a very high cost technology and the case of a high fixed cost, both corruption and social welfare are (1) lower in magnitude and (2) less sensitive to the regulator's level of selfishness. Therefore, lowering fixed cost and improving technology, can increase corruption. In contrast to some findings in the literature, the model shows that higher competition may not be associated with higher social welfare and lower corruption.

1.1 INTRODUCTION

'Since [more than two decades of] privatisation in Iran has led the economy to anarchy, it would have been better if it was not pursued from the first date', declared Masoud Nili (2013), the chief economic adviser to Iran's president Rouhani during 2013-2017. This becomes more interesting knowing that Nili has been actively among the main leading advocates of market-oriented policies in Iran and was the chief strategist of the 3rd five-year development plan; the plan that according to Hakimian (2008) resulted in relative stability and the resumption of gradual reform during 2000–2005. He instead recommends that the government should have pursued a restructuring of state-owned enterprises rather than privatising them. He also added, 'Just three percent of enterprises in manufacturing sector, construct approximately 70 percent of value-added in this sector ... Such a privatisation has not worked in favour of Iran's economy and it was better not to be pursued at all if it was supposed to be implemented in this way'. In general, pursuing and implementing market-oriented policies and privatisation have brought up new difficulties for governments in most of the transition economies. For instance, as discussed by Rodrik (1996), even in developed countries, politicians might be encountered by the fact that some necessary reforms may turn out to be unpopular. Hence, to make it politically more feasible, politicians need to justify their intended plans to the public, who may overwhelmingly support the revision of privatisation (Denisova *et al.*, 2012). According to the survey of European Bank for Reconstruction and Development (EBRD), which was based on the responses of 28,000 individuals in 28 post-communist countries, 80 percent of respondents would like to revise current privatisation in some way (EBRD, 2007). Now, the following question would be why the public, who is assumed to be of high impact in electoral systems, may oppose a highly recommended and necessary reform. One answer deals with the perceived rise in corruption by the public during the process of privatisation.

In case the rules of the game dictate a high dependence of firms' profit on decisions of government bodies, then those who benefit from the status quo, which usually are monopolies, might see their profits at risk. Therefore, they might be encouraged to prevent any unwanted consequences of reform policies through regulatory capture and bribery. Most of the transition economies are highly regulated ones in which the governments tend to adopt different forms of control over firms. This can be due to the long history of state-oriented policies or the desire of the governments to be dominant on the private sector to prevent any political oppositions. For instance, in 1989 the Islamic Revolutionary Guard Corps (IRGC) in Iran, was invited by then-president of Iran, Rafsanjani, to take its capabilities towards the country's reconstruction in the aftermath of Iran-Iraq eight years war. However, few years later and during the succeeding president, the economic participation of IRGC's subsidiaries became more visible. Eventually in 2005, it ended with the cancellation of two contracts by IRGC: a contract with Turkcell in telecommunication and another with Tepe Akfen Vie (TAV) Airports Holding in aviation. In the latter case, IRGC used military force to prevent the operation of the airport. Later, IRGC's subsidiaries became the contractors of both projects. It did not stop there, and the head of another subsidiary became the ministry of oil and gas during Ahmadinejad's administration between 2005-2013. Such an approach, later resulted to even more contracts in key economic sectors like banking, insurance, trading, food and telecommunications.

Consequently, increase in the perception of corruption seems to be the common problem of privatisation, regardless of the adopted path by the government. An economy may encounter some problems in implementation of market-oriented policies, regardless of the various strategies and outcomes (Denisova *et al.*, 2012); whether privatisation is being pursued through establishing greenfield industries or through selling the existing state-owned enterprises. For instance, Nili (2015) believes that monopolies in Iran have been among the opposing group of any political dialogue with the west because they know that lifting the sanctions may open Iran's market to foreign competitors, and hence, their profits will be endangered.

Fighting with corruption requires deep understanding of causes, channels and results of corruption. Depending on the context, the roots and consequences of corruption can be different. Andvig (2007) criticises the n-country, cross-section econometric analyses of corruption in which corruption on average causes lower growth rates and lower per capita GDP. In other words, distinguishing different countries by their differences causes higher explanatory power in the transition countries. Following this approach, chapter one aims to investigate a regulatory capture model by having a thorough look on the mechanics of relations and more specifically the role of regulator's selfishness.

In the framework of transition economies, firms may legally be required to hold a government-issued licence to enter a market and become operational. Even if the firms are already operational, they might need to be qualified by some governmental bodies to be able to continue their activities. Therefore, the governments, whether benevolent or self-interested, are faced with the question of what are the socially optimal industry size and the possible ways to achieve that level of industry size. Even developed economies, in terms of social welfare, may not necessarily be benefitted by following free-entry policies. Mankiw and Whinston (1986) and Bliss and Di Tella (1997) show that by the presence of 'business stealing effect', free entry may lead to more than socially optimum industry size. Mankiw and Whinston (1986) define the 'business stealing effect' as the situation in which an increase in the number of firms leads to a decline in the equilibrium output per firm.

Some models assume the industry size as an exogenous variable in the model (Grossman and Helpman, 1994), while others assume it to be determined endogenously. In the latter group, at least two sub-groups can be recognised; the first group are those models in which the industry is determined after firms decide whether to remain in the market or not (Bliss and Di Tella, 1997; Mitra, 1999; Etro, 2014). The decisions of firms to remain in the market are determined by, for example, satisfying the incentive compatibility constraint. The second sub-group of models also assumes industry size as an endogenous variable, but they take it as a control variable of the regulator or the social planner (Mankiw and Whinston, 1986; Emerson, 2006).

This chapter belongs to the second sub-group as it assumes the industry size as the regulator's control variable. The regulator is in charge of issuing licences. Following Belleflamme and

Peitz (2010, p. 86) we can we can call the regulator the second-best social planner; which means that he can control entry but not the behaviour of firms once they are in the market.

Regarding the regulator's objective function, this chapter assumes it to be similar to that of Grossman and Helpman (1994), Mitra (1999) and Perotti and Volpin (2004) where the regulator maximises the weighted function of both his personal welfare and social welfare. At least two other groups of models can be recognised in the literature, in terms of the regulator's objective function. The first group, like that of Mankiw and Whinston (1986), only takes social welfare as the regulator's objective function. They provide a model for market entry and study the outcome of their model in two cases: (1) free entry, (2) under a social planner. In the second case, they assume that the social planner finds the maximising level of industry size for the social welfare. The second group assumes only personal welfare as regulator's objective function (Bliss and Di Tella, 1997; Emerson, 2006). The main question of Bliss and Di Tella (1997) is 'how could it be rational for a corrupt agent to induce exit of a firm under his control that constitutes his only source of bribe income?' As was stated earlier, the second part of the regulator's objective function, i.e., social welfare, can provide different answers to the above question.

Without taking care of social welfare, the regulator may lose his position and hence may lose the chance of being benefitted from bribes. The personal welfare of the regulator depends on the magnitude of transfers of association or the received bribes by the regulator. Hence, similar to the model of Perotti and Volpin (2004), the model presented in this chapter is a combination of both 'regulatory capture' and 'tollbooth theory'. As explained by Djankov (2002), the 'regulatory capture' theory sees the regulation as the choice of the industry, while 'tollbooth theory' emphasises the role of the bureaucrats and regulators in determining the regulatory framework of an economy.

Chapter one contributes to the literature of positive economics of institutional change. According to Acemoglu et al. (2005) and Hoff and Stiglitz (2008), in this approach, any opposition to institutional changes is mainly due to the few people who benefit from the existing system. They are that politically strong that can block any unfavourable institutional change even if it is at a great social cost.

The model in this chapter is built on the framework of Bliss and Di Tella (1997) and Emerson (2006) who investigated the relationship of the corruption and competition. However, the difference of this chapter with theirs is not limited to just the regulator's objective function. Both models assume a graft-maximising regulator whose decision can cause some firms to exit. Bliss and Di Tella define an exogenous parameter of 'deep competition', which has an uncertain effect on equilibrium corruption. Both models assume the officials as the bribe-demanders. Each firm has to make a decision about whether to pay up or to exit. Therefore, the industry size, or what they call 'abundance of firms', is determined indirectly by the cost burdened on firms in terms of the bribe. In Emerson, the number of firms is determined such that the incentive compatibility constraint for each firm is satisfied for the equilibrium bribe. This chapter assumes a different procedure for industrial organisation. In this model, I assume the association (or lobby) as the leader of the game who supplies the bribe. The second player of the game is the regulator, who decides based on what he receives as a bribe.

Having said the above, the industry size is determined in an interest lobby model like that of Grossman and Helpman (1994)[1]. In this chapter, some incumbent firms know that unregulated entry can end to zero profit. They also know that the regulator's greed can work in their favour. Therefore, they form an association and let the regulator know that for any decision he makes, some money is going to be transferred to him, which he can have it for his own personal welfare. The association (or the lobby) knows the regulator's reaction function[2]. After the determination of the number of licences by the regulator, any entrant should be a member of the association to have the licence. The membership fee is simply the amount transferred to the regulator divided by the number of licences. The association can affect the industry size by its choice of transfer. Thereafter, the association and the lobby may be used interchangeably.

The main contribution of chapter one is to introduce the role being played by the regulator's characteristic, or preference, or priorities in the game between the regulator and the lobby. The regulator's characteristics have been recognised as a key factor in some models. For

---

[1] The lobbying process presented by Grossman and Helpman (1994) can be the case only in electoral systems. For analysing non-electoral systems, it is better to interpret the procedure as bribery in which money would be transferred to a corruptible regulator.

[2] For instance, the 'Radio Positioning and Identifying Companies Syndicate (RPICS)' in Iran is an example of such a lobby. It comprises of 41 private companies who are either producer or importer or both. If a firm wants to join RPICS, they need to provide three licences from three different governmental bodies. The incumbents also are required to submit their extended business identity card, issued by the Ministry of Economic Affairs on yearly basis to be able to attend and vote in the general assembly of RPICS. This is how the Ministry of Economic Affairs constantly monitor the firms to hold their licences. Firms would benefit not only from various discounts and special import tariffs, they would also easily make collective decisions to prevent any decision that can endanger welfares of the members. For instance, in 2016, RPICS failed to convince one of the governmental bodies to implement an auction through their normal procedures in which the members of RPICS could compete with each other. Following that, the deputy of RPICS denounced the act of ignoring RPICS by making some pressures through interviewing major news agencies. The deputy revealed how by ignoring RPICS and its members as the leading private bodies of the industry, the new contract wastes the public resources by importing out-of-date products. The deputy based his argument on the fact that ignoring RPICS violates the main spirit of the 6th five-year development plans by not giving space to the main body of the private sector in the industry.

instance, Bó (2006, p. 221) discusses how personal characteristics of regulators may make differences in regulatory outcomes. As another example, Armstrong and Sappington (2007, p. 1562) point to the regulator's characteristic as one of the seven factors that affect optimal regulation in monopolies; especially in transition and developing economies where political institutions are weak and policymakers' type or characteristic becomes highly significant. The regulator's characteristic can be shown in two ways: (1) how greater the regulator's concern about consumer welfare are compared to that of the shareholders', for example, Armstrong and Sappington (2007); (2) the regulator's selfishness or how benevolent or self-interested the regulator is, for example Grossman and Helpman (1994).This chapter adopts the second approach.

Here, the regulator's character is recognised by his attitude towards personal welfare rather than to social welfare. I refer to this feature of the regulator's character as the *level of selfishness*[3]. Different authors use a different metaphor to refer to what I name 'regulator's level of selfishness'. For example, Hoff and Stiglitz (2004) define their paper based on the ability of individuals to strip assets. We can think of higher selfishness the same as the higher ability to strip assets. Later they note to 'civic virtue', which reflects the presence of a fraction of agents in each society who always pursue the rule of law, even if it is against their private interest. On the opposite side, the absence of civic virtue can lead to "bad" equilibrium. Like the case of Russia when corrupt managers or criminal figures obtained control rights through official privatizations.

In the analysis of this chapter, letting the regulator's selfishness to be varied in a continuous range can generate surprising results. While most of the existing models assume either a fixed or a binary for the regulator's level of selfishness, by introducing the regulator's level of selfishness, this model assumes the regulator's selfishness to be continuous in a range. This allows us to do comparative statics using a spectrum of values for the regulator's characteristic. For example, Boycko *et al.* (1996), in their theory of privatisation, assume that the politician is the one who always cares more about his own money. One can interpret the regulator's selfishness in this model as what Bliss and Di Tella (1997) introduce as the parameter for 'deep competition', according to which, lower level of the regulator's selfishness reflects higher tendency of the regulator to increase competition to yield the highest social welfare.

[3] Following Grossman and Helpman (1994) and depending on the context, some authors call the similar coefficient 'the weight the government attaches to political contributions relative to aggregate social welfare' (Goldberg and Maggi, 1999; Mitra, 1999; Gawande and Bandyopadhyay, 2000; Mitra *et al.*, 2002; Dutt, 2009). I follow other group of authors who use the term 'selfish' and 'self-interested' or 'non-benevolent' (Laffont and Tirole, 1990; Boot and Thakor, 1993; Sumner, 1996).

Suzumura *et al.* (1987, p. 162) separate different kinds of regulators in a different manner. They define a 'first-best' government as the one that enforces the marginal cost principle, but by 'second-best' government, they mean 'oligopolistic (marginal-cost-equals-marginal-revenue) pricing is taken for granted by an entry regulating government pursuing social welfare optimisation'. Bó (2006), in his survey of regulatory capture, discusses personal characteristics of regulator in his discussion of 'revolving door' phenomenon. 'Revolving door' investigates the connection between government regulators with the firms that they regulate. It is common that regulators try to obtain highly profitable positions in the same field for their retirement.

Lower level of the regulator's selfishness may not necessarily refer to the regulator's character. It might imply more constraint case for the regulator where he cannot find space to reveal his tendency towards gaining more personal welfare. This can be the result of a tighter checks-and-balances in place[4].

Characterizing the model by the regulator's selfishness implies that this chapter follows the footsteps of 'public choice' theory in which the regulator, or more generally the government, is less benign and policymakers usually follow their self-interests. The empirical study of Djankov et al. (2002) compares implications of the public interest theory and the public choice theory and find their result consistent with the latter. They also find two different approaches in the public choice theory. The first approach, which is known as "regulatory capture" and mainly pioneered by Stigler (1971) sees regulation more in favour of the industries. The second approach of the public choice theory, which is coined as "tollbooth" view by Djankov et al., holds that regulation works more in favour of politicians and bureaucrats. Their empirical investigation shows more consistencies with the second approach; i.e. 'tollbooth' in which politicians and bureaucrats are mainly benefitted from regulation. Using the lobbying process between the lobby from the industry side and the regulator from the government side enables us to do a more thorough investigation of the public choice theory. To do this, the model provides a simple version of Grossman and Helpman (1994) and Mitra (1999).

Interaction among different players of an economy is at the core of emergence of institutions. The players' objectives determine the demand and supply of a specific institution (Acemoglu

[4] For instance, as in the case of Iran during 2000s and 2010s, when a relatively more reformist government takes the administration, a more balance of power was in place. That provided a ground for stricter monitoring by the other major party, the conservatives. The ultimate result has been lower corruption due to higher level of monitoring. So one should not interpret that as a result of the governance of more benevolent regulators in the office.

et al., 2005). For example, if more competition lies within the interest of a politician, that would pave the path for more reforms towards higher competition. Consequently, the society will benefit from more pro-market institutions. Moreover, any change in economic policies may bring some opposition due to the changes in the framework of the economic game. In this context, the personal characteristic of the policy-maker plays a significant role in determining the institutional framework. The focus of this chapter is to show the effect of the regulator's characteristics, specifically the regulator's level of selfishness, on social welfare and corruption. As Boot and Thakor (1993) suggest, even a small degree of difference in the regulator's quality can create significant departures from social optima.

Adopting a low cost technology or reducing a fixed cost can potentially trigger the magnitude of corruption. In this chapter, the technology, fixed cost of production and the regulator's type are the main three exogenous variables. The main question is how the combination of these may affect the industry size relative to the first best, and what would be the corruption and social welfare in such an economy. In the proceeding chapters, I will expand on this by looking at the effect of deregulation policies as well as anti-corruption policies. Deregulation directly affects the fixed cost and anti-corruption policies try to reduce the level of corruption by fighting with bribery.

Competition is usually assumed to be a cure for corruption and a guaranteed way to enhance social welfare (Emerson, 2006; Straub, 2009; Pieroni and d'Agostino, 2013). This chapter suggests that when the industry size is a control variable of the regulator, it might be the case that for a relatively more benevolent regulator, more competition would not associate with lower corruption and higher social welfare. This outcome seems to be highly dependent on the marginal cost, and hence, in a more general conclusion, it depends on the cost function of the model.

The model also shows that the regulator's characteristics can have a higher impact on corruption and social welfare only if the marginal cost and fixed cost are low enough. In other words, the importance of the regulator's character is different for different states of cost. Clearly, the elements of the cost function are different in different sectors of the economy. The results of the model presented in this chapter echo the suggestion of Pieroni and d'Agostino (2013), that the general picture of the relation between economic freedom and corruption can be different from that of the sectoral level. Additionally, a lower level of the regulator's selfishness can reduce corruption only for certain ranges of the regulator's selfishness.

In other words, more selfishness in the regulator can even lead to a reduction in corruption, provided that the level of selfishness exceeds some value.

Other political economy models of reform (Dewatripont and Roland, 1992, 1995; Perotti and Volpin, 2004; Campante and Ferreira, 2007) emphasize lobby formation, uncertainty and/or asymmetric information, from which I completely abstract in this chapter. In addition, other political economy models (Biais and Perotti, 2002; Caselli and Gennaioli, 2008) are dynamic and they usually investigate the interaction of two groups of producers: incumbents and entrants. However, my static model assumes only one group of producers or elite.

The outline of this chapter is as follows. Section 1.2 discusses the model by first looking at the regulator's and the lobby's objective functions and then characterising the equilibrium. To be able to compare the outcomes of the model with a benchmark case, section 1.2.2 introduces unregulated entry as the first best. Section 1.3 investigates the comparative statics of the model in technology, fixed cost and more importantly, the regulator's level of selfishness. Section 1.4 concludes and shows potentially interesting questions to be answered based on this model.

1.2 Model

Although this model follows existing models of lobbying and corruption, I make no claim of generality for it. In the interest of simplicity and clarity, a large number of modelling choices are made in the process, which also have functional implications.

This model portrays a closed economy with two main players: the regulator and the association, which later will be called the lobby[5]. The regulator is assumed to have the full power of determining the industry size by issuing new licences for new firms and renewing licences for incumbents. Each firm needs to hold a government-issued licence. The regulator is responsible for issuing the licence. Nevertheless, any entrant needs to be a member of the association to obtain the licence. Without the licence, the regulator can stop any activity and prosecute offenders. Note that licences cannot be re-sold[6]. In other terms, the price of the licence is not a choice variable for the regulator. It is assumed that the licence will be issued

[5] The assumption of the close economy makes this model different from those models with similar framework in trade policy literature, (For example Grossman and Helpman, 1994; Lahiri and Ono, 2003; Mitra, 1999).

[6] Caselli and Gennaioli (2008) present a model to compare the economic and political consequences of two institutional reforms. They assume that the licence to operate a firm can either be purchased from the government or in the market for control. In the market for control, licences can be traded. They show that the ability to trade licence in the market for control, makes the economic consequences different with different levels of political opposition to implement them.

based on membership in the association and other qualifications, such as legally supported contracts with shareholders and employees, adequate financial credibility and so on and so forth.

The association is the other player of the game. The association eventually forms the lobby, which consists of all identical licence-holder firms in the industry. The association can start with even one firm to maintain the power of a monopolist. For example, in the 2011 Iranian embezzlement scandal, the biggest case of bank fraud in Iran, the main suspect who tries to bribe the regulator is said to be the price-maker in the steel market (Tabnak, 2012)[7].

Existing firms know the economy well and can predict its future based on social, political and economic facts. For instance, they know that social and political pressures can eventually force the regulator to open the doors of the economy. Therefore, the association anticipates the regulator's behaviour knowing that he can potentially take some bribe to work in favour of the association by issuing fewer licences. The association makes it clear for the regulator that some money can be transferred based on the number of licences he is going to issue. Then the regulator will determine the number of licences. Based on the number of firms, the membership fee of the association is determined by dividing the amount of bribe by the number of licences. In short, the association tries to convince the regulator to issue fewer licences and to work in the lobby's favour. But this will be done just by promising some transfers in exchange for issuing fewer licences.

The timeline of the game is as follows:

1. First stage: The lobby chooses the level of transfer to the regulator, given the reaction function of the regulator.
2. Second stage: Given the bribe and the reaction function of the firms, the regulator chooses the industry size.
3. Third stage: Firms compete in a Cournot fashion.

In order to derive the subgame perfect equilibrium, the game should be solved using backward induction. In other words, given the outcome of the game between the lobby and the regulator, firms decide on quantity. Then the regulator decides on number of firms given the reaction of firms and the amount of transfer chosen by firms. Finally, the lobby chooses the transfer given the reaction of other players.

[7] As Andvig (2007) notes, these anecdotal kind, single, and well-documented stories may reveal more general features of the procedure of corruption.

There are N firms in this economy that form a Cournot competition given the outcomes of the game between the association (lobby) and the regulator. There are features of monopolistic competition in this market in a sense that each firm faces a downward sloping demand that shows its market power. Since the entry is not free in this market, not all of the features of monopolistic competition are available here (Varian, 2010, p. 478). This model considers only one type of producer with identical abilities, skills and no initial wealth. Further, we will see how they compete in Cournot fashion.

A linear demand function and an identical cost function are assumed for all firms. The inverse demand function has the form of

$$p(Q) = a - bQ, a > 0, b > 0 \tag{1.1}$$

in which a and b are parameters of the demand function and $Q = \sum_i q_i$ is the total product of the industry. For example, Etro (2014) assumes that b reflects the 'size of the market', which can be referred to the endowment spent in the market or the number of consumers.

Cost function is identical to all firms and is of the following form

$$C_i = cq_i^2 + F, c > 0 \tag{1.2}$$

in which q_i is the quantity produced by firm i. Fixed cost is present because there are some factors that are fixed for the economy as a whole, even in the long run (Varian, 2010, p. 478). The number of active firms or number of licences in an industry could be fixed by law. Fixed cost can represent expenses like physical costs, machineries and buildings as well as expenses like lobbying, lawyers' fees, public relations costs and so on. Fixed cost is important in this theses as it represents bureaucratic barriers to entry. In this model, since the firms know that in the following steps, a game between the lobby and the regulator is going to be played, and they need to contribute some money to the lobby, they will consider some of these expenses in their cost function as a fixed cost. While having the fixed cost ensures the existence of increasing returns to scale, it can also be helpful in comparing the outcomes of the game with that of the first best.

It may appear that because of restricted entry to the market, we might have positive profit in the long-run. However, this may not be true since the opportunity costs should be considered as well. In other words, if we consider the opportunity cost of the value of the licence, the profit will become zero in the long-run.

The setting of the model leads to the following equilibrium quantity of

$$q^* = \frac{a}{b(N+1)+2c}$$

at the price of

$$p^* = \frac{a(b+2c)}{bN+(b+2c)}$$

Equilibrium quantity shows that there is a 'business stealing effect' in the market, which means that existing firms react to the entry of more competitors by contracting their output level (Belleflamme and Peitz, 2010). Appendix 1 proves that equilibrium profit at q^* is always decreasing in industry size.

$$\pi^*(q^*) = -\frac{FN^2b^2 + (2Fb^2 + 4Fbc)N + Fb^2 + 4Fbc + 4Fc^2 - a^2b - a^2c}{(Nb+b+2c)^2}. \tag{1.3}$$

$$\pi^{*\prime}_N < 0$$

After the competition of firms, there will be the game between the lobby and the regulator. At the second stage of the game, the regulator chooses the industry size given the level of transfer from the association (lobby). For simplicity, it is assumed that there is only one regulator. The lower number of regulators, as explained for example by Shleifer and Vishny (1993) can reduce corruption.

The regulator, in his objective function, takes into account both his own enrichment (pw) as well as social welfare (sw). The regulator cares about social welfare, because otherwise, he may lose his position as a regulator. Like Laffont and Tirole (1990, p. 5), it is assumed that the existence of courts and a constitution would exert control over public decision-makers like the regulator in this model. Courts are assumed to 'act on hard information transmitted by various parties (e.g., whistle-blowers, including consumers, mass media, discontented or idealistic civil servants, etc.) and content themselves with correcting deviations from what is specified in the constitution.'

Social welfare is defined as the simple unweighted sum of consumer surplus (cs) and producer surplus (ps) where cs and ps are defined as follows

$$cs^* = (a - bNq^*)p^*/2 \tag{1.4}$$

$$ps^* = N^*\pi^* \tag{1.5}$$

in which p^* and q^* are defined previously. Some models like Mankiw and Whinston (1986) take just consumer surplus as social welfare. Unlike the most common function of social welfare in the literature, some other models like Armstrong and Sappington (2007) assign different but related weights to consumer surplus and producer surplus[8].

$$sw = cs + ps. \tag{1.6}$$

The regulator in this model has almost the same objective function as in Grossman and Helpman (1994) and Mitra (1999) where regulator's payoff is a weighted sum of personal welfare and social welfare.

$$G = \gamma . Tr + (1 - \gamma). sw \tag{1.7}$$

It is assumed that the regulator's personal welfare equals total transfer (Tr) which will be introduced further.

The regulator's type is characterised by his level of selfishness which is denoted by γ. A higher γ represents a relatively more selfish regulator. In other words, γ is the weight that the regulator attaches to his personal welfare; so, the weight assigned to social welfare is $1 - \gamma$[9]. Therefore, γ distinguishes different types, priorities or preferences of the regulator. In the real world, we may face regulators of different types in terms of their preferences towards their personal welfare in comparison with social welfare. This change can happen after each election when new government takes the office or when new regulators being appointed as a result of some social or political pressures. As an example of these kinds of pressures, in July 2016, Rouhani, the president of Iran fired some CEOs of major public banks and appointed new members for the board of Iran's National Development Fund after that their payslips with extraordinary high salaries, bonuses and loans got published in media (Karami, 2016).

Now by combining (1.6) and (1.7) it is clear that the regulator's objective function is highly dependent on the industry size.

[8] In early stages of developing this model, I followed the same method by assigning weights to cs and ps. Later, following the suggestion from members of the department, the weights were dropped to deal with the most common function of social welfare in the literature.

[9] The weight attached to personal welfare of the regulator in this paper is equivalent to the weight the government attaches to political contributions in Grossman and Helpman (1994) model. Following the seminal work of Grossman and Helpman, some papers have tried to test whether their predictions are empirically valid or not. For instance, Goldberg and Maggi (1999), using data on nontariff barriers for the United States in 1983, in addition to finding confirmation for Grossman and Helpman prediction, find the weight of welfare in the government's objective to be around 0.98 (with a 95-percent confidence interval of 0.97-0.99), as opposed to a weight of around 0.02 for contributions. Likewise, Mitra *et al.* (2002) found the same result using four years of industry-level data from Turkey in the period of 1983 to 1990. They found the government's weight on social welfare to be much larger than the weight on political contribution. They also mention that the government' weight on social welfare is generally higher for the democratic regime than for dictatorship.

$$G(N) = \gamma . Tr(N) + (1 - \gamma) . [cs(N) + ps(N)] \quad (1.8)$$

$$N^* = \underset{N}{\operatorname{argmax}} \, G\,(N) \quad (1.9)$$

The formation of the lobby can be an outcome of a game, which is assumed to be initiated by an association. Association can start to perform even by a single incumbent in an industry[11]. Members of the association know that unregulated entry can end to zero economic profit in long-run. It is assumed that firms need to hold a licence to operate, and the number of licences in each industry is determined by the regulator. Any non-holder of the licence is assumed to be prosecuted in case of being caught operational. The association's membership fee is determined by dividing total transfer to the regulator by the number of licences issued. The license is not re-sellable. Having said all of the above, the association invites others to join so that they can convince the regulator to stop issuing more licences, and hence, benefit from higher profits with a lower number of rivals. The regulator is assumed to be careful of both his personal welfare and social welfare. Therefore, the association will try to transfer some money because it can affect the number of licences chosen by the regulator. In other words, the association knows the reaction function of the regulator.

The lobby, or the association, transfers some money (Tr) to the regulator, because it is a common knowledge that the regulator cares for his personal welfare. This model is different from Hoff and Stiglitz (2008, 2004) in its settings in a sense that even the privatisation through letting more firms to operate, may generate some economic losers, and hence, it will cause their reaction. Later, after that the regulator determines the number of licences (N), the association will be reimbursed by collecting membership fees. So, the membership fee is assumed to be equal to Tr/N.

On the other hand, any firm who is willing to be a member of the lobby, allocates a fraction, $\alpha \in [0,1]$, of its profit, π. The initial association collects all the contributions to form the lobby and act collectively by transferring all the collected transfers to the regulator. Hence, the association and the lobby can be used interchangeably.

[11] In some markets, the regulator and the lobby is the same person or entity. Like the 'Royal College of Radiologists' which determines the number of radiology trainees each year. Recently they have noticed that the number of radiologists per population in UK is the lowest in the Europe in 2015. 4.7 radiologist per 100k population which remained static over the last 5 years. This could be regarded as social pressure on the lobby to increase the number of trainees. But since the profit of each radiologist might be declined they may stop increasing the total number of radiologists after some point (The Royal College of Radiologists, 2015).

Since the regulator receives this amount because of his position, we can call total transfer as *corruption* as well[12]. Henceforward, what is meant by corruption in this model is the following

$$Tr = N\alpha\pi_i = \alpha.ps \tag{1.10}$$

Corruption is actually a fraction, α, of producer surplus, ps, as defined in (1.10)[13]. The lobby chooses what fraction of their total profit to transfer to the regulator to convince the regulator to protect them by issuing less of licences and prevent more entry. Based on the amount transferred by the lobby, the regulator chooses the number of firms to maximise his objective function.

Transfer is a metaphor for myriad ways, such as cash bribing, facilitating some of the regulator's problems in his personal life or even some side payments to the regulator for his party's campaign in electoral competitions[14].

The measure of corruption defined in (1.10) captures the environment of the entry game in this model. According to Banerjee *et al.* (2012), we need to transit to model manifestation of corruption in different environments. The environment reflects 'both the usual focus of the corruption literature—the nature of the monitoring and the punishments as well as the intrinsic motivation of the bureaucrats (e.g., how corruption fits into their moral compass)—and, what is less emphasised, the nature of the particular economic decision that the bureaucrats are participating in.' This definition of corruption in (1.10) will be helpful in other aspects as well. Banerjee *et al.* (2012) mention two reasons that could justify expanding the existing models of corruption: First, it can help to have more testable predictions according to different settings. Second, it can help to change policy design with regard to the settings. This will be more helpful in those cases that punishment cannot be feasible.

---

[12] As Sonin (2008) states 'what is considered as a fully legal lobbying activity or campaign contribution in an OECD country might be thought of as a bribe or even outright extortion in some other economy.'

[13] Note that ps, refers to the amount of producer surplus that the regulator perceives, not the one that producers perceive. To discuss the latter, we must subtract the amount of transfer to the regulator, i.e., $ps_P = (1 - \alpha)\pi$.

[14] In any case, the money is gained due to the regulator's position for goals other than legal and/or social ones. For example, in an interview with a senior official in Iran's railways, he told me about the offers he received from some of the operating firms in the market to finance all of his son's education expenses in a leading university in US or UK. Transfer can also be providing airplane and helicopters for policymakers as mentioned by Mitra *et al.* (2002). In a more complicated way, in the 2011 Iranian embezzlement scandal, the owner of an active firm in Steel market, which later was executed, offered the officials to construct a double-decker highway between two cities without asking for any money in exchange; just to have more say in Iran's steel market (Tabnak, 2012). Hence, a reasonable fraction of the regulator's annual budget was freed, which later could be collected personally. As another example, one can refer to the case of Helmut Kohl, who was accused of accepting secret donations for his party. Later no evidence of Kohl's personal enrichment was found but it should be regarded as a type of corruption. At the end, Kohl was ordered to pay a fine of DM 300,000. Also, his party, the CDU, was charged €21 million and suffered electoral costs (Kunicová, 2006).

One possible way to make the model more realistic is to assume that the regulator may not receive all the transfers because of other factors like the power of the central government. In the following chapters, by introducing the probability of apprehension, I will assume different objective functions for the regulator and the lobby.

To see the full image of comparative statics and to ckeck for the robustness of the results, this chapter also investigates two more variables: (1) economic social welfare or social welfare net-of-transfer, and (2) scale-neutral corruption. Economic social welfare (sw_a) is defined as accounting social welfare minus total transfer, or

$$sw_a = cs + ps - Tr = cs + (1 - \alpha)ps. \tag{1.11}$$

Social welfare net of transfer, sw_a, can be defined as 'economic social welfare' in contrast to 'accounting social welfare'. The latter does not take into account the dead-weight loss of corruption to the society. In other words, the society assigns zero weight to personal welfare of the regulator. As briefly discussed by Grossman and Helpman (1994), by some manipulation of weights, the objective functions with the two different definitions of social welfare are almost the same[15].

Corruption is sensitive to scales. Hence, we need to remove the role of scale in measuring corruption. This is in line with the Bardhan and Mookherjee's (2006) recommendation to avoid defining corruption just as total bribes[16]. Therefore, *scale-neutral corruption* (Tr_R) is defined as the following:

$$Tr_R = \frac{Tr}{Npq} \tag{1.12}$$

The lobby seeks to maximise its members' welfare. Similar to the model of Bliss and Di Tella (1997), this model assumes that there is a surplus in the industry, and it is better to share it with the corrupt regulator than to lose all or a big fraction of it. Bliss and Di Tella (1997) call

---

[15] They also define weights in a different manner. They define the government's objective function as $G = \sum C + a.W$, where C is contribution of each lobby, W is aggregate, gross-of-contributions welfare and $a > 0$ is the weight assigned. They also introduce another way to weight which is $G' = a_1 \sum C + a_2(W - \sum C)$. Maximizing G and G' is the same when $a = a2/(a1 - a2)$ provided that $a_1 > a_2$. They assume that this condition is satisfied because 'politicians value a dollar in their campaign coffers more highly than a dollar in the hands of the public.'

[16] They also say that defining corruption only based on bribes could be misleading in the study of welfare effects of decentralization. They recommend to entail 'costly efforts made by citizens to influence the design or application of laws in their own self-interest. This might include contributions by interest groups to politicians or costs incurred by citizens to evade laws.'

it 'surplus-shifting corruption'. Banerjee *et al.* (2012, p. 61) refer to models that cooperatives, like the cooperatives of farmers, can act like the lobby[17].

The lobby's objective function is to choose the level of transfers that maximises the remainder of producer surplus after making the transfer to the regulator. One can think of different ways the transfer can be made depending on different levels of the regulator's effectiveness. For example, in the 2011 Iranian embezzlement scandal, the suspect who was accused of supplying bribe, reduced the share of the minister of urban development by two percent after his impeachment[18] (Tabnak, 2012).

As mentioned before, since the Cournot competition among firms takes place after the lobby-regulator game, the equilibrium level of output, like the model of Bliss and Di Tella (1997), may not be affected by the lobbying process. So, the objective function of the lobby is

$$\max_{\alpha} L = (1-\alpha).N.\pi_i = (1-\alpha).ps \tag{1.13}$$

$$\alpha^* = \underset{\alpha}{\operatorname{argmax}}\, L\,(\alpha) \tag{1.14}$$

It should be noted that α^* and N^* could not be solved analytically. Therefore, I used numerical approach by which I found the equilibrium using different sets of variables.

Figure 1-1 gives a more detailed visual presentation of L with respect to α and N. As expected, lower α and lower N bring the highest return for the lobby. The maximum of L is where N is around one (pure monopoly) and α is roughly zero (no transfer from the lobby to the regulator).

[17] In case of having no access to corruption perception indices, we might have other useful regional indicators. For instance, Andvig (2007) mentions the following three: (i) estimates of the size of the second economy, (ii) the number of newspaper stories about corruption, or (iii) the number of people convicted of economic crimes including corruption.

[18] Laffont and Tirole (1993, p. 476) distinguishes five channels through which the interest groups can influence the regulators or more generally, public decision makers: (1) Monetary bribes, which due to legal issues may not be common; (2) 'Revolving door', which is the promise by firms or their law firms to recruit the regulators later or upon their retirement (Bó, 2006); (3) Personal relationships, which gives more incentives to the regulators to work in favour of their friends in firms; (4) Imposing less of public pressures from the lobby side, for instance by refraining from criticizing publicly the regulator's management; (5) Making indirect transfers through a few key elected officials who have influence over the regulators. For instance, contributing monetarily to political campaigns or providing votes and lobbying of the 'Grass Roots' (employees, shareholders, suppliers, citizens of communities where plants are located.

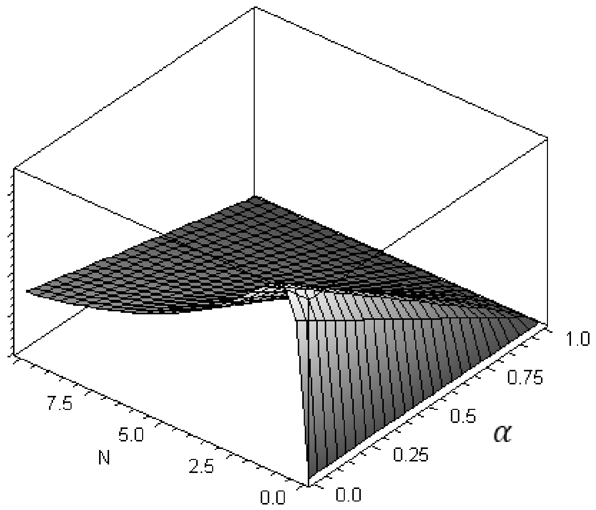

Figure 1-1 - Lobby Objective Function as a Function of N and α

We are interested in finding the combinations of N and α which results to the same L, i.e., the indifference curves. Since $N < 1$ is not possible in this model, we can show the contours in a two-dimension as in Figure 1-2. Those indifference curves at the left reflect higher return for the lobby. So, the less α (transfer) will result to more L (lobby's welfare), as expected. Appendix 1 discusses the formula of the contours of the lobby function.

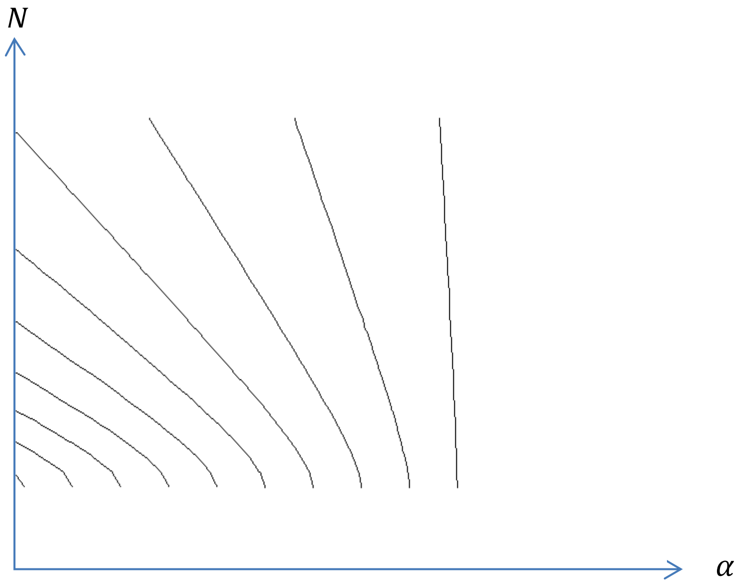

Figure 1-2 - Lobby Indifference Curves

1.2.1 Equilibrium

Following the first order condition of the regulator's objective function in (1.7) we have

$$G'_N = (1-\gamma)cs'_N + (1-(1-\alpha)\gamma)ps'_N = 0, \tag{1.15}$$

and hence,

$$-\frac{cs'_N}{ps'_N} = 1 + \frac{\alpha\gamma}{1-\gamma}. \tag{1.16}$$

If (1.16) does not hold, then the regulator may change his choice of industry size.

By solving (1.15) for N, we can get the regulator's reaction as a function of α. Figure 1-3 depicts the regulator's reaction function to the lobby's choice of transfer (α), which will be discussed in the next section.

$$N_r = N_r(\alpha), {N_r}'_\alpha < 0 \tag{1.17}$$

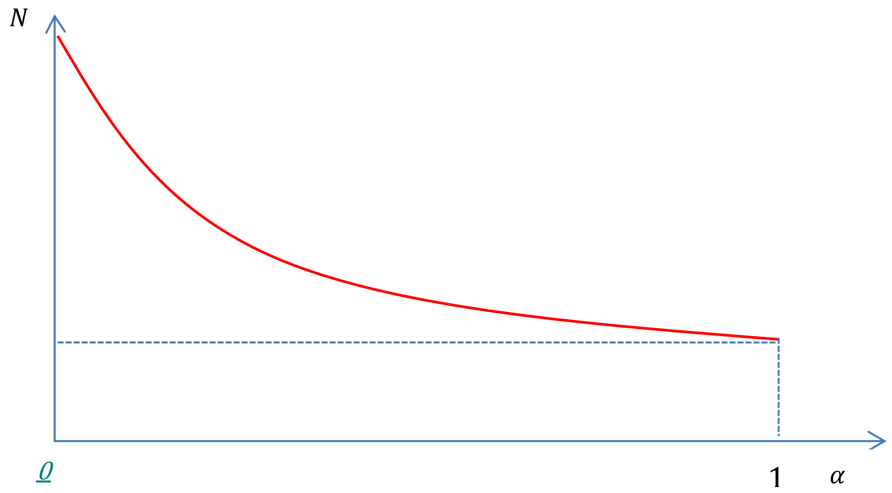

Figure 1-3 - Reaction Function of the Regulator

N remains strictly positive for all values of α. More detailed comparative statics and characterisation of the regulator's reaction function will be presented in section 1.3 . For instance, it will be shown that the regulator's reaction function is always downward sloping in α for different values of the parameters of the model.

Given the number of firms, the lobby wants to find the point on reaction function that achieves the highest return. This must clearly satisfy the tangency condition that the slope of the indifference curve equals the slope of the reaction function. In other words, the lobby would like to choose α along the highest possible indifference curve. As explained before, those indifference curves on the left reflects higher returns for the lobby. So, the lobby would like to choose α on L_2 and L_3 rather than L_1, but L_2 and L_3 are not feasible.

Mathematically, to find the equilibrium transfer and industry size, the reaction function of the regulator from (1.17) should be plugged into the lobby's objective function in (1.13). Then the lobby would solve for α to find the equilibrium level of transfers, α^*.

$$\alpha^* = \underset{\alpha}{\operatorname{argmax}}\, L(N_r(\alpha)) \tag{1.18}$$

Figure 1-4 shows the equilibrium at the tangency of the regulator's reaction function and the contours of the lobby's payoff.

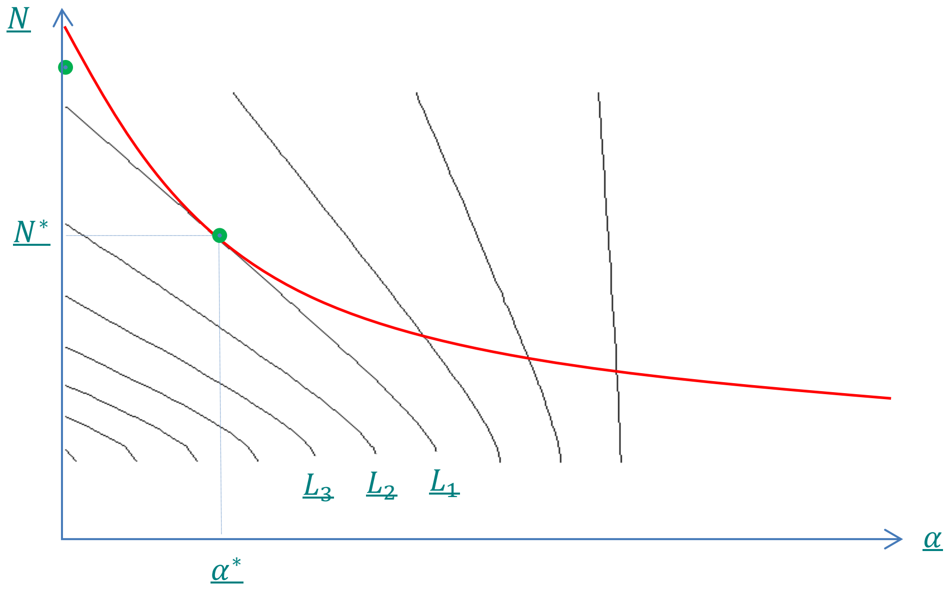

Figure 1-4 - The Equilibrium

By having a more careful look at the lobby's objective function, it can be concluded that transfers may work in favour of the lobby only if the marginal effect of industry size on profit ($\partial\pi^*/\partial N$) exceeds average profit, defined as π/N.

$$\begin{aligned} L &= (1-\alpha)N\pi \\ L'_\alpha &= -N\pi + (1-\alpha)N'_\alpha\pi + (1-\alpha)N\pi'_N N'_\alpha \\ &= -N\pi + (1-\alpha)\underbrace{N'_\alpha}_{-}\underbrace{(\pi + N\pi'_N)}_{+/-} \end{aligned} \tag{1.19}$$

Only if $\pi + N\pi'_N < 0$ we may have $L'_\alpha > 0$. Otherwise, the lobby's utility will be always negative in transfers; which remains no incentive for the lobby to transfer some of the collective profits to the regulator. So, the necessary condition is to have elastic profit with respect to industry size.

$$\pi + N\pi'_N < 0 \rightarrow \frac{\pi}{N} < \frac{\partial\pi}{\partial N} \rightarrow \frac{\partial\pi/\pi}{\partial N/N} > 1 \rightarrow \epsilon_{\pi,N} > 1$$

It is important to note that if $\epsilon_{\pi,N} > 1$ it is not necessarily the case that $L'_\alpha > 0$. In other words, the effect of transfers on the lobby's utility does not depend solely on this elasticity. Other parameters of the model are important too. But when $\epsilon_{\pi,N} > 1$ we are sure that the lobby may not transfer anything because it decreases the lobby's utility. This leads us to assume the following.

Assumption 1. Evaluated profit at equilibrium quantity is elastic with respect to the industry size;

$$|\epsilon_{\pi,N}| > 1. \tag{1.20}$$

In the following section it will be shown that without Assumption 1 there will be no interior solution for the regulator as well. In other words, in case Assumption 1 is violated, there will be no incentive for the regulator to stop issuing licences. This will be discussed in section 1.3

It is also important to discuss conditions under which the lobby would be formed. Grossman and Helpman (1994) do not provide a theory of lobby formation. Following Mitra (1999), each firm decides to participate in forming the lobby if the benefits of collective action through the lobby is greater than the benefits without lobbying. I assume that the regulator's objective function is the same with or without lobbying. The only difference is that without lobbying, no transfer would be made from the lobby, and hence, the regulator chooses the industry size by maximising social welfare. Or it can be the case that the regulator assigns no weight on personal welfare ($\gamma = 0$), which again ends to the same result.

In the next sub-section, it will be discussed that the number of firms under the lobby-regulator game is always lower than the unregulated entry case[19]. Hence, the lobby knows that without any effort to convince the regulator, there would be more competitors in the market, which results to lower profit for each firm.

Since in case of zero transfer from the lobby will result to unregulated entry into the market and hence lower profit for each firm, firms decide to form a lobby to avoid the stated above outcomes under unregulated entry. However, firms may collude in the lobby only if the profit of the firm under lobbying net of the amount spent on transfers would be greater than the profit of the firm with no lobbying. This condition will be discussed in the next sub-section in more details.

[19] The reason I call it 'unregulated entry' and not 'free entry' is due to presence of fixed cost.

1.2.2 The First Best

The first best is the case of unregulated entry in the long-run. In the first best case, the equilibrium number of firms, N_e, is determined such that no profit remains for a typical firm. Industry size in the first best is the highest given other parameters of the model. Hence, under the first best, cs is the highest. Using the explicit form for the first best provides us with benchmark values to compare the outcome of the model under the first best with the case of lobby-regulator game. This is the case where there is no barrier to entry and more entry results to a reduction in profit until no profit remains for firms. Hence, no incentive would be left for outsiders to enter the market.

$$N_e = \{N: \pi^*(N_e) = 0\} \tag{1.21}$$

$$N_e = \frac{a\sqrt{F(b+c)} - Fb - 2Fc}{Fb} \tag{1.22}$$

Now the benchmark is set for $b = 2, c = 10$ and $F = 20$. The value of a is set such that $sw = 100$ in the unregulated entry case. Following this, it turns out that $a = 48.401$. So, to do comparative statics, we set the benchmark values to above values. Following this procedure, we would have the following values for the first best.

$$N_e^* = 7.74, sw_e^* = 100$$

Remark 1 Industry size under the lobby-regulator game is always less than or equal to industry size in the first best and in the long-run perfect competition.

What is shown in Remark 1 is a standard result in the literature but with a different setting (for example Belleflamme and Peitz, 2010; Mankiw and Whinston, 1986; Suzumura *et al.*, 1987).

Using our benchmark, in the first best when $c = 10,$ the industry size is $N_e^* = 7.74$. The simulation of the model shows that equilibrium industry size under the lobby-regulator game is always less than 7.74. This means that by allowing the lobby-regulator game to be played, we definitely will have lower industry size, which guarantees higher levels of profit for firms. This can be regarded as an aspect of dead-weight loss in the model with the lobby-regulator game.

Social welfare in the first best is also always greater than social welfare under the lobby-regulator game. This means that the game causes a social inefficiency. This confirms the intuition that the lobby devotes considerable resources to maintain the number of firms fixed in their range of comfort. As Varian (2010, p. 428) stated:

> *'Lobbying expenses, lawyers' fees, public relations costs, and so on can be substantial. From the viewpoint of society, these kinds of expenses represent pure social waste. They aren't true costs of production; they don't lead to any more output being produced. Lobbying and public relations efforts just determine who gets the money associated with existing output. From the viewpoint of society, they represent a pure dead-weight loss since they don't create any more output, they just change the market value of existing factors of production.'*

Now that the case of unregulated entry is introduced, let's go back to the discussion of lobby formation, discussed in the previous sub-section and use the newly defined case of unregulated entry. As stated there, firms may collude in the lobby only if the profit of the firm under lobbying ($\pi(N^*)$) net of the amount spent on transfers would be greater than the profit of the firm with no lobbying. Since no-lobbying results to the unregulated entry, this means that we have to compare the benefits of the lobby under the lobby with that under the first best. This requires to satisfy the following condition for lobby formation.

$$(1-\alpha^*)\pi(N^*) \geq \pi(N_{NL}) \tag{1.23}$$

If we just assume that firms will take no lobbying, a foreword to the unregulated entry, then they will think of $\pi(N_{NL}) = \pi(N_e) = 0$. Therefore, in our case in which we assume that without lobbying, the outcomes of unregulated entry are expected, then (1.23) can be translated to that both $\alpha^* > 0$ and $\pi^* > 0$. If we assume that no lobbying may not necessarily ends to unregulated entry, then we have to add an assumption to make sure that the lobby will be formed.

Assumption 2. To allow firms to form the lobby, functions and parameters of the model will be chosen such that the following condition will be satisfied.

$$\frac{\pi(N_{NL})}{\pi(N^*)} \leq 1-\alpha^* \tag{1.24}$$

Hence if we know that $N^* \leq N_{NL}$, and since we assume that we always have $\pi'_N < 0$, then we will have this condition satisfied.

1.3 Policy Effects

This section investigates the effects of changes in the three main exogenous variables of the model on four endogenous variables. The three exogenous variables are regulator's level of selfishness (γ), technology or marginal cost (c) and fixed cost (F). The four endogenous variables are equilibrium transfer (α^*), equilibrium corruption (Tr^*), equilibrium industry size (N^*) and social welfare (sw^*).

1.3.1 Effects of Changes in the Regulator's Level of Selfishness

First, the changes in the regulator's level of selfishness (γ) will be examined. In different numerical experiments taken for this chapter, the model cannot be solved for low levels of the regulator's selfishness[20]. This shows that to have $\alpha^* = 0$, there is no need for a completely benevolent regulator. Hence, an economy can experience zero-corruption even when the regulator is slightly selfish. This also depends on other parameters of the model. Chapter three discusses this in more details. In all further numerical experiments, Assumption 1, Assumption 2 and second order conditions for maximisation problems are checked and they are all satisfied.

Now that the equilibrium and the first best are introduced, we can review some basic and immediate comparative statics of the model which construct the building blocks of the results. Appendix 3 discusses how γ affects the building components of corruption and social welfare; which are π^*, α^* and N^*.

Comparative statics of the model show that an increase in γ reduces the regulator's payoff and increases the lobby's and firms' payoff. Moreover, costlier technologies have ambiguous effect on α^* and N^* which largely depends on γ. Appendix 3 discusses how c and γ affect variables of interest. In light of what is presented in Appendix 3, Result 1 discusses the ultimate effect of these parameters on social welfare and corruption or total transfer

one might ask about the ultimate effect on total transfer or corruption..

Result 1 *Assuming $\epsilon_{\pi,N} > 1$, (1) social welfare is monotonically decreasing in γ, (2) corruption is non-monotonic in γ; first increasing and then decreasing.*

[20] For our benchmark values, on the regulator side of the game, for $\gamma < 0.12$ there is no real root for the first order condition. It's only for $\gamma > 0.12$ that we will have a well-behaved downward sloping reaction function for the regulator. In case we can prove that, it would be a general case, then we can interpret it as the fact that transfers from the association (lobby) will only influence those regulator with higher than some specific level of selfishness.

An increase in γ reduces the equilibrium industry size. Consequently, cs decreases and ps increases. The marginal change in ps is bigger than the marginal change in cs. Hence, sw is declining in γ. This implies that any increase in the regulator's level of selfishness does not end in favour of social welfare.

To study the effect of changes in γ on corruption, three variables must be investigated; α, N and π. N and π are decreasing in γ but Tr is increasing, because the marginal increase in profit is higher than the marginal effect on α and N. But in those economies with higher levels of regulator's selfishness, the marginal increase in profit becomes closer to the sum of marginal effect on both α and N.

Result 1 implies that for those economies with better technologies, the magnitude of corruption is higher. Better technologies help to create higher profits as discussed in Appendix 3[22]. Accordingly, the amount of money that the lobby is willing to pay is higher too. Intuitively, the amount of money required to make an impact in say petrochemical industry is much higher compared to the amount of money required to make an influence in a local market in a village. As another example, think of a thief who wants to break a chained door. The only thing he needs is a bolt cutter. However, if he wants to hack someone's computer, at least he needs to hire an expert which is definitely more expensive than a bolt cutter. So, better technologies cost more to be broken.

1.3.2 Changes in Fixed Cost and Technology

Based on the comparative statics of changes in c and F, the following result summarizes how the outcome variables of interest, corruption and social welfare, might be changed accordingly. Then, the next sub-section discusses the effect of changes in fixed cost in more details which will be used for further discussions in chapter two and three.

Result 2 *An increase in either of c or F leads to*

(1) a lower level of social welfare,

(2) a lower level of the regulator's corruption,

(3) a less sensitive and monotonically decreasing function of social welfare in γ, and

(4) a less sensitive and non-monotonic function of corruption in γ.

[22] See Figure 1-18 in Appendix 3.

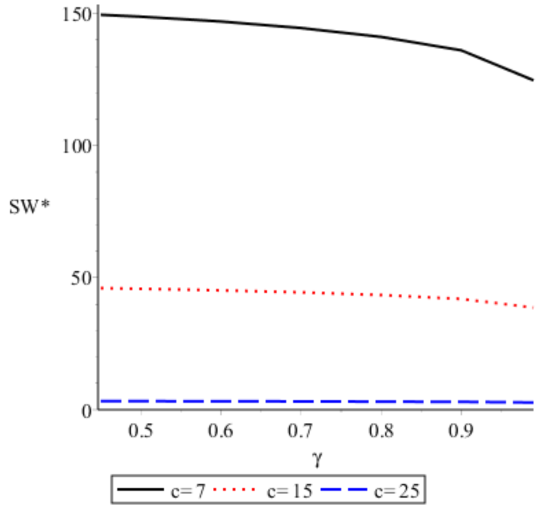

Figure 1-6 - Social Welfare (sw^*) vs. the Regulator's Levels of Selfishness for different Marginal Cost

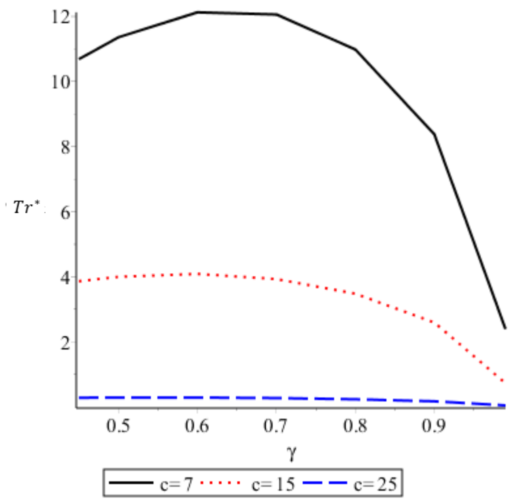

Figure 1-7 - Corruption vs. the Regulator's Selfishness for Different Levels of Marginal Cost

Different levels of technology and fixed cost, determine the behaviours of social welfare and corruption with respect to changes in regulator's level of selfishness. In case of a very low cost technology or low fixed cost, as the level of the regulator's selfishness increases, social welfare is monotonically decreasing in γ, while corruption is non-monotonic in γ; first increasing and then decreasing.

A change in either technology or fixed cost affects both sw^* and sw_a^* similarly; in terms of their magnitude both face a decrease. In terms of the trend, sw^* and sw_a^* are both decreasing in γ for different levels of technology and fixed cost[23].

The effect of changes in marginal cost becomes lower for higher values of c. The same holds for F. In the first best where $\gamma = 0$, the evaluated social welfare for benchmark values (including $c = 10$ and $F = 20$) is $sw^* = 100$. When γ increases to 0.35, we will have $sw^* = 99.54$. Assuming γ constant, a decrease of around 30% in the marginal cost, from $c = 10$ to $c = 7$ yields roughly a 45% increase in social welfare, from $sw = 100$ to around $sw = 145.79$. A rise of 20% in the marginal cost to $c = 12$ leads to around 30% of a decrease in social welfare. A rise of around 50% from the benchmark marginal cost to $c = 15$, reduces social welfare by about 56%. Finally, if marginal cost is doubled from the benchmark value of 10 to 20, social welfare reduces by around 85%.

Result 2 has clear policy implications for the regulator. In the case of a high-cost technology, having a more corruptible regulator in the office does not induce higher corruption. This

[23] The reader may find the figures of sw_a^* and Tr_R^* in Appendix 4.

may sound counter-intuitive; as always it is expected that a more selfish regulator's sets expectations for corruption higher in the economy. As shown in Figure 1-7 if the regulator's selfishness exceeds some amount, an economy with a more selfish regulator may end-up in a lower corruption. A more selfish regulator is too greedy and may be convinced with a relatively lower amount of transfer. When the cost of production increases, less of money remains. Therefore, the regulator would be happy to receive even a small fraction of that money. On the contrary, in the case of low cost technology, corruption is non-monotonic in regulator's level of selfishness. This suggests the regulator that if he wants to increase his monetary gain, he has to first follow those policies that reduce the marginal cost. Secondly, one should not necessarily associate an increase in the regulator's selfishness to an increase in corruption.

The next sub-section discusses the effects of changes in fixed cost in more detail.

1.3.2.1 Further Details on Changes in Fixed Costs

One of the main themes in chapters two and three is institutional changes and more specifically, investment on deregulation. Deregulation mainly affects the fixed cost. Therefore, chapter one presents a deep dive on how changes in fixed cost affects the outcomes of the model to pave the way for further discussion in the second and the third chapter.

The model interestingly predicts that lowering fixed cost, which could be through the removal of red tapes ends to more corruption. Ease of entry to the market can be an example of reduction in fixed cost. Figure 1-10 shows that if fixed cost reduces to a third of its value, corruption can be increased by more than 8 times. Although as depicted in Figure 1-15, the lobby picks a lower level of transfer as a result of an increase in F, the regulator will react by reducing number of licenses. The reason can be seen in Figure 1-10 where corruption increases. In other words, having fewer rivals has helped firms a lot by increasing their profits, as in Figure 1-11. So, they do not see a reason to increase the regulator's share from their profit (α) because the total magnitude of transfer (Tr) is still increasing. Since the total magnitude of corruption has increased, then the lobby allows fewer firms in the market, which is in favour of all players.

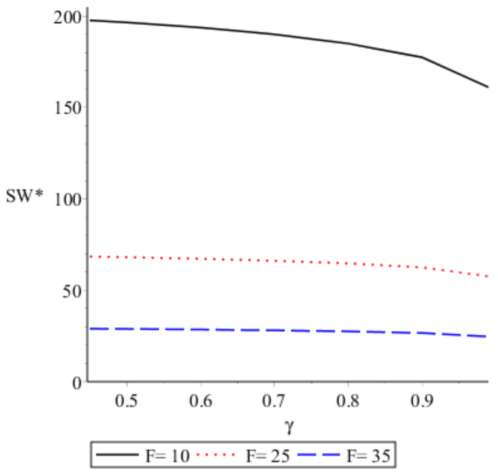

Figure 1-9 - Social Welfare (sw^*) vs. the Regulator's Selfishness for Different Levels of Fixed Cost

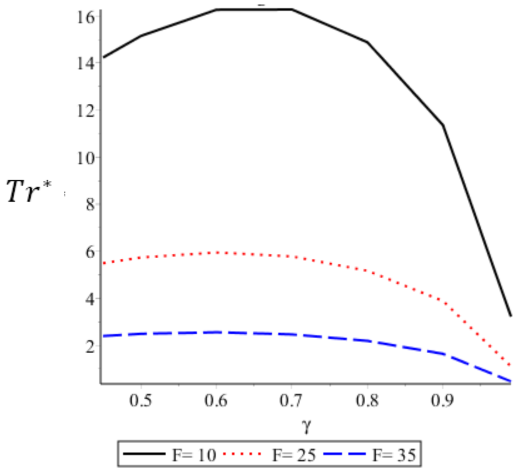

Figure 1-10 - Corruption vs. the Regulator's Level of Selfishness for Different Levels of Fixed Cost

In light of Result 1, we can expect that in developing countries where less efficient technology is being used or firms are dealing with high fixed cost, a more corrupt regulator gets convinced to work in favour of the lobby for a very low level of bribe. Also, in the context of developing countries, we may witness less corruption in total as more selfish regulator takes the office. Also, it is expected that in developed countries where more efficient technology is adopted, a regulator with the same low level of selfishness as in developing countries may receive a much bigger fraction of bribe. Moreover, corruption may be higher as a consequence of a change in the regulator's selfishness but it can be dropped to a lower value for further increases in the level of selfishness.

Result 2 also suggests that after some level of γ, having even a more selfish regulator may reduce the level of corruption. Intuitively, the reason is that it becomes costlier for the lobby to protect the industry, because the regulator requires a greater compensation for deviating from higher social welfare. Perotti and Volpin (2004) show the same insight according to their framework.

In the present setting of the model, γ is not a policy instrument. However, in light of the results discussed, one can suggest that if the level of the regulator's selfishness was a policy instrument, and if the goal is lowering corruption, then having a more selfish regulator can be of interest. The point is reducing the corruption is not the only goal in an economy for policymakers. Other variables like social welfare should be taken into account as well. This becomes more important when we look at numbers. Corruption, at maximum, is around 8% of the value of social welfare. For very high levels of γ, this ratio become lower than 3%. By

10% increase in γ from 0.8, total corruption reduces by around 25% to 5.37, while social welfare falls by 3% to 86.24.

When the technology is very costly, any change in the regulator's level of selfishness has almost no effect on either of social welfare and corruption. In other words, the regulator's personality plays a major role only when firms are benefitting from a low cost technology. In case of low cost technology, Result 2 and Result 1 together suggest three main ranges for the regulator's level of selfishness; (1) very low γ, where social welfare is decreasing and corruption is increasing; (2) medium level of γ, in which social welfare is decreasing but corruption is either constant or steadily increasing; and (3) high levels of γ, in which both social welfare and corruption are declining rapidly. Having a relatively more benevolent regulator might be helpful to reduce corruption and to raise social welfare only if γ lies in the first range; in other words, if γ is low. As γ exceeds some level, having a more benevolent regulator, can result to no effect on corruption or even an increase in it. As firms face a higher fixed cost, region 1, in which corruption is increasing, becomes shorter and region 2 becomes wider.

There is a range of low marginal cost at which, an increase in marginal cost results in higher industry size, higher corruption and lower social welfare[24]. This is in contrast to Straub's (2009) conclusion that more competition always enhances social welfare. In brief, if we consider the role of the regulator's characteristics, then for low levels of marginal cost, it might be the case that a more selfish regulator can increase competition and corruption and decrease social welfare at the same time. The result that more competition can lead to either an increase or a decrease in corruption is in line with empirical studies in the literature (Straub, 2009; Pieroni and d'Agostino, 2013).

Changes in fixed cost ends to direct relation of competition and corruption. Figure 1-16 and Figure 1-10 show that by an increase in the fixed cost, one can see a reduction in industry size and in corruption. This implies that given the role of the regulator's level of selfishness, less competition can end to less corruption.

What has been discussed so far in this sub-section shows the ultimate effects of changes in F. As was mentioned previously, chapters two and three will discuss the implications of

[24] This statement is based on Figure 1-25, Figure 1-6 and Figure 1-7.

changes in fixed cost in more details. Therefore, the following paragraphs shows the mechanics of changes in F.

Remark 1 An increase in F leads to a lower and a less sensitive equilibrium transfer and equilibrium industry size.

An increase in F has almost the same effect on equilibrium industry size as the marginal cost. In order to fully investigate the effects of changes in fixed cost, again, it is needed to investigate the effect on π^*, α^* and N^* as the main components.

The fixed cost can affect equilibrium profit both directly and indirectly through equilibrium industry size as shown in (1.3). So, to be able to see why π^* is non-monotonic in F, as shown in Figure 1-12, we need to see the effect of F on N^* as well. As F increases, the regulator's reaction function shifts to the left and becomes flatter. This is the same for both low and high levels of γ as shown in Figure 1-13 and Figure 1-14.

The direct effect of a fixed cost on equilibrium profit is negative. The indirect effect is positive. Since we have $\partial N^*/\partial F < 0$ and $\partial \pi^*/\partial N^* < 0$, and hence, we have indirect positive effect of F on π^* through N^*, the overall effect depends on the magnitude of these two opposite effects. For low levels of F, the direct effect in absolute value is lower than the indirect one. Hence, for low levels of F, equilibrium profit is increasing in F.

The regulator's level of selfishness is important too. As shown in Figure 1-12 for low levels of γ, the direct effect is bigger than the indirect effect for wider range of F.

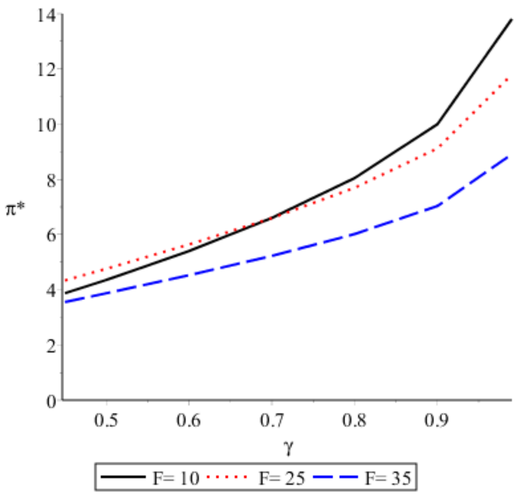

Figure 1-11 – Profit at Equilibrium vs. Levels of the Regulator's Selfishness for Different Fixed Costs

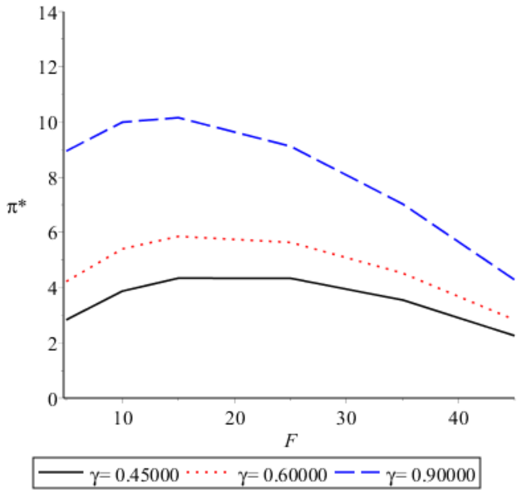

Figure 1-12 – Profit at Equilibrium vs. Fixed Cost for Different Levels of the Regulator's Selfishness

Next, I will look into the effects of a change on reaction functions of the regulator. Figure 1-13 and Figure 1-14 show two cases for changes in reaction functions as a result of change in F for two levels of γ.

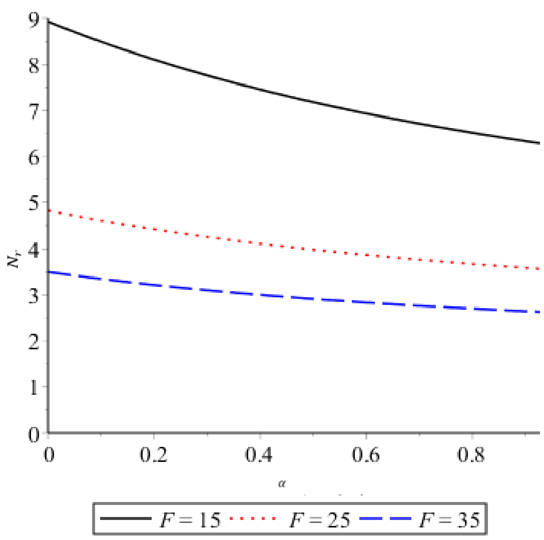

Figure 1-13 - Regulator's Reaction Function for Different Levels of Fixed Cost, Case of a relatively less selfish regulator ($\gamma = 0.3$).

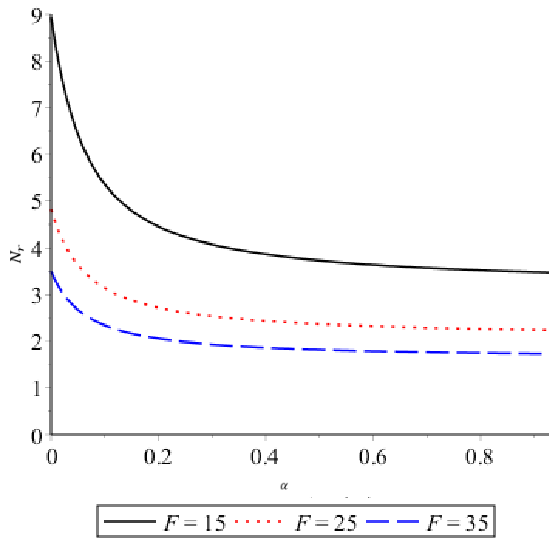

Figure 1-14 - Regulator's Reaction Function for Different Levels of Fixed Cost, Case of a relatively less selfish regulator ($\gamma = 0.9$).

Having said the effects on the equilibrium profit and reaction functions, α^* and N^* should be investigated. Again we should look for both the changes in magnitude and the behaviour of α^* in F and γ. Given that γ is fixed, as depicted in Figure 1-15, higher F causes lower level of α^*.

Unlike the comparative statics in marginal cost, equilibrium transfer is always monotonically decreasing in γ for different levels of fixed cost. For low levels of fixed cost, the equilibrium transfer is more sensitive to the regulator's level of selfishness. The policy implication learnt from this is the same as that of costly technologies that was previously discussed: competition-wise, policymakers should be less worried about changes in the regulator's selfishness when an industry is faced with a high fixed cost.

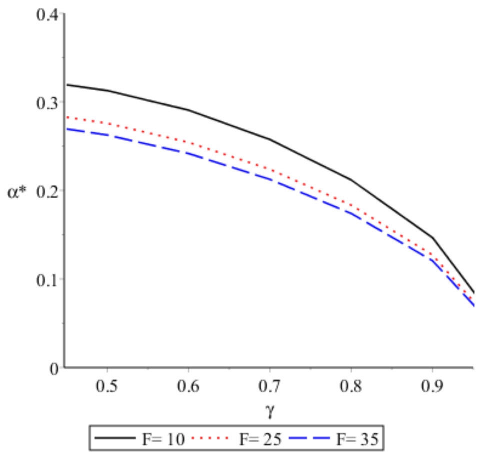

Figure 1-15 - Transfers versus the Regulator's Level of Selfishness for Different Levels of Fixed Cost

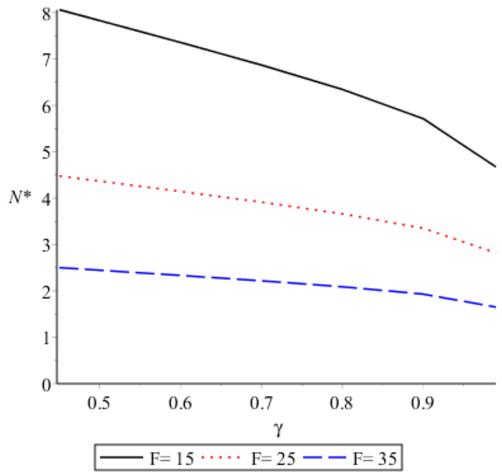

Figure 1-16 - Industry Size versus the Regulator's Level of Selfishness for Different Levels of the Fixed Cost

A rise in fixed cost reduces N^*. Also, as depicted in Figure 1-16, in situations with a higher fixed cost, N^* is less sensitive to the regulator's level of selfishness.

1.4 Conclusions

The model presented in chapter one investigates the game between the regulator and the lobby in an industry. The lobby, which is a collusion of all firms, as the leader of this game, tries to convince the regulator through transferring a fraction of its members' profit. The lobby takes the regulator's reaction function as given. At the second stage of the game, the regulator chooses the industry size such that it maximises his objective function. In the second stage, the regulator has already obtained the transferred money, which can be interpreted as bribery from the lobby.

The regulator's objective function consists of both the regulator's personal welfare as well as social welfare. This function will be maximised with respect to the number of firms chosen by the regulator. The model investigates how the regulator's type, or his tendency towards personal welfare rather than social welfare, can change and deviate the outcome of the model from the first best case. A more selfish regulator is the one who attaches a higher weight to his personal welfare.

The model shows that a more selfish regulator does not always convey higher corruption to the economy. The reason is a more selfish regulator can be convinced easier which ultimately ends to lower level of corruption.

The model shows that the outcome variables of interest are less affected by the regulator's type when high fixed cost are burdened on firms. The same finding holds for the case where firms employ high-cost technologies.

The main result of the model presented in chapter one is that more competition may not necessarily associate with less corruption and higher social welfare. Although some argue that competition is a cure for corruption and a booster for social welfare (e.g. Straub, 2009), the model in this chapter, in line with some other findings in the literature (e.g. Bliss and Di Tella, 1997), shows that this relation can be more complicated. The immediate policy implication would be to not generalise the relation between corruption and competition as other parameters of the model play significant roles. According to the comparative statics of the model, a general policy implication is that competition is less subject to changes in regulator's level of selfishness when firms employ relatively costly technologies or high fixed cost. By considering the role of the regulator's characteristics, then for low levels of marginal cost, a more selfish regulator may turn out to reduce competition, increase corruption and decrease social welfare at the same time.

Low-quality institutions can worsen the outcomes of market-oriented policies as well. Nili (2015) discusses that privatisation should be defined within a bigger framework of reform to reduce any possible friction. This may bring up another problem for the governments that in the case of having a choice to pursue two different policies, which one may bring higher social welfare and lower corruption for the economy. Are there any predictable side effects of following such policies when an economy is suffering from the weakness in both institutional and structural aspects? The following chapters will shed more light one this question based on the model presented in chapter one.

1.5 References

Acemoglu, D., Johnson, S., Robinson, J.A., 2005. Institutions as a Fundamental Cause of Long-Run Growth. Elsevier, pp. 385–472.

Andvig, J., 2007. Corruption in China and Russia compared: different legacies of central planning, in: International Handbook on the Economics of Corruption. Edward Elgar Publishing, p. 278.
Armstrong, M., Sappington, D.E.M., 2007. Chapter 27 Recent Developments in the Theory of Regulation, in: M. Armstrong and R. Porter (Ed.), Handbook of Industrial Organization. Elsevier, pp. 1557–1700.
Banerjee, A., Mullainathan, S., Hanna, R., 2012. Corruption (Working Paper No. 17968). National Bureau of Economic Research.
Bardhan, P., Mookherjee, D., 2006. Decentralization, corruption, and government accountability, in: International Handbook on the Economics of Corruption. pp. 161–188.
Belleflamme, P., Peitz, M., 2010. Industrial Organization: Markets and Strategies. Cambridge University Press.
Biais, B., Perotti, E., 2002. Machiavellian Privatization. The American Economic Review 92, 240–258.
Bliss, C., Di Tella, R., 1997. Does Competition Kill Corruption? Journal of Political Economy 105, 1001–1023. https://doi.org/10.1086/262102
Bó, E.D., 2006. Regulatory Capture: A Review. Oxford Review of Economic Policy 22, 203–225. https://doi.org/10.1093/oxrep/grj013
Boot, A., Thakor, A., 1993. Self-Interested Bank Regulation. American Economic Review 83, 206–12.
Boycko, M., Shleifer, A., Vishny, R.W., 1996. A Theory of Privatisation. The Economic Journal 106, 309–319. https://doi.org/10.2307/2235248
Campante, F.R., Ferreira, F.H.G., 2007. Inefficient lobbying, populism and oligarchy. Journal of Public Economics 91, 993–1021. https://doi.org/10.1016/j.jpubeco.2006.12.006
Caselli, F., Gennaioli, N., 2008. Economics and Politics of Alternative Institutional Reforms. Quarterly Journal of Economics 123, 1197–1250.
Clarke, G.R.G., Xu, L.C., 2004. Privatization, competition, and corruption: how characteristics of bribe takers and payers affect bribes to utilities. Journal of Public Economics 88, 2067–2097. https://doi.org/10.1016/j.jpubeco.2003.07.002
Denisova, I., Eller, M., Frye, T., Zhuravskaya, E., 2012. Everyone hates privatization, but why? Survey evidence from 28 post-communist countries. Journal of Comparative Economics 40, 44–61. https://doi.org/10.1016/j.jce.2011.11.001
Dewatripont, M., Roland, G., 1992. Economic Reform and Dynamic Political Constraints. Rev Econ Stud 59, 703–730. https://doi.org/10.2307/2297994
Dewatripont, M., Roland, G., 1995. The Design of Reform Packages under Uncertainty. The American Economic Review 85, 1207–1223.
Djankov, S., Porta, R.L., Lopez-de-Silanes, F., Shleifer, A., 2002. The Regulation of Entry. The Quarterly Journal of Economics 117, 1–37.
Dutt, P., 2009. Trade Protection and Bureaucratic Corruption: An Empirical Investigation. The Canadian Journal of Economics / Revue canadienne d'Economique 42, 155–183.
EBRD, 2007. Life in transition, a survey of people's experiences and attitudes. European Bank for Reconstruction and Development, London.
Emerson, P.M., 2006. Corruption, competition and democracy. Journal of Development Economics 81, 193–212. https://doi.org/10.1016/j.jdeveco.2005.04.005
Etro, F., 2014. The Theory of Endogenous Market Structures. Journal of Economic Surveys 28, 804–830. https://doi.org/10.1111/joes.12020
Gawande, K., Bandyopadhyay, U., 2000. Is Protection for Sale? Evidence on the Grossman-Helpman Theory of Endogenous Protection. The Review of Economics and Statistics 82, 139–152.
Goldberg, P.K., Maggi, G., 1999. Protection for Sale: An Empirical Investigation. American Economic Review 89, 1135–1155. https://doi.org/10.1257/aer.89.5.1135

Grossman, G.M., Helpman, E., 1994. Protection for Sale. The American Economic Review 84, 833–850.
Hakimian, H., 2008. Institutional change, policy challenges, and macroeconomic performance : case study of the Islamic Republic of Iran (1979-2004) (No. 57725). The World Bank.
Hoff, K., Stiglitz, J.E., 2004. After the Big Bang? Obstacles to the Emergence of the Rule of Law in Post-Communist Societies. The American Economic Review 94, 753–763.
Hoff, K., Stiglitz, J.E., 2008. Exiting a Lawless State*. The Economic Journal 118, 1474–1497. https://doi.org/10.1111/j.1468-0297.2008.02177.x
Karami, A., 2016. Four heads of Iranian banks fired for high salaries [WWW Document]. Al-Monitor. URL http://www.al-monitor.com/pulse/originals/2016/06/high-wages-iran-government-officials-banks-fired.html (accessed 10.29.17).
Kunicová, J., 2006. Democratic institutions and corruption : incentives and constraints in politics, in: International Handbook on the Economics of Corruption. Edward Elgar Publishing, p. 656.
Laffont, J.-J., Tirole, J., 1993. A Theory of Incentives in Procurement and Regulation. MIT Press.
Laffont, J.-J., Tirole, J., 1990. The Politics of Government Decision Making: Regulatory Institutions. Journal of Law, Economics, & Organization 6, 1–31.
Lahiri, S., Ono, Y., 2003. Trade and Industrial Policy under International Oligopoly. Cambridge University Press, Cambridge.
Mankiw, Whinston, M., 1986. Free Entry and Social Inefficiency. Rand Journal of Economics 17, 48–58.
Mitra, D., 1999. Endogenous Lobby Formation and Endogenous Protection: A Long-Run Model of Trade Policy Determination. The American Economic Review 89, 1116–1134.
Mitra, D., Thomakos, D.D., Ulubaşŏglu, M.A., 2002. "Protection for Sale" in a Developing Country: Democracy vs. Dictatorship. The Review of Economics and Statistics 84, 497–508.
Nili, M. (Ed.), 2015. Where Is the Iranian Economy Heading Towards? Donyay-e Eghtesad, Tehran.
Nili, M., 2013. The Unregulable Economy [WWW Document]. Tejarat-e Farda. URL http://tejarat.donya-e-eqtesad.com/fa/packagestories/details?service=economy&story=a7285363-3e44-43c2-b38b-16ff03ecae7d (accessed 11.18.16).
Perotti, E.C., Volpin, P.F., 2004. Lobbying on Entry (SSRN Scholarly Paper No. ID 592404). Social Science Research Network, Rochester, NY.
Pieroni, L., d'Agostino, G., 2013. Corruption and the effects of economic freedom. European Journal of Political Economy 29, 54–72. https://doi.org/10.1016/j.ejpoleco.2012.08.002
Rodrik, D., 1996. Understanding Economic Policy Reform. Journal of Economic Literature 34, 9–41.
Shleifer, A., Vishny, R.W., 1993. Corruption. The Quarterly Journal of Economics 108, 599–617. https://doi.org/10.2307/2118402
Sonin, K., 2008. state capture and corruption in transition economies, in: Durlauf, S.N., Blume, L.E. (Eds.), The New Palgrave Dictionary of Economics. Palgrave Macmillan, Basingstoke.
Stigler, G.J., 1971. The Theory of Economic Regulation. The Bell Journal of Economics and Management Science 2, 3–21. https://doi.org/10.2307/3003160
Straub, S., 2009. Regulatory Intervention, Corruption and Competition. Review of Industrial Organization 35, 123–148. https://doi.org/http://dx.doi.org.ezproxy.sussex.ac.uk/10.1007/s11151-009-9218-z

Sumner, X.H., 1996. Commitment with Selfish Regulators. The Canadian Journal of Economics / Revue canadienne d'Economique 29, S265–S269. https://doi.org/10.2307/135998
Suzumura, K., Kiyono, K., Suzumura, K., Kiyono, K., 1987. Entry Barriers and Economic Welfare. Review of Economic Studies 54, 157–167.
Tabnak, 2012. Threat to Reveal Names of Involved Officials [WWW Document]. Persian. URL http://www.tabnak.ir/fa/news/247685 (accessed 8.31.16).
The Royal College of Radiologists, 2015. Current and Future Workforce Demand and Supply [WWW Document]. URL https://www.rcr.ac.uk/sites/default/files/documents/hee_evidence_2015-16_clinical_radiology.pdf (accessed 8.31.16).
Varian, H.R., 2010. Intermediate Microeconomics: A Modern Approach. W.W. Norton & Company.

1.6 Appendices

Appendix 1

$$\frac{dN}{d\alpha} = \frac{-(Nb+b+2c)\left(Fb^2N^2+(2Fb^2+4Fbc)N+Fb^2+4Fbc+4Fc^2-a^2b-a^2c\right)N}{(-1+\alpha)(Fb^3N^3+(3Fb^3+6Fb^2c)N^2+A_0N+A_1)}$$

$A_0 = 3\mathrm{Fb}^3 + 12\mathrm{Fb}^2\mathrm{c} + 12\mathrm{Fbc}^2 + \mathrm{a}^2\mathrm{b}^2 + \mathrm{a}^2\mathrm{bc}$

$A_1 = \mathrm{Fb}^3 + 6\mathrm{Fb}^2\mathrm{c} + 12\mathrm{Fbc}^2 + 8\mathrm{Fc}^3 - \mathrm{a}^2\mathrm{b}^2 - 3\mathrm{a}^2\mathrm{bc} - 2\mathrm{a}^2\mathrm{c}^2$

Equilibrium profit is decreasing in industry size

Profit at q^* is always decreasing in industry size.

$$\frac{\partial \pi^*(q^*)}{\partial N} = \underbrace{-bq^{*2}}_{-} + \underbrace{\frac{\partial q^*}{\partial N}}_{-}\underbrace{[-2q^*(bN+c)+a]}_{-}$$

This suggests that the sign of $\partial \pi^*(q^*)/\partial N$ depends on the interaction of the two terms with opposite signs, but by contradiction, it can be proved that $\partial \pi^*(q^*)/\partial N$ is always negative.

$$-bq^{*2} + \frac{\partial q^*}{\partial N}[-2q^*(bN+c)+a] < 0 \rightarrow$$

$$\frac{bN+c}{bN+c+b+c} < 1$$

which always holds.

Appendix 2 Lobby's contour

The lobby contours would be as follows:

$$\frac{dN}{d\alpha} = \frac{-(Nb + b + 2c)(Fb^2N^2 + (2Fb^2 + 4Fbc)N + Fb^2 + 4Fbc + 4Fc^2 - a^2b - a^2c)N}{(-1+\alpha)(Fb^3N^3 + (3Fb^3 + 6Fb^2c)N^2 + A_0N + A_1)}$$

where

$$A_0 = 3\mathrm{Fb}^3 + 12\mathrm{Fb}^2\mathrm{c} + 12\mathrm{Fbc}^2 + \mathrm{a}^2\mathrm{b}^2 + \mathrm{a}^2\mathrm{bc}$$

$$A_1 = \mathrm{Fb}^3 + 6\mathrm{Fb}^2\mathrm{c} + 12\mathrm{Fbc}^2 + 8\mathrm{Fc}^3 - \mathrm{a}^2\mathrm{b}^2 - 3\mathrm{a}^2\mathrm{bc} - 2\mathrm{a}^2\mathrm{c}^2.$$

Appendix 3 Effect of a change in γ, F and c

Corruption and social welfare are the main outcomes of interest in chapter one. The main components of these variables are α, N and π. This appendix discusses the effects of changes in parameters of the model on these three.

Remark 2 An increase in γ (1) reduces the regulator's payoff, (2) reduces the equilibrium industry size and (3) increases the elasticity of the regulator's reaction function.

Now we can discuss the sign of the regulator's first order condition, shown in equation (1.15).

$$\frac{\partial G}{\partial N} = (1-\gamma)\underbrace{cs'_N}_{+} + (1-(1-\alpha)\gamma)\underbrace{(\pi + N\pi'_N)}_{-}$$

So, the sign of $\partial G/\partial N$ depends on the interaction of two effects mentioned above. Note that without Assumption 1, the above will definitely result to $\partial G/\partial N > 0$, which means that there would be no incentive for the regulator to stop issuing more licences as it always results to higher outcome for the regulator. Therefore if $\epsilon_{\pi,N} < 1$, there would be no reason for the regulator to stop increasing the industry size. Hence, without having Assumption 1 satisfied, the regulator has no incentive to stop increasing the industry size. The above shows that the regulator will increase number of firms until the point where the weighted marginal effect of N on consumer surplus becomes equal to the weighted effect of N on producer surplus.

Figure 1-17 depicts the change being made in the reaction function due to the change in γ. Intuitively, any change in the regulator's preferences towards his personal welfare rather than social welfare, results to lower competition and fewer firms. An increase in γ can be interpreted as leaning towards a more corruptible regulator. Those policies which empty more space for corruptive actions and rent-seeking can be examples of an increase in γ.

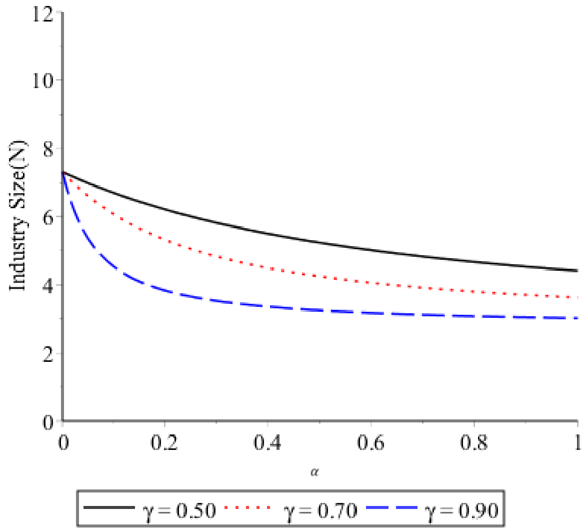

Figure 1-17 - Regulator's Reaction Functions for Different Level of Regulator's Selfishness

By an increase in γ, reaction function shifts to the bottom left. Regulator's selfishness has effects not only on the magnitude of industry size, but also on the slope of the reaction function or sensitivity of the regulator to transfer. In other words, a more selfish regulator is more sensitive to what the lobby is going to allocate from the profit of each firm to the regulator. On the other hand, as shown in Figure 1-17, N^* under a less selfish regulator is less subject to changes in α. Intuitively, a more benevolent regulator decides more independent of what is being transferred to him.

When the regulator is less selfish, the marginal utility from a given dollar of transfer (or bribe) is smaller; so, the lobby has to spend more per unit of protection received. It, therefore, hedges by paying slightly more but accepting less protection. For example, suppose that the lobby is paying α_0 and receiving protection $N_0 < N_1$; where N_1 is the number of firms under a benevolent regulator. Now suppose γ decreases marginally. For a given α_0, the new regulator would set a higher N, and for given N_0 the new regulator would need a higher α. The lobby hedges by accepting marginally higher N while offering a marginally higher transfer.

For low values of α all reaction functions with different levels of the regulator's selfishness converge. Intuitively when very low level of transfer is being made, all types of regulator would announce the same level of industry size. The change of the regulator preferences towards more personal welfare causes higher changes in N only when α is not very low[25].

Even when α is high, the regulator may not set the industry size at zero. This means that transfer is not the only determinant of the industry size. Industry size will only be close to zero when other parameters of the model, like the regulator's level of selfishness, exceeds some level. The comparative statics shows that even in case of very high γ, the regulator becomes less sensitive to transfers and may determine the industry size, almost, regardless of the level of transfer.

Here are more formal discussion on what was discussed above.

$$\frac{\partial G}{\partial \gamma} = \frac{\partial}{\partial \gamma}(\gamma . pw + (1-\gamma)(cs + ps)) = \ Tr - cs - ps$$
$$= -(1-\alpha)ps - cs < 0$$

Note that as stated earlier, I assume $pw = Tr = \alpha . ps$. The above is subject to change if the personal welfare of the regulator does not equal to corruption. The slope of $G(N)$, which was discussed in (1.15), changes as γ changes.

$$\frac{\partial}{\partial N}\frac{\partial G}{\partial \gamma} = \underbrace{-cs'_N}_{-} - (1-\alpha)\underbrace{(\pi + N\pi'_N)}_{-} < 0$$

Also, regulator's reaction function is concave. Following (1.17) and (1.15),

$$\frac{\partial^2 G}{\partial N^2} = (1-\gamma)\underbrace{\partial^2 cs/\partial N^2}_{-} + (1-(1-\alpha)\gamma)\underbrace{\partial^2 ps/\partial N^2}_{-}$$

Since the higher γ corresponds to lower slope of $G(N)$ and $G(N)$ is concave, we can conclude that higher γ relates to lower equilibrium industry size.

It can be derived from the above that γ directly affects concavity of the regulator's objective function. That is

$$\frac{\partial}{\partial \gamma}\frac{\partial^2 G}{\partial N^2} = -\frac{\partial^2 cs}{\underbrace{\partial N^2}_{-}} - (1-\alpha)\frac{\partial^2 ps}{\underbrace{\partial N^2}_{-}} > 0$$

[25] In the models of chapter 2 and 3, due to the introduced policies, a change in γ changes the intercept of reaction functions as well as their slope.

So, by an increase in γ, the elasticity of the regulator will increase.

Remark 3 An increase in γ results to (1) an increase in profit of the firm, (2) an increase in the lobby's payoff.

Assumption 1 guarantees the positive effect of γ on Lobby's payoff. So, by having $\epsilon_{\pi,N} > 1$, the regulator's selfishness works in favour of the lobby. In case of the violation of Assumption 1, having a more selfish regulator in office may work against the lobby's benefit. Thus, the assumption that makes $L'_\alpha > 0$, assures that the regulator's selfishness will work in favour of the lobby.

Here are more formal discussion on Remark 3. We know that

$$\frac{\partial \pi^*(q^*)}{\partial \gamma} = \frac{\partial \pi^*(q^*)}{\partial N}\frac{\partial N}{\partial \gamma}$$

Previously we discussed that $\partial N/\partial \gamma < 0$ and Appendix 1 shows that $\partial \pi^*(q^*)/\partial N < 0$. So $\partial \pi^*(q^*)/\partial \gamma > 0$. Note that the regulator's reaction function will be plugged into the lobby's function to find the equilibrium α^*.

$$\frac{\partial L}{\partial \gamma} = \frac{\partial}{\partial \gamma}(1-\alpha)N(\alpha,\gamma)\pi(N(\alpha,\gamma))$$

Using envelope theorem

$$\frac{\partial L^*}{\partial \gamma} = (1-\alpha^*)\underbrace{N_\gamma^{*\prime}}_{-}\underbrace{(\pi^* + N^*\pi_N^{*\prime})}_{-} > 0.$$

Intuitively for low levels of marginal cost, firms are expected to be more flexible and in control of more resources to allocate to transfers. Therefore, for low levels of marginal cost, there might be an increase in transfers, even when a more selfish regulator is in the office.

Figure 1-18 shows that firms' profit is increasing in the regulator's level of selfishness for all levels of marginal cost. However, the impact of the regulator's selfishness is higher when marginal cost is low.

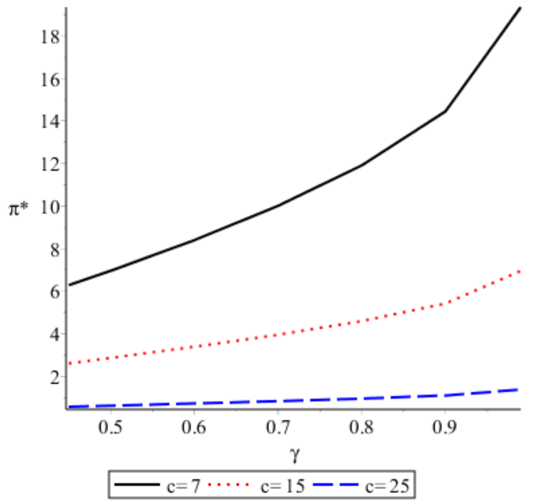

Figure 1-18 – Profit at Equilibrium vs. Levels of Regulator's Selfishness for Different Marginal Costs

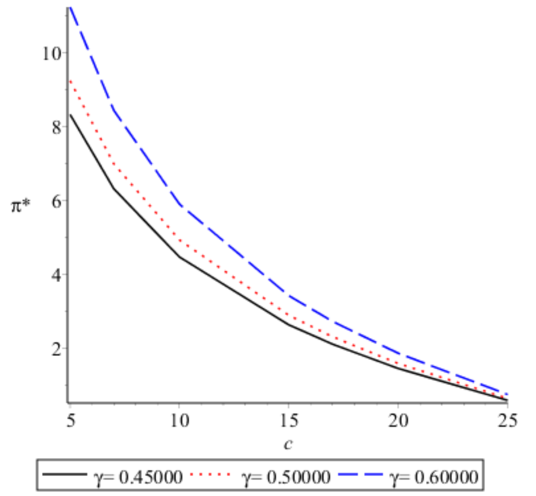

Figure 1-19 – Profit at Equilibrium vs. Marginal Cost for Different Levels of Regulator's Selfishness

Generally, the marginal cost has a negative effect on regulator's payoff. By an increase in marginal cost from a low value, the regulator's reaction function first shifts upward. Any further increase in marginal cost causes the regulator's reaction function to be shifted downward. All these show that equilibrium industry size is not monotonic in marginal cost. This is something specific to our settings in this model and holds even in the first best. Equation (1.26) in Appendix 5 shows the condition for a marginal cost that makes the equilibrium industry size decreasing in c. Figure 1-5 shows how regulator's payoff reacts to a change in marginal cost. Any increase in marginal cost reduces the regulator's payoff, but the effect on maximising level of N depends on the level of marginal cost.

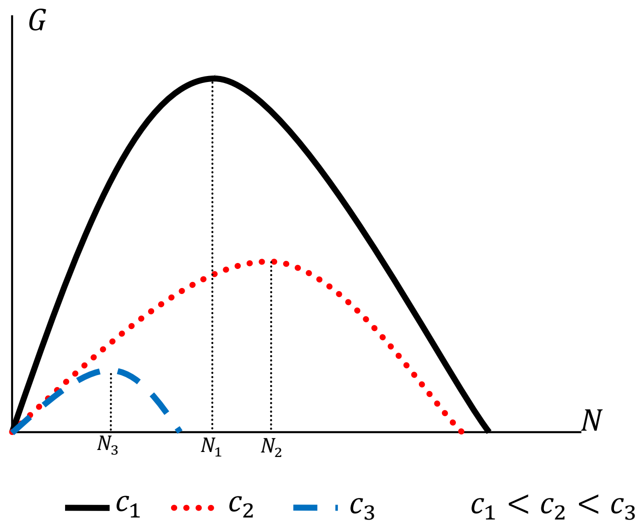

Figure 1-20 - Effect of a change in Marginal Cost on Regulator's Utility

The fact that an increase in marginal cost causes the regulator to first choose a higher industry size and then a lower one, is specific to the settings of the models, namely the cost function. But introducing the regulator's selfishness may change the effect of marginal cost on reaction function. Figure 1-21 and Figure 1-22 show how differently the effect of marginal cost is on regulator's reaction function for different levels of the regulator's selfishness. Given a range of low values for the regulator's level of selfishness, i.e. among relatively more benevolent regulators, more benevolent regulator is in the office, like in Figure 1-21, the lobby can predict that for any transfer made from the lobby, the regulator is going to determine lower levels of industry size. However, given a range of high values of the regulator's selfishness, or among relatively more selfish regulators, in the case of a selfish regulator, like in Figure 1-22, the lobby sees that the regulator will respond to transfers differently. The intersection of the two regulator's reaction functions for $c = 5$ and $c = 15$ expresses the effect of transfer on regulator's reaction.

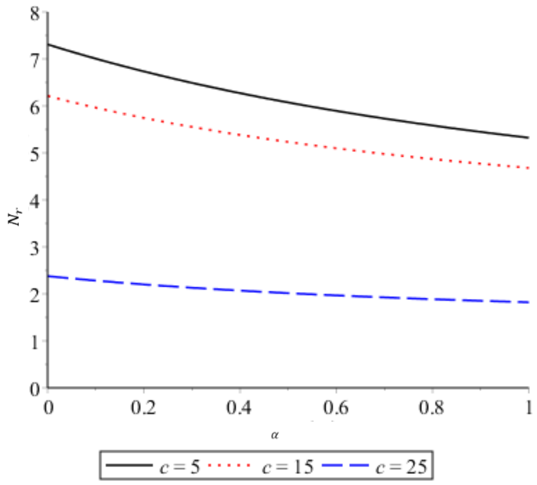

Figure 1-21 - Regulator's Reaction Function for Different Levels of Marginal Cost, Case of a relati vely less selfish regulator (γ=0.3).

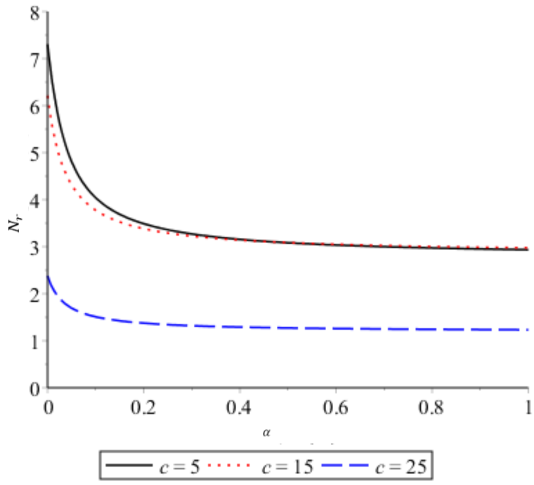

Figure 1-22 - Regulator's Reaction Function for Different Levels of Marginal Cost, Case of a relatively more selfish regulator (γ=0.9).

Having said the effect of regulator's selfishness on his reaction function, now the lobby knows that to convince a less selfish regulator, a higher transfer must be made. Hence, the lobby's behaviour as the leader of the game should be investigated more carefully.

Remark 4 An increase in γ leads to a decrease in equilibrium transfer. Equilibrium individual transfer (α^*) is higher for low levels of γ and c. As γ and c increase, equilibrium transfer becomes lower.

This means that the lobby determines a higher fraction of profit to be transferred to the regulator when the regulator is relatively more benevolent. In other words, the lobby might find it beneficial for its members to increase the share of the regulator from their profit only if the marginal cost is low.

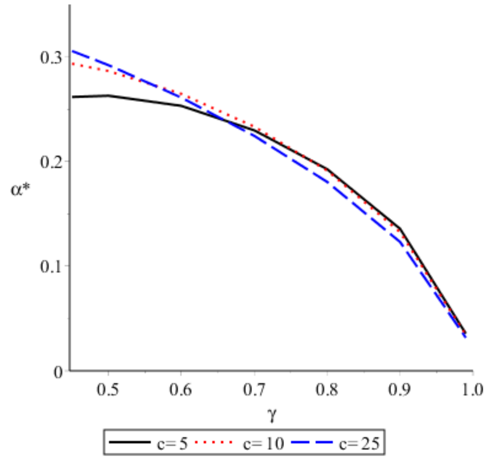

Figure 1-23 - Transfers versus Regulator's Selfishness for c=7, c=10 and c=25

Figure 1-23 compares transfers versus regulator's selfishness for three levels of marginal cost. For low levels of regulator's selfishness, transfers would be higher for the case with a higher marginal cost. The lobby transfers less in those economies with more selfish regulators. As the lobby faces more selfish regulator it would transfer less. But the decrease in transfer for the case of the high marginal cost is bigger than the decrease in the case of low marginal cost. The following summarises the relation of α^* and c for different levels of γ.

> Remark 5 An increase in c leads to an increase or a decrease in equilibrium transfer depending on the level of the regulator's selfishness; for low levels of γ and c, equilibrium transfer is non-monotonically increasing in γ but as either γ or c increases, equilibrium transfer becomes monotonically decreasing.

The question is how the level of selfishness changes the relationship of transfers and marginal cost from increasing to decreasing. Figure 1-17 shows that we know that the regulator's reaction function is less elastic for lower γ's; i.e., a less selfish regulator is less sensitive to transfers compared to a selfish one. So, the lobby knows that for a less selfish regulator, a higher transfer is needed to keep the same number of industry size. So, for the case in which a less selfish regulator is in office, even higher marginal cost may not prevent the lobby from allocating a higher fraction of their profit to transfers. Provided that the lobby is equipped with adequate resources, it would have continued to increase transfers to the regulator. The empirical investigation of Clarke and Xu (2004) confirms that 'enterprises that are more profitable are more likely to pay bribes and pay higher bribes than less profitable enterprises'.

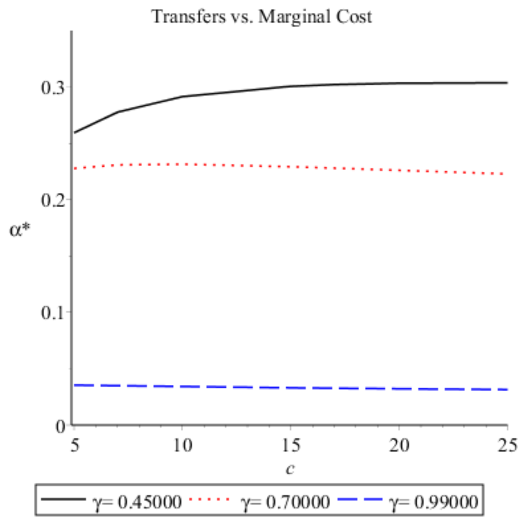

Figure 1-24 - Transfers versus Marginal Cost for Different Levels of the Regulator's Level of Selfishness

When c is fixed, π and ps increases as γ increases, which means that the lobby is doing the right thing to protect itself. Intuitively, when the regulator is more selfish, it becomes easier for the lobby to convince him. So, it takes fewer resources from the lobby. In other words, a higher fraction of the profit would be needed to convince a more benevolent regulator. Therefore, we see a decrease in transfer because even by a decrease in transfer the profit and producer surplus are protected.

The benchmark lets us compare some numbers here. In the benchmark when $c = 10$ we have $N_e = 8.17$. There would be no transfer in our first best. Then for $\gamma = 0.35$, the lobby chooses transfers around $\alpha^* = 0.29$. For a more selfish regulator ($\gamma = 0.95$) the lobby chooses $\alpha^* = 0.08$. As discussed earlier this means that a more selfish regulator can be convinced with a lower share of profit. By fixing γ at around 0.35, the lobby would react to an increase in marginal cost by increasing the transfer from around 0.29 to 0.32. For a more selfish regulator ($\gamma = 0.95$), transfers are decreasing in c. The lobby reacts to an increase in marginal cost by changing the share of the regulator (transfers) from around 0.09 to around 0.08.

Remark 6 An increase in c leads to an increase or a decrease in equilibrium industry size depending on parameters of the model and level of regulator's selfishness. Assuming all other parameters constant, for higher values of c, an increase in γ makes N^* to be increasing for a wider range of c.

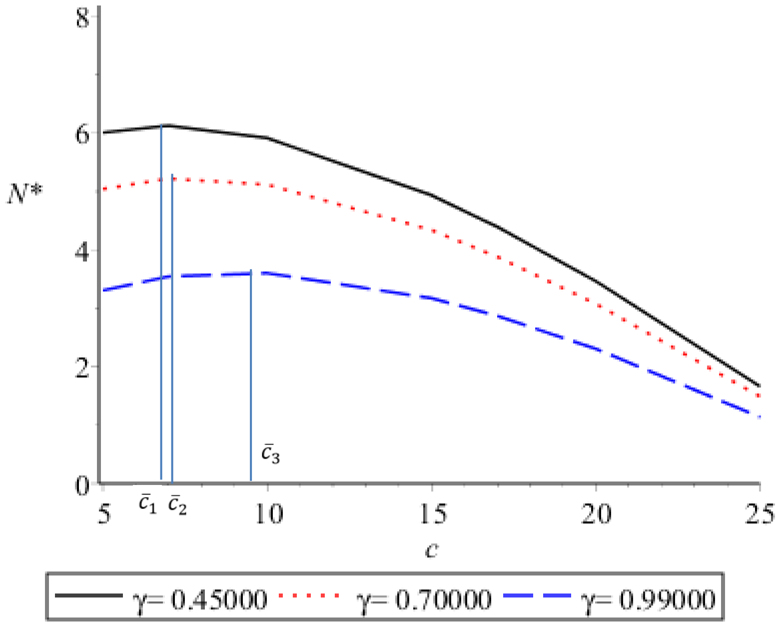

Figure 1-25 - Industry Size versus Marginal Cost for Different Levels of the Regulator's Level of Selfishness

By an increase in the marginal cost, the regulator would first determine the higher industry size and then he would decrease it. The same relation between industry size and c holds in the first best. Appendix 5 discusses the condition under which the industry size is increasing in c in the first best. Like the same way we analysed the effect of N on the regulator in (1.16), we can show that the effect of a change in marginal cost depends on how marginal cost can affect consumer surplus and producer surplus. A range of marginal cost causes more changes in consumer surplus rather than producer surplus. For this range of marginal cost, the equilibrium industry size is increasing in marginal cost. On the other hand, there is a range of marginal cost that affects producer surplus more than consumer surplus. The equilibrium industry size is decreasing in that range of marginal cost.

Non-monotonicity of industry size in the marginal cost is due to the model, and namely, the cost function. However, having variation in the regulator's selfishness, reduces the level of sensitivity of the equilibrium industry size to the regulator's level of selfishness. Also, for higher levels of the regulator's selfishness, the industry size is increasing for a bigger range of marginal cost. Figure 1-25 shows that the maximising level of marginal cost shifts to the right as the economy experiences a more selfish regulator. It can be seen by the fact that $\bar{c}_1 < \bar{c}_2 < \bar{c}_3$ where $\gamma_1 < \gamma_2 < \gamma_3$. Figure 1-25 also suggests that by an increase in marginal cost, industry size becomes flatter in γ. This means that industry size is more sensitive to the regulator's level of selfishness for lower levels of marginal cost. The policy implication of this finding is that in those economies with costly technologies, industry size is less subject to changes in the regulator's level of selfishness. Hence, competition-wise, policymakers should be less worried about changes in the regulator's selfishness when firms employ high cost technologies. Therefore, fighting with corruptible individuals may not make significant effect.

There are ranges of marginal cost and regulator's selfishness at which an increase in competition accompanies with higher transfer. Figure 1-24 and Figure 1-25 show such a situation. For instance, when $\gamma = 0.45$, which is considered as a relatively benevolent regulator, an increase in marginal cost, ends to a higher level of transfer and also higher level of industry size. Note that here it is the individual transfer, α^*, is being investigated, not total transfer or corruption. The effect on corruption will be discussed in the following section. This section aims to show that, having a relatively benevolent regulator is a trigger for the lobby to increase the fraction of their profit to share with the regulator, even when the cost of production increases.

Appendix 4 Robusness check; Investigating Scale-Neutral Corruption and Economics Social Welfare

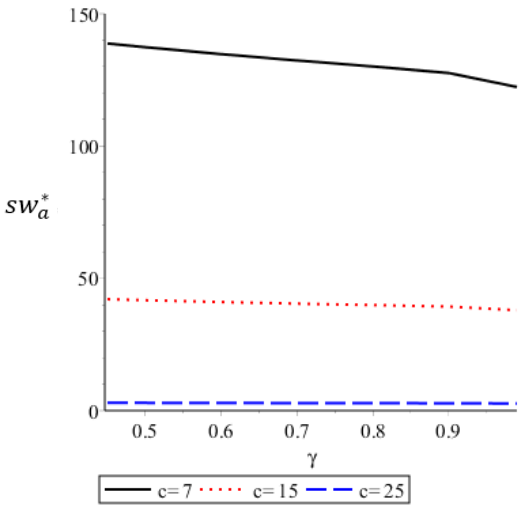

Figure 1-26 - Social Welfare net of Transfer (sw_a^*) vs. the Regulator's Levels of the Regulator's Selfishness for different Marginal Cost

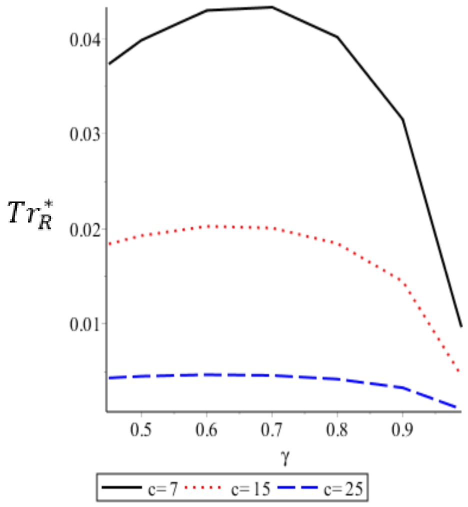

Figure 1-27 – Scale-neutral corruption vs. Marginal Cost for Different Levels of Regulator's Selfishness

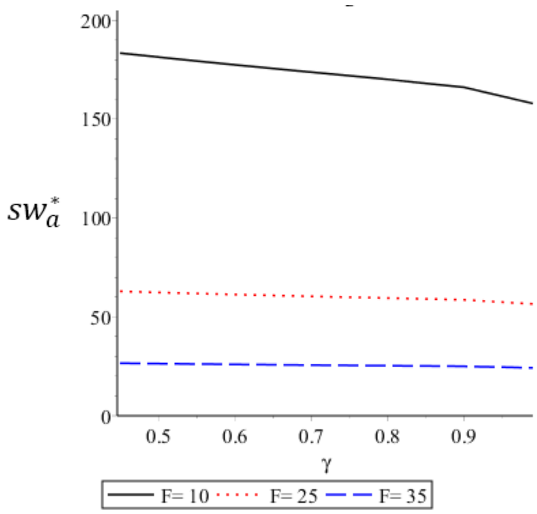

Figure 1-28 - Social Welfare net of Transfer (sw_a^*) vs. the Regulator's Level od Selfishness for D ifferent Levels of Marginal Cost

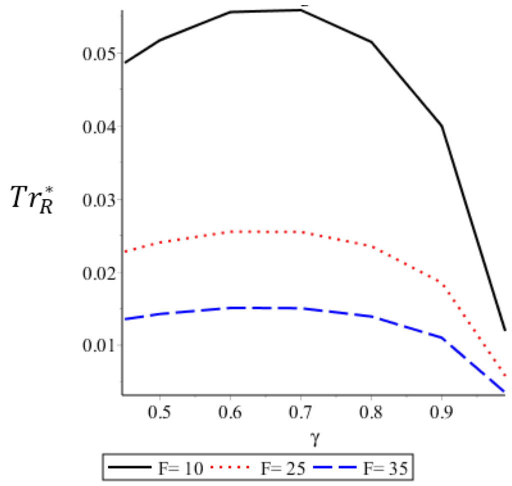

Figure 1-29 – Scale-neutral Corruption vs. the Regulator's Level of Selfishness for Different Levels of Fixed Cost

Appendix 5 The number of firms under the first best and long-run perfect competition.

First best- Number of firms under unregulated entry, is given in (1.22). To have $\delta N_e/\delta c < 0$ we must have

$$\frac{\partial N_e}{\partial c} = \frac{-\left(4F\sqrt{b+c} - a\sqrt{F}\right)}{2Fb\sqrt{b+c}} \leq 0,$$

or

$$c > \frac{a^2}{16F} - b \tag{1.25}$$

If c violates the condition above, number of firms in the first best would be increasing in marginal cost. It is easy to show that $\partial^2 N_e/\partial c^2 < 0$ which means that N_e is concave in c.

Long-run perfect competition - One can take perfect competition in the long-run as the first best. In long-run only firms that can produce at break-even point can survive in the market. The break-even point for each firm in long-run is where $MC = AC$. The level of output each firm can produce at break-even point is $q^*_{lpc} = \sqrt{F/c}$. In a competitive market the equilibrium price is determined by $p = MC$. So, we will have $p^*_{lpc} = 2\sqrt{c.F}$. Market demand at this price will be determined as $Q^*_{lpc} = (a - 2\sqrt{c.F})/b$.

The industry must be able to produce the quantity demanded. Each firm produces only q^*_{lpc} so the optimum number of firms is

$$N^*_{lpc} = \frac{Q^*_{lpc}}{q^*_{lpc}} = \frac{a\sqrt{c} - 2c\sqrt{F}}{b\sqrt{F}}.$$

To have $\delta N^*_{lpc}/\delta c < 0$ we must have

$$\frac{\partial N^*_{lpc}}{\partial c} = \frac{a - 4\sqrt{cF}}{2b\sqrt{cF}} \le 0,$$

or

$$c > a^2/16F \tag{1.26}$$

This means that when c violates this condition, number of firms would be increasing in marginal cost. Second derivative is

$$\frac{\partial^2 N^*_{lpc}}{\partial c^2} = \frac{-a}{4bc\sqrt{cF}}$$

which is always negative, meaning that, for sure, N^*_{lpc} is concave in c. So as c increases we would have only a decreasing relationship between equilibrium industry size and marginal cost. So, the increasing and concave relationship of industry size and marginal cost holds in the first best too.

It can easily be proved that in the first-best, equilibrium industry size is always decreasing and convex in the fixed cost of production. In is shown in other sections that this relation is in place even in the model under the lobby-regulator game.

CHAPTER 2

THE IMPACTS OF INVESTMENTS IN DEREGULATION AND DETERRENCE POLICIES ON CORRUPTION AND SOCIAL WELFARE

Abstract

In this model, firms collude in a lobby and play a game in which the lobby transfers some money to a potentially selfish regulator to convince him to keep the industry size in their favour. In a comparative static analysis involving different levels of the regulator's selfishness, I find that a more selfish regulator might induce lower levels of corruption. The model introduces the probability of apprehension which can punish both the regulator and the lobby for bribery. The model investigates the effect of implementing two policies: enhancing detection technology and deregulation. The results suggest that enhancing the detection technology may not necessarily decrease corruption. The effect of the detection technology on corruption might be different for different levels of the regulator's selfishness. In addition, deregulation which reduces the fixed cost of production by cutting bureaucratic costs, may only lead to an increase in social welfare and a decrease in corruption for some certain ranges of the parameters of the model, namely the regulator's selfishness.

2.1 INTRODUCTION

Any transition from a planned and centralised economy requires a shift from a highly concentrated industrial structure. Emerging economies usually lack institutions that foster entrepreneurship (Caselli and Gennaioli, 2008) and mostly exist side by side with weak political institutions such as party system or independent media (Estrin et al., 2009). A centralised and planned economy is accompanied usually by highly regulated markets in which there are too many bureaucratic obstacles to being economically active. In this framework with high intensity of bureaucratic barriers, the economic players try to convince political authorities to work in their favour. In addition, the regulators and policymakers, while cautious not to lose their position, want to deploy their in-hand political rents by using their position to gain unofficial and personal gains. This can be done, for instance, by demanding some side payments or charging higher than socially optimum prices for bureaucratic works and required licences. Therefore, there would be the demand of bribe from the regulators which will be satisfied by the supply of bribe from the economic players who have to bear some costs in terms of money or time to satisfy all the bureaucratic requirements. In other words, economic players try to capture the state by transferring money to the regulators to convince them to work in their favour. Therefore, especially in transition economies, we are faced with highly regulated markets and corruptive relations between businesses and policymakers. Usually, the cure is seen in enhancing 'doing-business' indicators as basic requirements to guarantee competition and market initiations, which support innovation and growth (Djankov, 2009).

The model presented in chapter two can be regarded as the first step to follow Jain's (2001, p. 102) recommendation on comparing 'marginal utilities of efforts to fight corruption versus reduction in the role of industrial policies'. Which one is more effective: reduction of the government's role in the economy or implementing anti-corruption activities? This question is of direct policy relevance for transition econonimies. As Jain (2001) points out, such a question becomes very useful when it comes to elements of government policies like privatisation. The framework presented in this chapter will help us to tackle this important question of Jain in more detail in the next chapter.

Chapter two provides a theoretical setting for investigating social welfare and corruption in a partial equilibrium model which is affected highly by the regulator of a market and active firms in that market. In the framework provided, the firms collude in an association which later forms the lobby by collecting membership fees from joining firms. On the other hand, the regulator, who is of second importance in the hierarchy of the government, maximises his objective function, which is the weighted average of his personal welfare and social welfare. The regulator chooses the industry size based on the amount of money he receives from the lobby. Therefore, there is a game between the regulator and the lobby. The lobby decides on the amount of money to transfer to the regulator based on its cost-benefit calculations linked to the lobby's net profits. The model hypothesizes that these benefits and costs differ across industries and across countries, based on (1) *the regulator's characters* and (2) *quality of governance,* among other factors.

Due to weak institutions in transition economies, policymakers tend to implement some institutional reforms to improve the good governance indicators. Good governance is one of the basic requirements for sustained economic development. There is no strong consensus on a single definition of governance in the literature. This chapter adopts the definition provided by Kaufmann and Kraay (2007, p. 6):

> *the process by which governments are selected, monitored and replaced; the capacity of the government to effectively formulate and implement sound policies; and the respect of citizens and the state for the institutions that govern economic and social interactions among them'.*

As discussed by (Kaufmann and Kraay, 2007), with regards to the scope of the governance, and according to the fact that many aspects of governance are not observable easily, it is not possible to provide only one indicator. Therefore, it can be portrayed only through a combination of indicators which can encompass all dimensions of governance. The latest version of the Worldwide Governance Indicators (WGI) research, provides six dimensions of governance: Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption (Kaufmann et al., 2009).

This chapter focuses on two indicators of the quality of governance: state of bureaucratic process (or deregulation) and the probability of apprehension. These two deal with the last three dimensions in the WGI. Regulatory Quality captures 'perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development'. It will be discussed in the following sections that the components of Regulatory Quality deal with administrative quality and bureaucratic processes. Hence, a higher indicator of Regulatory Quality reduces the fixed cost for the firms.

Rule of law dimension in the WGI captures 'perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence'. Finally, the Control of Corruption dimension of the WGI captures 'perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests'. Both of these two dimensions increase the probability of apprehension and therefore reduce any wrongdoings by the players of the game. These will be discussed in more details in the following sections.

The main contribution of this chapter is to investigate the effects of deterrence or *anti-corruption policies* and *deregulation* as two potential policy instruments on social welfare and corruption along with distinguishing the different types of regulators according to their preference towards personal welfare as opposed to social welfare. Both of these two policy instruments, anti-corruption and deregulation policies, were mentioned as policy tools to fight corruption in the study of Clarke and Xu (2004) in which they combine firm-level data in 21 countries in the infrastructure sector. Their study investigates how the different characteristics of firms can affect bribery. They add as a general finding that the tool to fight corruption is to change the incentives of bribe-takers through market-friendly policies like utility privatisation and increased competition.

Corruption in this chapter, like in chapter 1, is measured by the fraction of producer surplus that is appropriated in the form of bribe or transfer by the regulator. Having said that, corruption is seen as dead-weight-loss to society. Following Caselli and Gennaioli (2008), what is meant by *deregulation* is a policy which 'eliminates unnecessary setup costs, chiefly by reducing the number of licenses needed to open a business, the number of agencies involved in issuing such licenses, and the quantity of paperwork to be produced'. These would be reflected mainly in the fixed cost of production. Generally, the main theme of market reforms such as privatisation and deregulation is 'improving economic efficiency by reducing the role of the state and increasing the degree of private sector competition' (Bjorvatn and Søreide, 2005). Without taking such an approach, privatisation might be deviated from its main goals as in the case of Iran (Nili, 2015).

The model examines the comparative statics of the changes in reform policies under two different cases for the tax on firms. In the first case, no tax is assumed to be imposed on firms. This exercise is to see the behaviour of social welfare and corruption in a simpler case which potentially can enable us to conclude more general results. In the second case, the cost of implementing deregulation is assumed to be financed through a tax on firms. Therefore, in the second case, the tax is assumed to be endogenous and equal to the cost of implementing deregulation. In both cases, the regulator's level of selfishness plays a significant role in the effect of a change in the quality of the bureaucratic process on which corruption depends. Considering even a very low level of selfishness in the regulator deviates social welfare from the first best outcome under the completely benevolent regulator who prescribes unregulated entry.

In addition, given the case of costless deregulation or zero tax, this chapter shows that by defining the policy space in a continuous range, deregulation policies may not necessarily reduce corruption. An improvement in the state of the bureaucratic process can be a trigger for higher or lower corruption depending on the type of the regulator who is ruling the office. Djankov et al. (2002) find that regulation is associated generally with higher corruption. It might be concluded from their findings that deregulation may always reduce corruption. In other words, this chapter shows that by considering the regulator's level of selfishness, we might encounter with a case in which by implementing deregulation, the economy suffers from higher level of corruption. The model shows cases where we may not see the negative correlation of corruption and competition as presented, for example, in Emerson (2006).

The model shows that when the amount of tax is determined endogenously, for a case with a very selfish regulator, deregulation may not change corruption a lot. This implies that when a more benevolent regulator is in the office, corruption is more sensitive to changes of deregulation. In addition, in the case of an extremely selfish regulator, corruption turns out to be much lower than corruption under a less selfish regulator.

In the case of no tax, depending on parameters of the model, an increase in the state of the bureaucratic process does not necessarily increase social welfare.

In the second case, where tax in determined endogenously, the model shows that in a sector or in an economy where a more selfish regulator rules the office, lower investment in deregulation maximises the social welfare. That means that depending on the regulator's level of selfishness, an economy may need different levels of deregulation to maximise the social welfare. Between two cases with different levels of the regulator's selfishness, the one with a more selfish regulator needs a lower level of deregulation to maximise the social welfare.

Moreover, the results of the model show a non-monotonic relation between social welfare and deregulation. In other words, there are conditions under which deregulation may reduce social welfare.

In addition, this chapter shows that depending on the parameters of the model we might end up in a situation that while following some of the reform policies ends to higher social welfare, it causes simultaneously higher corruption as well. In the literature, this is known as 'grease-the-wheels' effect. Early analysis of 'grease-the-wheels' appeared in Leff (1964), Leys (1965) and Huntington (1968) and express the argument that small side payments to officials can increase economic growth through speeding up bureaucratic processes. Dreher and Gassebner (2011) find empirical evidences in support of 'grease-the-wheels' in the analysis of 43 countries over the 2003–2005 period, in which corruption facilitates firm entry into highly regulated economies. This model shows that depending on the regulator's type, implementing deregulation might end to 'grease-the-wheels' effect or its opposite, 'sand-in-the-wheels' effect. The former refers to the case where by an improvement in the state of bureaucracy, social welfare and corruption simultaneously increase while the latter show simultaneous reduction in both.

Regarding the probability of apprehension, intuitively, it is expected to have lower corruption when probability of apprehension is higher. However, the results of the model show that only by assuming a relatively benevolent regulator in the office we may have decreasing corruption in the probability of apprehension. In other words, in sectors or economies with a relatively selfish regulator, increasing the probability of apprehension may not necessarily decrease corruption. This can be interpreted in line with the finding of Mookherjee and Png (1995) where in certain conditions, an increase in the penalty on the inspector for corruption may raise the corruption.

The outline of this chapter is as follows. Section 2.1 introduces the model. Section 2.2 discusses the policy effects and results of the model. As was mentioned earlier, this chapter investigates the model under two different cases. Under the first case, there is no tax burden on firms. Under this assumption, the comparative statics of the model is investigated for changes in the regulator's level of selfishness and deregulation status in section 2.2 . In the second case, the tax is assumed to be endogenous and equal to the cost of implementing the deregulation, which will be presented in section 2.3 . Comparative statics in the level of selfishness, deregulation status and the probability of apprehension is investigated in this sub-section. The conclusion which highlights some policy implications of the model is the last part of the chapter.

2.1 Model

The structure of the model is the same as in chapter 1. This is a regulatory capture model in which the association, tries to convince the regulator not to issue too many licences. The association does this by transferring some money to the regulator. Then the regulator determines the number of licences and, hence, the industry size.

This model incorporates two new state variables: (1) state of deregulation or bureaucratic process and (2) probability of apprehension. The first one shows the state of the economy or sector in terms of the deregulation policies which are being implemented to reduce the fixed costs of the industry. The second one, the probability of apprehension shows how good the detection technology is in the market to apprehend wrongdoers. This probability is the same for both the regulator and the lobby. Both of these variables will be discussed in details in the following sections.

Given the state variables of deregulation and probability of apprehension, the timeline of the game which is the same as chapter one.

In order to derive the subgame perfect equilibrium, the game should be solved using backward induction. To find the equilibrium, we go backwards from the third stage. As was previously discussed in chapter one, the model cannot be solved analytically and hence I used the numerical simulation to see how the model works.

2.1.1 Firms

There are N firms in the economy, where N will be determined by the regulator. All firms compete in Cournot fashion. The inverse demand function is the same as (1.1) in chapter 1 but the cost function is different. Cost function is identical to all firms and has the form of

$$C_i = cq_i^2 + \frac{f}{(1+y)} + \tau \tag{2.1}$$

in which q_i is the quantity produced by firm i, and c is the main component of marginal cost. The term $F = f/(y+1)$ represents entry costs where f is the sum of both natural costs and the costs of red tape and y is the investment in deregulation.

The amount of money spent by the government to improve the institutional framework and to reduce the transaction cost is represented by y. Since fixed cost includes set-up cost and lobbying expenses, one can take y as the *state of bureaucratic process* or the amount of investment in *deregulation* by the government. The former is used when it is given and the latter refers to cases where y is a policy instrument of the government which would be determined endogenously. Hence, hereafter y would be used interchangeably as 'the state of bureaucratic process' or 'deregulation'. As mentioned earlier in the preceding sections, 'Regulatory Quality' is one of the ingredients incorporated in the Worldwide Governance Indicators (WGI) by the World Bank (Kaufmann et al., 2009). To narrow down what is meant by y, Appendix 1 provides the full lists of variables used in the WGI to portray the 'regulatory quality' aspect of governance.

Finally τ is the tax that each firm must pay to the government. To make the model simpler, it is assumed that deregulation is the only expenditure of the government. In other words, the probability of apprehension is out of the government's control. Chapter 3 takes the model one step further and assumes that probability of apprehension is determined by investment on deterrence.

To have a full picture of the outcomes of the model, the model will be examined in two different scenarios: (1) when $\tau = 0$; and (2) when $\tau > 0$ where the cost of implementing deregulation would be financed endogenously through imposing tax to cover the expenses of implementing y, or formally when $\tau = y/N$.

The equilibrium quantity and equilibrium price would be exactly the same as in chapter one. Profit at equilibrium turns out to be

$$\begin{aligned}\pi^* = \frac{1}{(Nb+b+2c)^2(1+y)N}(&-b^2fN^3 \\ &+ (b^2y^2+2fb^2+4fbc+b^2y)N^2 \\ &+ (-a^2by-a^2cy+2b^2y^2+4bcy^2 \\ &+ fb^2+4fbc+4fc^2-a^2b-a^2c \\ &+ 2b^2y+4bcy)N+b^2y^2+4bcy^2 \\ &+ 4c^2y^2+b^2y+4bcy+4c^2y), \\ &\partial\pi^*/\partial N < 0\end{aligned} \tag{2.2}$$

Equilibrium profit shows the existence of ‘business-stealing’ effect: more entry to the market reduces the profit gained by each firm.

2.1.2 The Regulator

In the second stage of the game, given the amount of transfers from the lobby, the regulator determines the number of licences and, hence, the industry size. The regulator’s objective function is the same as in chapter 1, except that according to the probability of apprehension, the regulator’s personal welfare is at the risk of being confiscated.

This model introduces detection technology through which the regulator might be caught and be punished by some probability. The regulator’s objective function is hence as follows

$$\max_{\mathrm{N}} G = (1-\eta).\gamma.Tr + (1-\gamma).[cs+ps] \tag{2.3}$$

$$N^* = \operatorname*{argmax}_{N} G \tag{2.4}$$

Here $\eta \in [0,1]$ is defined as probability of apprehension or probability of detection. In case of being caught, only the personal welfare of the regulator will be confiscated. As Hoff and Stiglitz (2008) mention, taking transfers is like getting ‘blood on one’s hands’. It makes the regulator vulnerable to a loss in case of being caught. I make the minimalist assumption that only the personal welfare of the regulator is vulnerable to recapture.[26] Probability of apprehension can be regarded as an indicator for one of the dimensions of the quality of governance. As was explained earlier, 'control of corruption' and 'rule of law' are two of the ingredients of the WGI by the World Bank (Kaufmann et al., 2009). For further details of the variables, see Appendix 2 and Appendix 3. It should be noted that since bribery is an illegal act, the quality of rule of law would be important too.

As was in chapter 1, the different types of the regulator are introduced by γ. As γ goes up, the regulator cares more about his personal welfare. Therefore, a higher γ represents a higher level of selfishness.

2.1.3 The Lobby

The lobby, which would be built upon an association, is the other player of the game given the outcome of the Cournot competition among firms and the number of licences issued by the regulator. The lobby's goal is to avoid the outcome of unregulated entry. The basic settings and definitions are exactly the same as in chapter 1. Therefore, the index of corruption and scale-neutral corruption are the same as the definitions given in chapter 1 presented in (1.10) and (1.12).

To see the effect of the rule of law, the model assumes that, similar to the regulator, due to illegal transfers the lobby might get caught as well with the same detection technology. In case the lobby is caught by probability η, the lobby will be punished but the extent of the punishment depends on the government's punishment power, represented by ϕ. So, just a fraction (ϕ) of the lobby's payoff would be confiscated. In case of not being caught, the lobby would earn producer surplus net of the transfer. Therefore, the lobby's objective function is to maximise the expected outcome in the two mentioned cases by choosing transfer.

$$\max_{\alpha} L = (1 - \eta\phi)(1 - \alpha)N\pi_i \tag{2.5}$$

The lobby's welfare has been reflected in $(1 - \alpha)N\pi$ in Equation (2.5) as was in the lobby's objective function in chapter 1. Generally, this equation is the same as the one in chapter one except that the lobby will be punished partially (ϕ), in case of being caught (η). The fact

[26] This model is static. However, in case of a dynamic one, like Hoff and Stiglitz (2008) we can assume that only personal welfare of the current period is subject to recapture and any gained personal welfare in earlier periods, are 'grandfathered' – time had gained them legitimacy.

that probability of apprehension may endanger the payoff of the lobby can potentially enhance resistance to legal reform. The detection technology goes against the interest of the lobby. In case of being caught, the lobby loses members or resources.

2.1.4 Equilibrium

The regulator determines the number of firms following the first order condition for (2.3) which is based on his personal welfare and social welfare. We can define the ratio of marginal effects of industry size on personal welfare and social welfare, marginal propensity of an additional license. The regulator will stop changing the industry size when the marginal propensity of an additional licence becomes equal to a ratio which depends on γ and η.

$$-\frac{Tr'_N}{sw'_N} = \frac{(1-\gamma)}{(1-\eta).\gamma} \tag{2.6}$$

The decision of the regulator can be analysed either based on (2.6) using personal welfare and social welfare or in terms of consumer surplus and producer surplus. Since personal welfare is a fraction of producer surplus, then the problem can be explained in light of the net impact on consumer surplus and producer surplus. Combining (2.3) and (1.10) we will have

$$\max_N G = (1-\eta).\gamma.\alpha.ps + (1-\gamma).cs + (1-\gamma).ps$$

And then

$$\max_{\mathrm{N}} G = (1-\gamma).cs + (1-(1-\alpha(1-\eta))\gamma)ps. \tag{2.7}$$

Following the first order condition for the regulator we have

$$G'_N = (1-\gamma)cs'_N + (1-(1-\alpha(1-\eta))\gamma)ps'_N = 0 \tag{2.8}$$

and hence

$$-\frac{cs'_N}{ps'_N} = 1 + \frac{\alpha\gamma(1-\eta)}{1-\gamma}. \tag{2.9}$$

Both (2.6) and (2.9) show where the regulator would stop changing his choice of industry size.

By solving (2.8) for N, we can get the regulator's reaction as a function of α.

$$N_r = N_r(\alpha), \partial N_r/\partial\alpha < 0 \tag{2.10}$$

I denote $\overline{N}$ to the lowest level of industry size that the regulator may determine when he collects all the profit earned by a typical firm ($\alpha = 1$).

$$\overline{N} = \{N: \alpha^*(\overline{N}) = 1\} \tag{2.11}$$

By plugging the regulator's reaction function into the lobby's function (2.5) and following the first order condition we have

$$L'_\alpha = (1 - \eta\phi)(-N\pi + (1 - \alpha) \underbrace{N'_\alpha}_{-} \underbrace{(\pi + N\pi'_N)}_{+/-}) \tag{2.12}$$

L'_α might be zero only if $\pi + N\pi'_N > 0$ in which the lhs is the elasticity of profit with respect to industry size. As in chapter 1, the specification of the model requires to have the following assumption satisfied.

Assumption 1. Evaluated profit at equilibrium quantity is elastic with respect to industry size; $|\epsilon_{\pi,N}| > 1$.

If Assumption 1 is violated, then we will have $L'_\alpha < 0, \forall\alpha$ and hence the lobby may not see transferring in favour of its members.

2.1.5 The First Best

As mentioned earlier in the explanation of the cost function, there are markets at which even in the long-run, fixed cost exists. Hence, the perfect competition case cannot be reached in such markets. I assume that because of specific institutional frameworks, firms always face with a fixed cost. Therefore, the first best in this model is when the entry to the market is unregulated. In this case, where the regulator is completely benevolent and accepts no bribe ($\gamma = 0$), entry into the market will be continued until no economic profit remains for firms. As was discussed earlier, this is due to the 'business-stealing effect'. As was shown in (2.2), that is where $\partial\pi^*/\partial N < 0$. According to (1.21), N_e is the industry size at which there would be no profit in the market. By plugging the cost function in chapter 2, N_e turns out to be

$$N_e = \frac{\sqrt{\left((1+y).(b+c).a^2.(\tau y+\tau+f)\right)} - (b+2c)(\tau y+\tau+f)}{(\tau y+\tau+f)b} \tag{2.13}$$

Since y stands for the state of bureaucratic process, we are interested in the effect of a change in y on the first best industry size, which from (2.13) turns out to be positive and concave.

$$\frac{\partial N_e}{\partial y} = \frac{f(b+c)a}{2(\tau y+\tau+f)b\sqrt{\left((1+y)(b+c)(\tau y+\tau+f)\right)}} > 0, \tag{2.14}$$

$$\frac{\partial^2 N_e}{\partial y^2} < 0.$$

Equation (2.14) implies that industry size in the first best is always monotonically increasing in deregulation. This will help us to analyse the results in the following sections. By definition, in the first best, $ps = 0$. Hence, $sw = cs$ and therefore

$$\frac{\partial sw_e}{\partial N} = \frac{\partial cs_e}{\partial N} \tag{2.15}$$

$$= \frac{\left((b+2c)(\tau y+\tau+f) - a\sqrt{(\tau y+\tau+f)(b+c)(1+y)}\right)^2}{2(1+y)(b+c)b(\tau y+\tau+f)} > 0.$$

(2.14) and (2.15) together imply that

$$\frac{\partial sw_e}{\partial y} > 0. \tag{2.16}$$

(2.16) implies that the net effect of deregulation on social welfare in the first best is positive. In an economy with a higher y, there would be lower bureaucratic costs and, hence, the overall costs of a firm are lower. This implies a more efficient industry.

In the context of the game between the lobby and the regulator, assuming all other parameters fixed, since we know $\partial\pi^*/\partial N < 0$ and $\partial N_e/\partial y > 0$, we might end up with the question that, up to what extent y can be improved? The answer is it can be continued until the firms encounter with either no profit or the case at which they share all their profits. Therefore, as soon as y reaches a level that can satisfy either of the above, there will be no incentive for the lobby to play the game. $\overline{y}$ denotes that level of deregulation and is defined as the following

$$\overline{y} = \min_{y}\{[y: N^*(\overline{y}) = \overline{N}], [y: N^*(\overline{y}) = N_e\ ]\}. \tag{2.17}$$

(2.17) defines the minimum of y that makes the industry size equal to either N_e or $\overline{N}$, where the former is defined in (1.21) and the latter in (2.11). In the first case no profit remains for the firms and in the second one, all of the profits is going to be shared with the regulator. In either cases, no incentive remains for the firms to play the game with the regulator.

Similar to chapter 1, it should be noted that firms needs to be convinced that forming the lobby is in their favour. Therefore, their outcome by forming the lobby should be greater than the case of the first best with no lobbying.

$$(1-\eta\phi)(1-\alpha)\pi(N^*) \geq \pi(N_e)$$

where N^* is the industry size determined under the lobby-regulator game and N_e is industry size under unregulated entry as introduced in (1.22). This requires taking the following as an important assumption so that we have the lobby formed.

Assumption 2. Provided that $y < \overline{y}$, to allow firms to form the lobby, functions and parameters of the model will be chosen such that the following condition will be satisfied.

$$\frac{\pi(N_e)}{\pi(N^*)} \leq (1-\eta\phi)(1-\alpha) \tag{2.18}$$

Assumption 2, which is equivalent to Assumption 2 in chapter 1, says that firms may only have the incentive to form the lobby provided that the expected profit after forming the lobby is greater than or equal to the profit under the first best number of industry size.

To find the benchmark value for y, N_e would be obtained as a function of y. Then the following can be solved to get the y which makes the highest social welfare, given all other parameters' values.

$$y_e^* = \underset{y}{\operatorname{argmax}}\, sw(N_e(y)) \tag{2.19}$$

It will be discussed in the following sections that different forms of tax change y_e^* and hence N_e^*. In case of no tax, there would be a corner solution for y_e^* and hence N_e^*. However, when the tax is assumed to be determined endogenously in the model, there would be an interior solution for y_e^* and, hence, N_e^*.

As explained previously, the model is investigated in two different cases: (1) when $\tau = 0$, and (2) when $\tau = y/N$. In the first case, there is no tax burden on firms and y is assumed to be given to the economy as a gift. In the second case, the cost of implementing y will be financed through tax on firms. Under these two scenarios, we look for how the economy works in terms of social welfare and corruption.

2.2 POLICY EFFECTS, COSTLESS DEREGULATION, $\tau = 0$

As was explained in chapter one, fixed cost represent both physical costs as well as bureaucratic barriers to entry. Therefore, implementing deregulation is meant to decrease the second type of fixed cost. From chapter one, it is expected that a decrease in fixed cost ends to higher magnitude of corruption. Now the question is whether deregulation may lead to higher corruption or not. When, on one hand, it is assumed that the cost of implementation of deregulation is going to be reimbursed by firms, then one can expect a non-monotonic relation between deregulation and corruption. This is so mainly because for firms to be benefitted from a reform, they must pay for implementation of the reform. What if, by assumption, firms only benefit from implementation of deregulation without being forced to pay for it? In the first scenario, it is assumed that $\tau = 0$. Therefore, the cost function is $C_i = cq_i^2 + f/(1+y)$, which is of the same format as the cost function in chapter one.[27] The only difference is that in chapter two, y reduces the whole fixed cost term, i.e. $F = f/(1+y)$. Therefore, it is expected to see that y behaves exactly opposite to the effects of changes in F. From chapter one, it is expected that a decrease in fixed cost ends to a higher magnitude of corruption.

As expected, the model in chapter two shows that corruption and economic indicator of social welfare can be non-monotonic in y. This would be a special case of the model in chapter one where deregulation is equivalent to reduction of fixed cost. Depending on the regulator's level of selfishness, we might see different behaviours in Tr. The reason is that $Tr = \alpha.N.\pi$ where α and N are monotonically increasing in y and π is monotonically decreasing in y. Therefore, depending on different combinations of y and γ, the relation of Tr might turn out to be monotonic or non-monotonic.

It also shows the existence of 'grease the wheels' effect. This means that we may have a simultaneous increase in both social welfare and corruption upon a decrease in fixed cost. I will discuss this effect in more detail in the following sections.

In the following section I will assume endogenous τ where firms will pay tax to finance implementation of improvements in y.

[27] It should be noted that introduction of η and y in this model, did not change the effects of technology on social welfare and corruption and they are the same as those in chapter one. Therefore, it will not be discussed here again.

2.3 Policy Effects, Costly Deregulation, $\tau > 0$

This section assumes that firms know the government is going to impose some tax which is mainly to finance implementing deregulation policies to improve the state of bureaucratic process. Firms also know that the tax is going to be set equally to all operating firms. Therefore, it is common knowledge in the economy that each firm has to pay τ, where

$$\tau = {}^{y}\!/_{N} \tag{2.20}$$

and, hence, the cost function changes to

$$C_i = cq_i^2 + {}^{f}\!/_{(1+y)} + {}^{y}\!/_{N} \tag{2.21}$$

In this section, the comparative statics in y will be investigated first. In the previous section y was taken as the state of bureaucratic process in the industry. Now by financing y through tax, it can be taken as a policy towards higher quality of governance and, hence, higher efficiency in the industry. The model shows that generally, social welfare is non-monotonic in y and, hence, there is an optimum y which maximises social welfare. Hence, for further comparative statics, y will be fixed at that optimum level and then the effect of other parameters will be probed.

2.3.1 Deregulation

In this section, the effect of deregulation policies, which is reflected in this model by an increase in y, will be investigated as well as the changes in the regulator's selfishness (γ). Appendix 4 presents the effects of changes in y and γ on π^*, N_r, α^* and N^*. These four are the building blocks of corruption and social welfare. Before investigating the effects on corruption and social welfare are based on the effects on equilibrium profit (π^*), reaction function (N_r), equilibrium transfer (α^*) and equilibrium industry size (N^*) which are presented in Appendix 4.

2.3.1.1 Effects of Deregulation on Corruption

Chapter 1 shows that corruption is non-monotonic in γ. Before further investigation, it can be guessed from what were shown previously that corruption will turn out to be non-monotonic in y as it is now costly to the firms. The following figures show how corruption (Tr^*) and scale-neutral corruption (Tr_R^*) may behave in response to changes in y and γ.

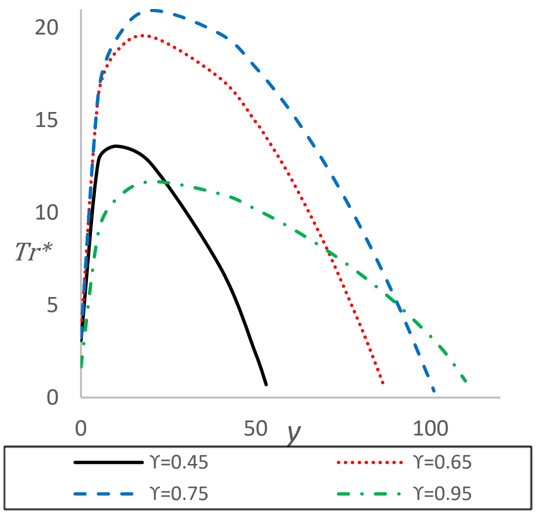

Figure 2-1–Corruption vs. Deregulation for Different Levels of the Regulator's Selfishness, $c = 10, F = 20, \eta = 0.1, \phi = 0.1$.

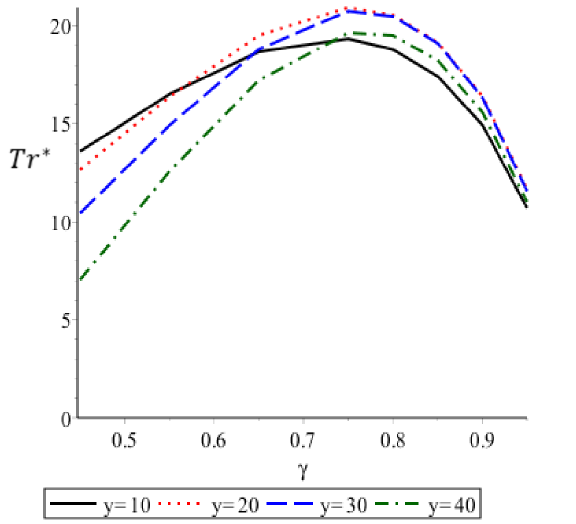

Figure 2-2 - Corruption vs. the Regulator's Selfishness for Different Levels of Deregulation, $c = 10, F = 20, \eta = 0.1, \phi = 0.1$.

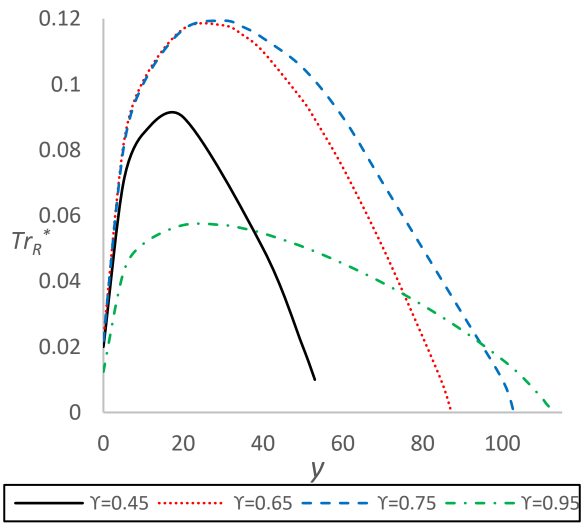

Figure 2-3–Scale-Neutral Corruption vs. Deregulation for Different Levels of the Regulator's Selfishness, $c = 10, F = 20, \eta = 0.1, \phi = 0.1$.

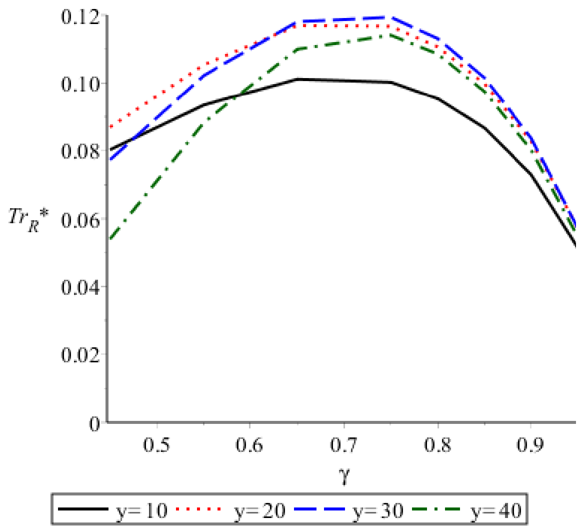

Figure 2-4 - Scale-Neutral Corruption vs. Levels of the Regulator's Selfishness for Different Levels of Deregulation, $c = 10, F = 20, \eta = 0.1, \phi = 0.1$

Chapter one shows that higher competition might be associated with higher corruption. Chapter two shows that higher industry size and hence, higher competition can only be accompanied by lower corruption, provided that y be greater than some specific level, which that specific level is highly dependent on γ[28]. Emerson (2006) provides a theoretical framework as well as empirical evidence at which corruption and competition are negatively correlated. My model shows that by letting the regulator's willingness to utilise his position and

[28] Figure 2-19 and Figure 2-1 depict this.

gain more personal welfare as a continuous variable defined in a range, then we might see a different result from that of Emerson. This model is consistent with Pieroni and d'Agostino (2013) where they show that there would be a more complex correlation among competition and corruption.

Figure 2-2 and Figure 2-4 reveal that comparing two sectors or two economies with almost the same characteristic but a different type of regulator, the one with the lower level of the regulator's selfishness does not necessarily bring a lower level of corruption. This can happen where γ exceeds some specific level. For example in Figure 2-2, assuming fixed level of investment in deregulation, when γ is greater than 0.8, regardless of the level of investment in deregulation, lower level of selfishness accompanies with higher level of corruption. In other words, if the regulator's level of selfishness is greater than some specific value, then the economy with a less selfish regulator might experience higher corruption.

Two outcomes can be witnessed in the Figure 2-1 to Figure 2-4:

1) Taking γ fixed, corruption is non-monotonic in deregulation. For relatively low levels of y, corruption is increasing in γ. However, as depicted in Figure 2-1 there is a level of deregulation at which corruption is at the highest. This shows that one cannot conclude from Djankov et al. (2002) that deregulation may always reduce corruption. They find correlations between stricter regulation and higher corruption. This model suggests that an economy may encounter increasing corruption for lower levels of y as more deregulation pursued by the government.
   Maybe the most important policy implication of the non-monotonicity of corruption in deregulation is that regardless of the type of the regulator, low levels of deregulation always ends in higher corruption. That level of deregulation, which results in the maximum corruption, increases as γ increases. Upon reaching to that level of deregulation, corruption becomes decreasing until $y = \overline{y}$, where $\overline{y}$ is defined in (2.17). For any $y > \overline{y}$, there is no incentive for firms to participate in the game with the regulator. Remember that $(\partial\overline{y})/\partial\gamma > 0$, which means that for an economy with a relatively high level of regulator's selfishness, more deregulation is needed to kill the incentives of firms to participate in the lobby-regulator game.

2) Taking y fixed, extreme values for γ does not necessarily mean higher magnitude of corruption. For instance, when $\gamma = 0.95$, it would be expected to have higher corruption

compared to any other γ. However, Figure 2-1 and Figure 2-3 show that corruption turns out to be much lower than expected. In case $\gamma = 0.95$ it can be even lower than the case where $\gamma = 0.45$. Only if $y > \overline{y}$ we might have $Tr^*(\gamma = 0.95) < Tr^*(\gamma < 0.95)$. To see the reason behind this we need to investigate the changes in the magnitude of π^*, α^* and N^*.

Based on Figure 2-18 and Figure 2-19 in Appendix 4, the effect of a change in γ is an increase in the magnitude of π^* and a fall in the magnitude of both α^* and N^*. According to these figures, under all other types of the regulator, when y is assumed to be fixed, the rise in π^* seems to outweigh the decline in α^* and N^*, except the case of $\gamma = 0.95$. In this case, reduction in α^* and N^* is bigger than the rise in firms' profit. This is because the extremely selfish regulator cares very little about social welfare and, hence, does not change the industry size immensely. The lobby's respond to that is to decrease the magnitude of transfer (α^*) when γ is extremely high. Although this ends in a relatively high level of π^* but the overall effect is that $Tr^*(\gamma = 0.95)$ is much lower than that of other γs. As was mentioned previously, there is only one exception to this and that is where $y > 90$, where α increases sharply and consequently we have $Tr^*(\gamma = 0.95) < Tr^*(\gamma < 0.95)$.

The policy implication of this is that the impact of implementing deregulation varies with respect to the type of the regulator. In other words, investing too much in deregulation without taking enough care of the role that the type of the regulator plays, may not bring what a policymaker expects in terms of the desired impact on corruption. Therefore, a comprehensive policy design thoroughly considers the effect of the regulator's type on the outcome of the model.

Scale-neutral corruption shows almost the same relationship with deregulation. This ensures that what was discussed as the results of corruption are robust even when we take out the role of scales by dividing the corruption index by the revenue of a typical firm.

For each type of the regulator, an increase in y beyond some level may cause the transfer to reach its maximum. For relatively more benevolent regulators, a lower level of y is needed to extract all the profits gained by the firms. Intuitively, a small increase in investment in deregulation may attract the attention of the outsiders to enter the market. The incumbents know that this increase may not be in their favour. On the other hand, they know that the regulator may not be convinced easily. Therefore, in case of a benevolent regulator, the lobby would decide to transfer all its members' profit should deregulation be increased by a small number[29]. The other cases with higher levels of the regulators selfishness, firms may not be encountered with such a situation to be imposed to transfer all the profit gained. This is so because other regulators may not reduce industry size lower than some specific number.

Remark 7 summarizes the effect of deregulation on corruption indicators.

> Remark 7 (1) Corruption is non-monotonic in the regulator's level of selfishness. (2) The level of corruption converges to the same value for different levels of γ as y increases.

The point of convergence explains that if the policymaker is serious in following deregulation policies, he can overcome the role of the regulator's character. It is worth compare the case of no-corruption and full implementation of deregulation. As shown in Figure 2-2 and Figure 2-4 in almost all cases, corruption turns out to be lower when deregulation is implemented fully. Moreover, the figures show that full implementation of deregulation can end to zero corruption. This can be another incentive for the policymaker to follow the deregulation in its full capacity.

Remark 7 can be re-stated as the following too. Corruption is non-monotonic in y; first increasing and then decreasing for higher levels of deregulation. Moreover, corruption is more sensitive to y when a relatively less selfish regulator is in the office.

It was mentioned in chapter 1 that a change in the level of the regulator's selfishness should not only be interpreted as a change in the regulator's character. It can be a result of a stricter monitoring where the regulator chooses to assign lower weight to his personal welfare.

Now we are going to assume y fixed at its maximising level, which will be discussed shortly in the next section. Following investigation is based on this assumption.

2.3.1.2 Effects of Deregulation on Social Welfare

Social welfare will be always lower under the lobby-regulator game than in the first best as shown in Figure 2-5. In addition, social welfare will be lower under a more selfish regulator. Deregulation may help to close the gap between the levels of the first best social welfare and that under the lobby-regulator game.

[29] This can be seen in Figure 2-14 in Appendix 4 where π^* approaches to zero for $\gamma = 0.45$.

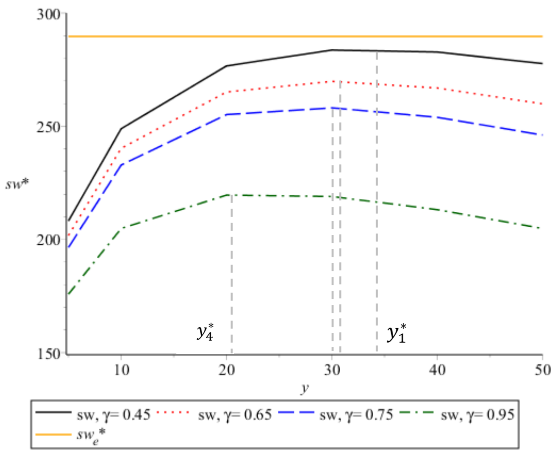

Figure 2-5 - Social Welfare vs. Deregulation for Different Levels of the Regulator's Selfishness, $c = 10, f = 20, \eta = 0.1, \phi = 0.1$

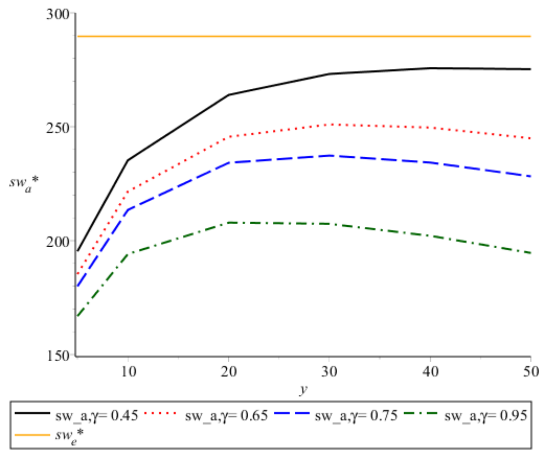

Figure 2-6 - Social Welfare net of Transfers vs. Deregulation for Different Levels of the Regulator's Selfishness, $c = 10, f = 20, \eta = 0.1, \phi = 0.1$

It is not in favour of the economy as a whole to follow as much deregulation as it can. Figure 2-5 shows that too much of deregulation can result in a reduction in social welfare. Therefore, there exists a critical value y^* where sw is maximised. The critical value y^* solves the following

$$y^* = \underset{y}{\operatorname{argmax}}\, sw. \tag{2.22}$$

This is mainly due to the opposite effects that it may cause on consumer surplus and producer surplus. Higher levels of deregulation may have a lower impact on industry size and hence, on the consumer surplus. So after some level of deregulation, due to concavity of N^* and hence cs^* in y, for $y > y^*$, the negative effect of deregulation on producer surplus becomes greater than the positive effect of cs^* and as a result, sw^* becomes decreasing in y. This can be interpreted in line with Djankov et al. (2002) who find no association between heavier regulation and better quality of private or public goods.

Based on the costly nature of deregulation in the second scenario, one can predict that social welfare would be non-monotonic in y. In other words, when implementing deregulation has some cost which is going to be compensated by a group in the society, then it can be expected that after expending more than some specific level on that policy, the corresponding social cost becomes greater than the social benefit which causes social welfare to decline.

When a more selfish regulator is in the office, the whole economy (1) benefits from less social welfare, and (2) lower level of deregulation is needed to maximise social welfare. In other words, for a more selfish regulator, the critical level of deregulation (y^*) is lower which means that any further increase in deregulation after y^* reduces social welfare. Figure 2-5 shows that for the case where $\gamma = 0.45$, the economy needs an investment of around $y_1^* = 35$ units to narrow dawn the gap of social welfare with the first best case. The required investment for the case of $\gamma = 0.95$ is around 20 ($y_4^* = 20$). In other words, any investment on deregulation more than 20 units decreases social welfare and widens the gap with the social welfare under the first best. Even by netting out the amount of transfers, social welfare remains non-monotonic in y as depicted in Figure 2-6.

Remark 8 summarize all the effects of deregulation policies on social welfare and show how both the accounting definition of social welfare and the economic definition may react accordingly.

> Remark 8 (1) Both social welfare (sw^*) and social welfare net of transfer (sw_a^*) are non-monotonic in y; first increasing and then decreasing. (2) As the regulator's selfishness (γ) increases, social welfare decreases. (3) As the regulator's selfishness (γ) increases, lower deregulation (y^*) is needed to maximise social welfare.

In this model, we take the level of deregulation as given. To choose the level of deregulation, by looking more carefully into Figure 2-1 and Figure 2-5, we can derive Figure 2-7 in which three ranges of y can be distinguished: (1) where both sw^* and corruption are increasing in y ($y < y_1^*$); (2) where sw^* is decreasing and corruption is increasing in y ($y_1^* < y < y_2^*$); and (3) where both sw^* and corruption are decreasing in y ($y > y_2^*$). This mapping provides a more accurate picture of policy-making.

Transition economies face with variety of goals due to their various institutional problems. They usually suffer from relatively low levels of social welfare and high corruption. Here it is assumed that the main goal of the government is to maximise social welfare in the first best. Therefore, as discussed earlier we assume that y is going to be fixed at y_e^* which was derived in (2.19). Needless to say, governments may choose different strategies and, hence, may fix y at other values. For instance, social and political pressures may force a policymaker to prioritise corruption minimisation over other goals, regardless of the possible effect of changes on social welfare. For instance, in different periods in Iran, anti-corruption policies were followed mainly due to the rival's propaganda. For instance, as a result of publishing the payslips with extraordinary high salaries, bonuses and loans of some governmental departments, Rouhani administration had to prioritise anti-corruption policies mainly due to political pressures (Karami, 2016).

In general, we can assume that governments choose y as shown in (2.19). However, in response to some political and social pressures, the government may decide to switch strategically to anti-corruption policies rather than social-welfare-enhancing policies.

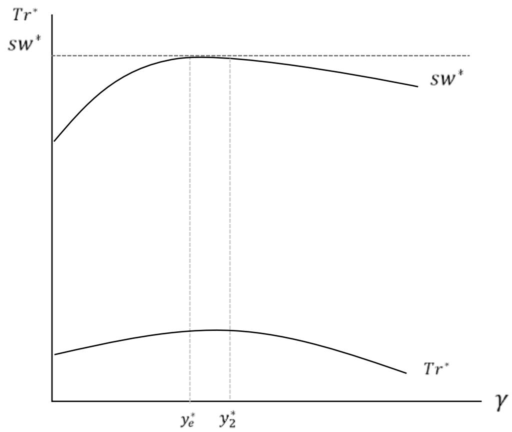

Figure 2-7 - Social Welfare and Corruption for Medium and Relatively High Levels of the Regulator's Selfishness

Following deregulation policies might bring some opposition because of an induced increase in corruption. However, as was discussed earlier, continuing further deregulation will have two more effects; the first effect is a later reduction in corruption, and the second one is a simultaneous increase in social welfare. In addition to the two effects mentioned, another way to respond to these kinds of opposition is to direct attentions to the magnitudes of social welfare and corruption. In the examples provided, the magnitude of corruption is maximum 11% of social welfare. The marginal effect of deregulation on social welfare is bigger than the marginal effect on corruption.

This model shows that depending on parameters of the model, we may or may not have the effect of 'grease-the-wheels' effect. This is where we have an increase in both social welfare and corruption as the results of the policies. For instance, in Figure 2-7, up to y_e^* we can see the presence of 'grease-the-wheels' effect as more deregulation is being followed. This could be the case especially for relatively poorer countries. As Djankov et al. (2002, p. 28) state:

'In countries whose markets are fraught with failures, it might be better to have corrupt regulators than none at all. Corruption may be the price to pay for addressing market failures'.

Also, Bardhan and Mookherjee (2006) refer to numerous theoretical analyses of corruption that have shown that corruption minimisation may not be part of optimal policy design. The reason is the same as what has been discussed above: there would be too much of sacrifice of other welfare goals, namely social welfare to reach to lower corruption. More generally, Bardhan and Mookherjee claim that minimisation of corruption in different areas may even require no government at all, which would not be a recommendation by anyone.

So far, implementation of deregulation has been investigated in two different scenarios; costless reform and costly reform. In both cases, as summarized in Result 1, it turns out that the economy may experience simultaneous rise in corruption and social welfare.

Result 1 *As the consequence of implementing deregulation, regardless of whether it is going to be financed through taxation or not, the economy may experience both 'grease-the-wheels' and 'sand-in-the-wheels' effect, depending on parameters of the model.*

2.3.2 Improving the Detection Technology

As mentioned earlier, the probability of apprehension in this model is an indicator of the rule of law. Like the model of Emerson (2006) individuals are faced with a threat of being detected and punished for their illegal activities like bribery[30]. This probability is assumed as given in this chapter. In the next chapter, I will develop a model at which the probability of apprehension is a function of the amount of investment on anti-corruption policies by the policy-maker. Increased policing over government agents, increasing the freedom of media, increasing democratic participation, fairer and tighter monitoring and auditing, keeping the records of crimes and so on and so forth, can be regarded as attempts to improve the probability of apprehension. Therefore, it is assumed that implementing any policy which enhances η is costless. In other words, it is believed that some basic reforms can be pursued easily without imposing any cost.

[30] Different studies name probability of apprehension as probability of being caught (Søreide, 2006) or probability of detection (Mishra, 2007; D'Souza and Kaufmann, 2013).

Before investigating the effects of a change in η, we need to define the level probability of apprehension at which the lobby would choose to share all its members' profit to the regulator. Here, $\bar{\eta}$ denotes the level of probability of apprehension at which no incentive remains for firms to participate in the game with the regulator.

$$\bar{\eta} = \min_{\eta}\{[\eta: N^*(\bar{\eta}) = \bar{N}], [\eta: N^*(\bar{\eta}) = N_e]\} \tag{2.23}$$

Remember that when $N^* = \bar{N}$, firms transfer all their profit to the regulator or $\alpha^* = 1$. In addition, when $N^* = N_e$ there will be no profit for firms or $\pi^* = 0$. This is the same notion as $\bar{y}$ which was defined in (2.17). It will be discussed in the following section that $\partial\bar{\eta}/\partial\gamma > 0$. In other words, in an economy with a more selfish regulator higher probability of apprehension is needed to kill all incentives for firms to play the game with the regulator.

Figure 2-8 to Figure 2-11 show how the two indicators of corruption and scale-neutral corruption might be affected as the economy experiences changes in η and γ. Figure 2-9 and Figure 2-11 show that the first part of Remark 7, which discusses the non-monotonicity of corruption in γ, is robust even to changes in η. Now let us take γ as given and concentrate on changes in η.[31] Figure 2-8 and Figure 2-10 show that there exists $\bar{\gamma} \in [0,1]$ which alters the behaviour of corruption in response to changes in η. Depending on other parameters of the model, the value of $\bar{\gamma}$ would be different. Following are the outcomes before and after $\bar{\gamma}$:

(1) $\gamma < \bar{\gamma}$

when $\gamma < \bar{\gamma}$, corruption is decreasing in η for most of its values except for the very high values of η. As depicted in Figure 2-8, as expected, corruption first decreases as η increases. Despite the increase in both α^* and N^* in Appendix 5, this decrease happens due to a reduction in profit because of a raise in industry size. In other words, the change in profit would outweigh the changes in α^* and N^*. However, this is not the case for all levels of η. As depicted in Figure 2-23, for low levels of the regulator's selfishness, when η exceeds some level (around $\eta = 0.47$ for $\gamma = 0.45$), the equilibrium transfer becomes steeper in η and consequently, as shown in Figure 2-24, the equilibrium industry size becomes flatter for all further increases in η. The ultimate effect would be increasing corruption due to the relatively

[31] Similar to previous section, to make the main text shorter, the reader can find the discussion on the behaviour of α^*, N^* and π^* in Appendix 5.

rapid increase in transfer by the lobby. The intuition can be found in the following lines from Banerjee et al. (2012, p. 45):

> *Greater corruption in one country could simply be a reflection of a greater willingness to fight corruption in that country. Because they do not supply information about the sources of corruption, these corruption indices actually tell us little about what types of governance interventions would help deal with these problems, or even whether we should reward or praise governments that have less corruption by these measures.*

(2) $\gamma > \bar{\gamma}$

Corruption is non-monotonic in η when $\gamma > \bar{\gamma}$. It is first increasing and then it becomes decreasing. As shown in Figure 2-20 in Appendix 5, π^* is decreasing and concave in η. Therefore, as it approaches to $\bar{\eta}$, we would see a sharper decline in π^*. The lobby knows that the reaction function of the regulator is steeper in slope and lower in magnitude when γ is higher. Therefore, the lobby will do its best by transferring more to persuade the regulator to determine a lower industry size. As η reaches to $\bar{\eta}$, the lobby suddenly increases its share for transfer as shown in Figure 2-23. Consequently, the industry size is first increasing but as η approaches to $\bar{\eta}$, there would be a sharp increase in N^* as depicted in Figure 2-24. As soon as $\eta = \bar{\eta}$ the marginal effect of the reduction in π^* outweighs the marginal effect on α^* and N^* and, hence, we would have corruption to be decreasing in η as shown in Figure 2-8.

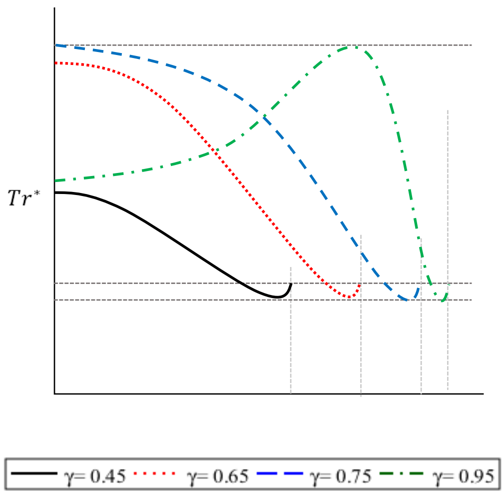

Figure 2-8 – Corruption vs. Probability of apprehension for Different Levels of the Regulator's Selfishness, $c = 10, f = 20, y = 30.94, \phi = 0.1$

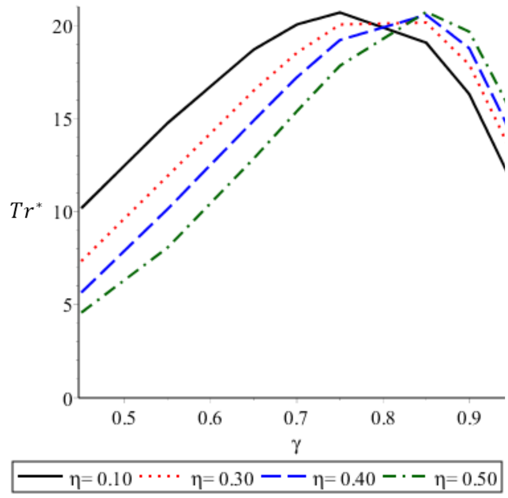

Figure 2-9 – Corruption vs. the Regulator's Level of Selfishness for different Levels of Probability of apprehension, $c = 10, f = 20, y = 30.94, \phi = 0.1$

If we look at the scale-neutral corruption, Tr_R, we can see the same behaviour in the corruption index for changes in γ and η. Also, in Figure 2-10, when η is low, the scale-neutral corruption under the relatively less selfish regulator ($\gamma = 0.45$) turns out to be higher than the case of an extremely selfish one ($\gamma = 0.95$). This is analogues to what was discussed in Remark 7 and Figure 2-3 for low levels of y. Again, this is due to the lobby's response when it finds that the regulator is not looking for his personal welfare. The lobby would choose to offer a starting high bribe under $\gamma = 0.45$ even when η is increasing. It is only when η exceeds some level (in this case $\eta > 0.23$) that the corruption drops to something lower than the corruption under a more selfish regulator.

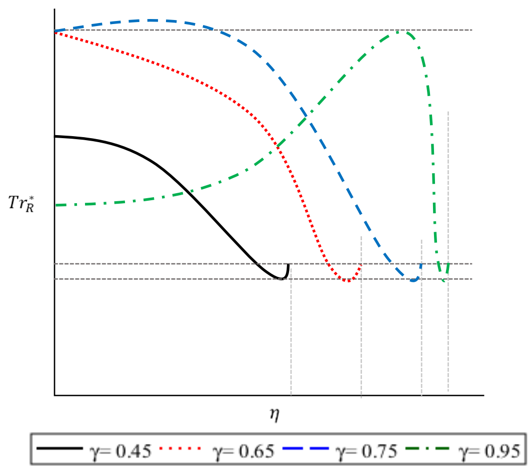

Figure 2-10 - Scale-Neutral Corruption vs. Probability of apprehension for Different Levels of the Regulator's Selfishness, $c = 10, f = 20, y = 30.94, \phi = 0.1$

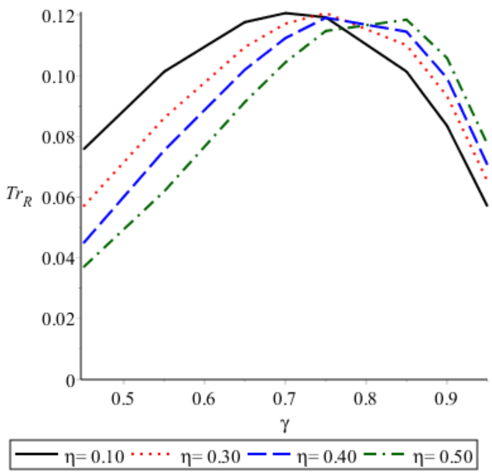

Figure 2-11 - Scale-Neutral Corruption vs. the Regulator's Level of Selfishness for different Levels of Probability of apprehension, $c = 10, f = 20, y = 30.94, \phi = 0.1$

Result 2 summarizes the impact of improvements in detection technology on corruption.

Result 2 *Depending on the regulator's level of selfishness, corruption is non-monotonic in* η*; it can be either first decreasing and then increasing, or the opposite.*

Social welfare is increasing in the probability of apprehension. However, as it is clear from Figure 2-12, improving the detection technology may not fill the gap between social welfare in the first best (unregulated entry) and that under the lobby-regulator game. This gap between the two social welfare indicators under two different cases is due to both detection technology and the regulator's selfishness. Therefore, even by an immense improvement in detection technology, the regulator's selfishness may not allow the economy to reach to its highest social welfare under the first best.

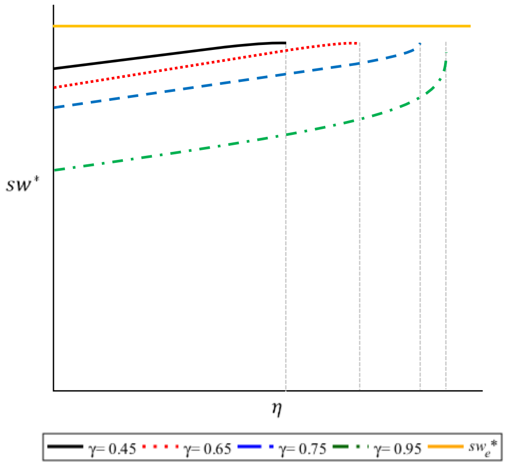

Figure 2-12 - Social Welfare vs. Probability of Apprehension for Different Levels of the Regulator's Selfishness

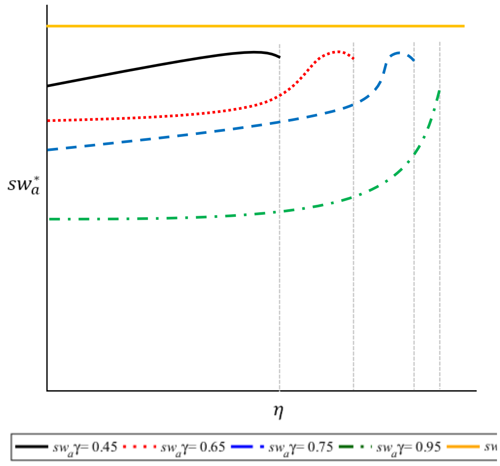

Figure 2-13 - Social Welfare net of Transfers vs. Probability of Apprehension for Different Levels of the Regulator's Selfishness

Social welfare net of transfers is almost monotonically increasing and concave in η. So both the economic definition on social welfare (sw_a^*) and the accounting definition (sw^*) show the same behaviour in η.

In this model, η is assumed to be given. Even if η is a control variable, Figure 2-12 and Figure 2-13 show that there is a corner solution to the problem of maximising social welfare in η.

One policy that could enhance η is taking the records of any criminal act so that individuals consider it in their calculations for their action. Hoff and Stiglitz (2008) note that as the legal system becomes more history-dependant, less incentive would remain for the players to do anything negative. Those wrongdoers who have broken the law or have mis-used their position to gain more personal welfare may also face a risk of retroactive criminal prosecution in a history-dependant legal system.

The concluding point about η is that, while detection technology has only positive effect on social welfare, its effect on corruption can be both positive and negative. The policy implication is that if a change in η is regarded as anti-corruption policy, then Result 2 elaborates that depending on the regulator's character or preferences, the outcome can be an increase in corruption. This echoes the finding of Mookherjee and Png (1995) that under certain conditions, an increase in the penalty on the inspector for corruption may raise the corruption. Hence, a more careful investigation is required when it comes to corruption minimisation problem with the help of a change in η.

2.4 Conclusion and Policy Recommendations

Policymakers mostly deal with multiple goals, encompassing corruption reduction and social welfare enhancement. Implementing different institutional reforms, while assuming them as exogenous variables, may have different effects on each of those goals. This chapter provides a framework to investigate the outcome of institutional reforms in more detail.

This model investigates the entry of firms in an economy where government-issued licences are needed to operate. The existing firms do not like having more rivals due to business-stealing effect, which reduces their profit. Therefore, they would form an association or a lobby, which its duty is to protect its members by transferring a fraction of members' profit to the regulator to convince him to stop directing the economy towards the unregulated entry. The regulator is assumed to be selfish. The model shows that letting the regulator's selfishness to be a continuous variable defined in a range may change the outcomes of the model. Two policies are investigated in this model: (1) investment in deregulation which reduces the fixed cost; (2) investment in enhancing the probability of apprehension as an indicator of the quality of governance. Apprehension works as a threat for wrongdoers in demanding and supplying bribes. This chapter looks at two different settings for deregulation: (1) where there is no cost to implement deregulation policies and, hence, firms do not have to pay anything in the form of tax; (2) where investment in deregulation will be financed in terms of tax by the government. Firms know that it will become a part of the cost for firms. In the first case, if we find non-monotonicity of sw^* and Tr^* in y, we can be sure that this relation is not due to the nature of the game and consequently the cost function. In other words, when social welfare and corruption show non-monotonicity in deregulation, while implementing deregulation has no cost, then we can be sure of a more general relation rather than a model-specific result.

In any of the two scenarios for tax, even very low level of regulator's selfishness in the regulator increases the gap of social welfare from its value in the first best, where the first best is defined as the case under a completely benevolent regulator who advocates unregulated entry to the market.

When the tax is assumed to be zero, letting the regulator's selfishness defined as a continuous variable in a range, can show us that following deregulation policies may not necessarily reduce corruption. An improvement in the state of bureaucratic process can be a trigger to higher or lower corruption depending on what type of regulator runs the office. These limit the prediction of Emerson (2006) where corruption and competition are always negatively correlated and, hence, the outcome of the model is more consistent with the empirical finding of Pieroni and d'Agostino (2013) where lack of government regulations may lead to higher corruption.

Assuming the tax to be determined endogenously, corruption would be non-monotonic in deregulation for all levels of the regulator's selfishness. In the case of endogenous tax, the level of deregulation mainly determines whether corruption is increasing or decreasing in deregulation. In both scenarios of tax, counter-intuitively, corruption might turn out to be lower under an extremely selfish regulator compared to the less selfish regulators. This depends on the level of deregulation and mainly is due to low levels of industry size and the corresponding transfer. Intuitively, this is due to the fact that a more selfish regulator decides more independent of the parameters of the model.

When tax is assumed to be endogenous, the model shows that more deregulation does not always lead to higher social welfare. The results are robust even for the economic definition of social welfare. This is mainly because deregulation is going to be financed by firms. As expected, social welfare is lower for relatively more selfish regulators.

The outcomes of enhancing the probability of apprehension also show different results for the different types of regulators. Only when a relatively more benevolent regulator is in the office, apprehension would be regarded as a threat for players. Hence, an increase in the probability of apprehension might result to lower corruption only when the economy experiences a relatively benevolent regulator. In the case of a relatively selfish regulator, investment in improving the detection technology may even worsen the corruption. This is another way to state what Banerjee et al. (2012) mean that greater corruption can be a result of a greater willingness to fight corruption.

The contribution of chapter two is providing an answer to the Jain's (2001, p. 102) recommendation on comparing 'marginal utilities of efforts to fight corruption versus reduction in the role of industrial policies'. The model shows that defining the regulator's selfishness as a continuous variable in a range, changes both the magnitude and trend of deregulation on social welfare and corruption. Depending on the regulator's type, deregulation might end in 'grease-the-wheels' effect or 'sand-in-the-wheels'. In the former, by an improvement in the state of bureaucracy, social welfare and corruption simultaneously increase while in the latter they both face a reduction. In addition, anti-corruption policies always enhance social welfare but its effect on corruption remains dependant on the regulator's level of selfishness.

The concluding point is that following deregulation and anti-corruption policies do not always work in favour of the economy. The model shows how the regulator's willingness to utilise his position to gain more personal welfare rather than social welfare can change the outcomes of deregulation and anti-corruption policies.

2.5 REFERENCES

Banerjee, A., Mullainathan, S., Hanna, R., 2012. Corruption (Working Paper No. 17968). National Bureau of Economic Research.

Bardhan, P., Mookherjee, D., 2006. Decentralization, corruption, and government accountability, in: International Handbook on the Economics of Corruption. pp. 161–188.

Bjorvatn, K., Søreide, T., 2005. Corruption and privatization. Eur. J. Polit. Econ. 21, 903–914. https://doi.org/10.1016/j.ejpoleco.2005.02.001

Caselli, F., Gennaioli, N., 2008. Economics and Politics of Alternative Institutional Reforms. Q. J. Econ. 123, 1197–1250.

Clarke, G.R.G., Xu, L.C., 2004. Privatization, competition, and corruption: how characteristics of bribe takers and payers affect bribes to utilities. J. Public Econ. 88, 2067–2097. https://doi.org/10.1016/j.jpubeco.2003.07.002

Djankov, S., 2009. The Regulation of Entry: A Survey. World Bank Res. Obs. 24, 183–203.

Djankov, S., Porta, R.L., Lopez-de-Silanes, F., Shleifer, A., 2002. The Regulation of Entry. Q. J. Econ. 117, 1–37.

Dreher, A., Gassebner, M., 2011. Greasing the wheels? The impact of regulations and corruption on firm entry. Public Choice 155, 413–432. https://doi.org/10.1007/s11127-011-9871-2

D'Souza, A., Kaufmann, D., 2013. Who bribes in public contracting and why: worldwide evidence from firms. Econ. Gov. 14, 333–367. https://doi.org/10.1007/s10101-013-0130-5

Emerson, P.M., 2006. Corruption, competition and democracy. J. Dev. Econ. 81, 193–212. https://doi.org/10.1016/j.jdeveco.2005.04.005

Estrin, S., Hanousek, J., Kočenda, E., Svejnar, J., 2009. The Effects of Privatization and Ownership in Transition Economies. J. Econ. Lit. 47, 699–728.

Hoff, K., Stiglitz, J.E., 2008. Exiting a Lawless State*. Econ. J. 118, 1474–1497. https://doi.org/10.1111/j.1468-0297.2008.02177.x

Huntington, S., 1968. Political Order in Changing Societies.

Jain, A.K., 2001. Corruption: A Review. J. Econ. Surv. 15, 71–121. https://doi.org/10.1111/1467-6419.00133

Karami, A., 2016. Four heads of Iranian banks fired for high salaries [WWW Document]. Al-Monit. URL http://www.al-monitor.com/pulse/originals/2016/06/high-wages-iran-government-officials-banks-fired.html (accessed 10.29.17).

Kaufmann, D., Kraay, A., 2007. Governance Indicators: Where are We, Where Should We Be Going? (SSRN Scholarly Paper No. ID 1019685). Social Science Research Network, Rochester, NY.

Kaufmann, D., Kraay, A., Mastruzzi, M., 2009. Governance Matters VIII: Aggregate and Individual Governance Indicators, 1996-2008 (SSRN Scholarly Paper No. ID 1424591). Social Science Research Network, Rochester, NY.

Leff, N.H., 1964. Economic development through bureaucratic corruption. Am. Behav. Sci. ABS, American behavioral scientist : ABS. - Thousand Oaks, Calif : Sage Publ, ISSN 0002-7642, ZDB-ID 2068679. - Vol. 8.1964, 3, p. 8-14 8.

Leys, C., 1965. What is the Problem about Corruption? J. Mod. Afr. Stud. 3, 215–230.
Mishra, A., 2007. Corruption, hierarchies and bureaucratic structure, in: International Handbook on the Economics of Corruption. Edward Elgar Publishing, pp. 189–215.
Mitra, D., Thomakos, D.D., Ulubaşŏglu, M.A., 2002. "Protection for Sale" in a Developing Country: Democracy vs. Dictatorship. Rev. Econ. Stat. 84, 497–508.
Mookherjee, D., Png, I.P.L., 1995. Corruptible Law Enforcers: How Should They Be Compensated? Econ. J. 105, 145–159. https://doi.org/10.2307/2235324
Nili, M. (Ed.), 2015. Where Is the Iranian Economy Heading Towards? Donyay-e Eghtesad, Tehran.
Pieroni, L., d'Agostino, G., 2013. Corruption and the effects of economic freedom. Eur. J. Polit. Econ. 29, 54–72. https://doi.org/10.1016/j.ejpoleco.2012.08.002
Shleifer, A., Vishny, R.W., 1993. Corruption. Q. J. Econ. 108, 599–617. https://doi.org/10.2307/2118402
Søreide, T., 2006. Corruption in International Business Transactions: The Perspective of Norwegian Firms, in: Corruption in International Business Transactions: The Perspective of Norwegian Firms. Edward Elgar Publishing.

2.6 Appendices

Appendix 1 Regulatory Quality

The following table is the full list of variables for Regulatory Quality presented in Kaufmann et al. (2009, p. 76):

Code	Concept Measured
Representative Sources	
Global Insight Global Risk Service (DRI)	• Export Regulations • Import Regulations • Other Regulation burdens • Restrictions on ownership of Business by Non-Residents • Restrictions on ownership of equity by Non-Residents
Economist Intelligence Unit Country Risk Service and Democracy Index (EIU)	• Unfair competitive practices • Price controls • Discriminatory tariffs • Excessive protections

Code	Concept Measured
Cerberus Corporate Intelligence Gray Area Dynamics (MIG, GAD)	• Stock Exchange / Capital Markets • Foreign Investment
World Economic Forum Global Competitiveness Survey (GCS)	• Administrative regulations are burdensome • Tax system is distortionary • Import barriers as obstacle to growth • Competition in local market is limited • Anti-monopoly policy is lax and ineffective • Environmental regulations hurt competitiveness • Complexity of tax System • Easy to start company
Heritage Foundation Index of Economic Freedom (HER)	• Foreign investment • Banking / finance • Wage/Prices
Institutional Profile Database (IPD)	• Administrative business start-up formalities • Administered prices and market prices • Competition: productive sector: ease of market entry for new firms • Competition between businesses: competition regulation arrangements
Political Risk Services International Country Risk Guide (PRS)	• Investment Profile.
Global Insight Business Conditions and Risk Indicators (WMO)	• Tax Effectiveness: How efficient the country's tax collection system is. • Legislation: An assessment of whether the necessary business laws are in place.
Non-representative Sources	

Code	Concept Measured
African Development Bank Country Policy and Institutional Assessments (ADB)	• Trade policy • Competitive environment • Labour Market Policies
Asian Development Bank Country Policy and Institutional Assessments (ASD)	• Trade Policy and Forex Regime • Enabling Environment for Private Sector Development
Business Environment & Enterprise Performance Survey (BPS)	• How problematic are labour regulations for the growth of your business. • How problematic are tax regulations for the growth of your business. • How problematic are custom and trade regulations for the growth of your business.
Bertelsmann Transformation Index (BTI)	• Competition • Price Stability
Country Policy and Institutional Assessment	• Competitive environment • Trade policy
European Bank for Reconstruction and Development Transition Report (EBR)	• Price liberalization • Trade & foreign exchange system • Competition policy
IFAD Rural Sector Performance Assessments (IFD)	• Enabling conditions for rural financial services development • Investment climate for rural businesses • Access to agricultural input and produce markets

Code	Concept Measured
Institute for Management Development World Competitiveness Yearbook (WCY)	• Access to capital markets (foreign and domestic) is easily available • Ease of Doing Business • Banking regulation does not hinder competitiveness • Competition legislation in your country does not prevent unfair competition • Customs' authorities do not facilitate the efficient transit of goods • Financial institutions' transparency is not widely developed in your country • Easy to start company • Foreign investors are free to acquire control in domestic companies • Price controls affect pricing of products in most industries • Public sector contracts are sufficiently open to foreign bidders • Real corporate taxes are non-distortionary • Real personal taxes are non-distortionary • The legal framework is detrimental to your country's competitiveness • Protectionism in your country negatively affects the conduct of business in your country • Labour regulations hinder business activities • Subsidies impair economic development

Appendix 2 Rule of Law

The following table is the full list of variables for Rule of Law presented in Kaufmann et al. (2009, p. 77):

Code	Concept Measured
Representative Sources	
BRI	• Enforceability of contracts • Direct Financial Fraud, Money Laundering and Organized Crime
Global Insight Global Risk Service (DRI)	• Losses and Costs of Crime • Kidnapping of Foreigners • Enforceability of Government Contracts • Enforceability of Private Contracts
Economist Intelligence Unit Country Risk Service and Democracy Index (EIU)	• Violent crime • Organized crime • Fairness of judicial process • Enforceability of contracts • Speediness of judicial process • Confiscation/expropriation
Cerberus Corporate Intelligence Gray Area Dynamics (MIG, GAD)	• Nationalisation / Expropriation
World Economic Forum Global Competitiveness Survey (GCS)	• Common crime imposes costs on business • Organized crime imposes costs on business • Quality of Police • The judiciary is independent from political influences of members of government, citizens or firms • Legal framework to challenge the legality of government actions is inefficient • Intellectual Property protection is weak • Protection of financial assets is weak • Tax evasion
GWP	• Confidence in the police force • Confidence in judicial system

Code	Concept Measured
	• Have you been a victim of crime?
Heritage Foundation Index of Economic Freedom (HER)	• Property Rights
HUM	• Independence of Judiciary
Institutional Profile Database (IPD)	• Respect for law in relations between citizens and the administration • Security of persons and goods • Organised criminal activity (drug-trafficking, arms-trafficking, etc. • Importance of the informal economy • Importance of tax evasion in the formal sector • Importance of customs evasion (smuggling, under-declaration, etc.) • Running of the justice system • Security of traditional property rights • Security of property rights: formal property rights • Security of contracts between private agents • Government respect for contracts • Settlement of economic disputes: justice in commercial matters • Intellectual property • Arrangements for the protection of intellectual property • Agricultural sector: security of rights and property transactions
Political Risk Services International Country Risk Guide (PRS)	• Law and Order. The Law sub-component is an assessment of the strength and impartiality of the legal system, while the Order subcomponent is an assessment of popular observance of the law (assessed separately).
TPR	• Trafficking in People Report

Code	Concept Measured
Global Insight Business Conditions and Risk Indicators (WMO)	• Judicial Independence An assessment of how far the state and other outside actors can influence and distort the legal system. This will determine the level of legal impartiality investors can expect. • Crime - How much of a threat businesses face from crime such as kidnapping, extortion, street violence, burglary…
Non-representative Sources	
African Development Bank Country Policy and Institutional Assessments (ADB)	• Property Rights
AFR	• Based on your experiences, how easy or difficult is it to obtain help from the police when you need it? • Over the past year, how often, if ever, have you or anyone in your family feared crime in your own home? • Over the past year, how often, if ever, have you or anyone in your family had something stolen from your house? • Over the past year, how often, if ever, have you or anyone in your family been physically attacked? • Trust in courts
Asian Development Bank Country Policy and Institutional Assessments (ASD)	• Rule of Law
Business Environment & Enterprise Performance Survey (BPS)	• Fairness, honesty, enforceability, and quickness of the court system • How problematic is crime for the growth of your business. • How problematic is judiciary for the growth of your business.

Code	Concept Measured
Bertelsmann Transformation Index (BTI)	• Rule of Law • Private Property
CCR	• Rule of Law
Country Policy and Institutional Assessment (CPIA)	• Property rights
FRH	• Judicial Framework and Independence
GII	• Executive Accountability • Judicial Accountability • Rule of Law • Law Enforcement
European Bank for Reconstruction and Development Transition Report (EBR)	• Executive Accountability • Judicial Accountability • Rule of Law • Law Enforcement
IFAD Rural Sector Performance Assessments (IFD)	• Access to land • Access to water for agriculture
LBO	• Trust in Judiciary • Trust in Police • Have you been a victim of crime?
VAB	• Trust in Justice • Trust in Police • Trust in Supreme Court • Have you been a victim of crime?
Institute for Management Development World Competitiveness Yearbook (WCY)	• Tax evasion is a common practice in your country • Justice is not fairly administered in society • Personal security and private property are not adequately protected

Code	Concept Measured
	• Parallel economy impairs economic development in your country • Patent and copyright protection is not adequately enforced in your country

Appendix 3 Control of Corruption

The following table is the full list of variables for Control of Corruption presented in Kaufmann et al. (2009, p. 79):

Code	Concept Measured
Representative Sources	
BRI	• Internal Causes of Political Risk: Mentality, including xenophobia, nationalism, corruption, nepotism, willingness to compromise • Indirect Diversion of Funds
Global Insight Global Risk Service (DRI)	• Losses and Costs of Corruption
Economist Intelligence Unit Country Risk Service and Democracy Index (EIU)	• Corruption
Cerberus Corporate Intelligence Gray Area Dynamics (MIG, GAD)	• Cronyism • Government Efforts to Tackle Corruption
World Economic Forum Global Competitiveness Survey (GCS)	• Public trust in financial honesty of politicians • Diversion of public funds due to corruption is common • Frequent for firms to make extra payments connected to: import/export permits

Code	Concept Measured
	• Frequent for firms to make extra payments connected to: public utilities • Frequent for firms to make extra payments connected to tax payments • Frequent for firms to make extra payments connected to: awarding of public contracts • Frequent for firms to make extra payments connected to: getting favourable judicial decisions • Extent to which firms' illegal payments to influence government policies impose costs on other firms
GWP	• Is corruption in government widespread?
Institutional Profile Database (IPD)	• Corruption
Political Risk Services International Country Risk Guide (PRS)	• Corruption. Measures corruption within the political system, which distorts the economic and financial environment, reduces the efficiency of government and business by enabling people to assume positions of power through patronage rather than ability and introduces an inherent instability in the political system.
Global Insight Business Conditions and Risk Indicators (WMO)	• Corruption: This index assesses the intrusiveness of the country's bureaucracy. The amount of red tape likely to be encountered is assessed, as is the likelihood of encountering corrupt officials and other groups.
Non-representative Sources	
African Development Bank Country Policy and Institutional Assessments (ADB)	• Transparency / corruption
AFR	• How many elected leaders (parliamentarians or local councillors) do you think are involved in corruption?

Code	Concept Measured
	• How many judges and magistrates do you think are involved in corruption? • How many government officials do you think are involved in corruption? • How many border/tax officials do you think are involve d in corruption?
Asian Development Bank Country Policy and Institutional Assessments (ASD)	• Anti-corruption
Business Environment & Enterprise Performance Survey (BPS)	• How common is for firms to have to pay irregular additional payments to get things done • On average, what percent of total annual sales do firms pay in unofficial payments to public officials • How problematic is corruption for the growth of your business. • Frequency of bribery in taxes, customs and judiciary
Bertelsmann Transformation Index (BTI)	• Corruption
CCR	• Transparency / corruption
Country Policy and Institutional Assessment (CPIA)	• Transparency / corruption
FRH	• Corruption
GCB	• Frequency of corruption among political parties, government officials, parliament, media and judiciary • Frequency of household bribery
GII	• Anti-Corruption Agency
IFAD Rural Sector Performance Assessments (IFD)	• Accountability, transparency and corruption in rural areas

Code	Concept Measured
LBO	• Have you heard of acts of corruption?
PRC	• Corruption Index
VAB	• Frequency of corruption among government officials
Institute for Management Development World Competitiveness Yearbook (WCY)	• Bribing and corruption exist in the economy

Appendix 4 Effect of a Change in y on π, α, and N; Case of $\tau > 0$

Before investigating the effect of a change in y and γ on social welfare and corruption, we need to investigate the changes on π, α and N.

Equilibrium profit (π^*) shows decreasing relation in y. When more deregulation is pursued by the government, there are two opposite effects on π; one through the overall cost, which deals more with the efficiency of firms; and the other through industry size which is basically the business-stealing effect that was discussed before in (2.2). In terms of the effect of y on fixed cost, there are two terms involving: $F/(1+y)$ which is inversely related to deregulation and y/N which the final effect of a change in y is ambiguous as both numerator and denominator change. Therefore, the final effect of deregulation on fixed cost remains ambiguous. It will be discussed how N^* is non-monotonic in y. Whatever the effect of fixed cost on π, Figure 2-14 shows that the overall effect of an improvement in y limits the amount of the firms' profit. Intuitively, higher deregulation in an economy decreases the fixed cost, which encourages more entry into the market and more entry causes lower profit per firms. The magnitude of π^* is related to γ and moves in opposite direction. A more selfish regulator in the office brings higher profit to a typical operating firm in the market.

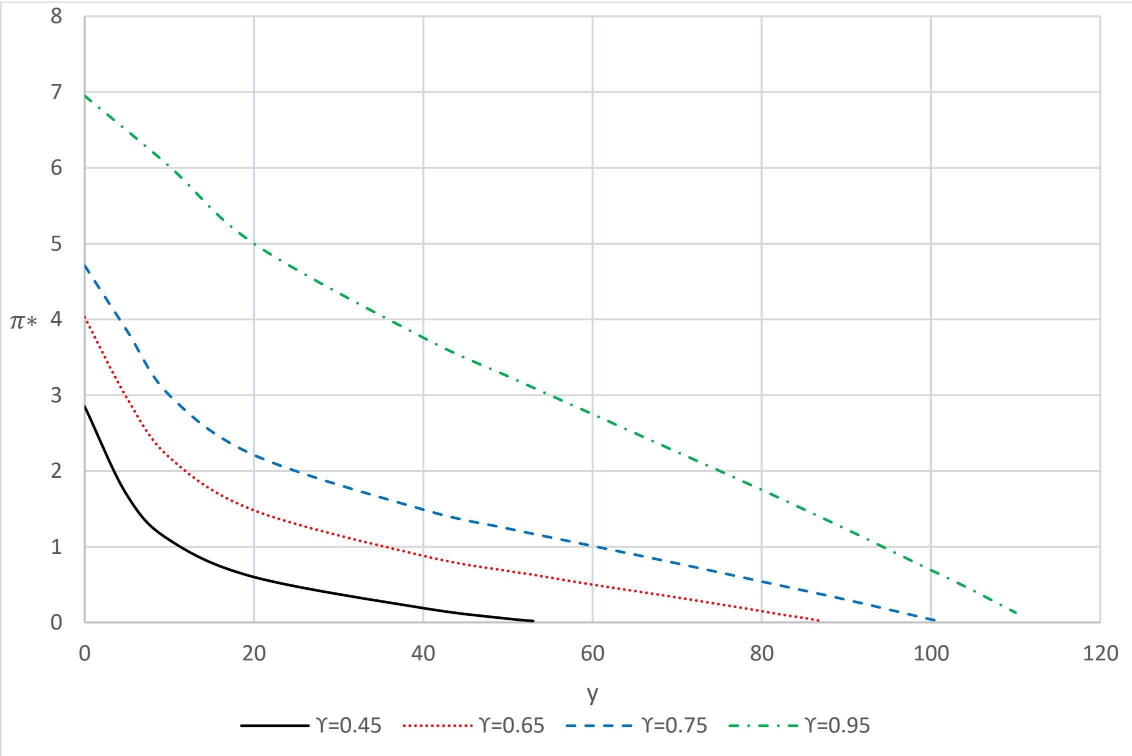

Figure 2-14 - The Effect of a Change in Deregulation on the Regulator's Reaction Function, $c = 10,\ f = 20,\ \eta = 0.1, \phi = 0.1$

Since business-stealing effect dominates the efficiency effect, deregulation might increase until it reaches to $\overline{y}$, which was defined in (2.17). Therefore, ultimately no incentive would remain for firms to participate in this game.

The regulator reacts the same way as in the case of $\tau = 0$ where γ shifts the reaction function to the right and makes it steeper. In other words, as shown in Figure 2-15, a more selfish regulator, not only determines higher industry size, but also he is more sensitive to what is being transferred (α^*) from the lobby. This is because the marginal effect of an additional license on personal welfare of a more selfish regulator would be higher than the effect of the same thing on social welfare. A more selfish regulator cares more about his personal welfare.

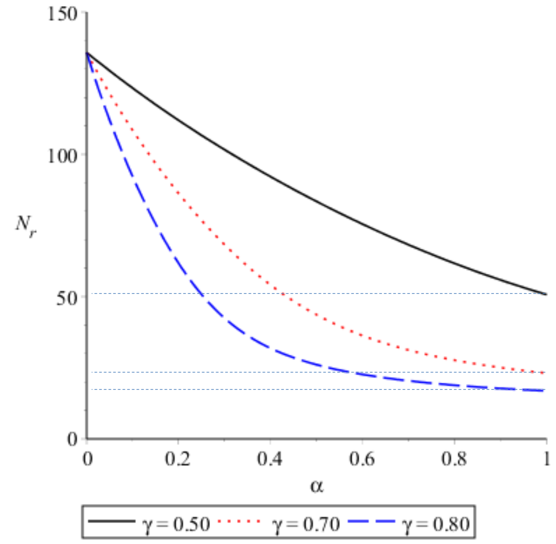

Figure 2-15 - The Effect of a Change in the Regulator's Level of Selfishness (γ) on the Regulator's Reaction Function, $\eta = 0.1, \phi = 0.1, y = 100$

The effect of a change in deregulation policy is also the same as the case when $\tau = 0$. In addition, the effect of a change in y on the regulator's reaction function is the same as what is depicted in Figure 2-16 and Figure 2-17.

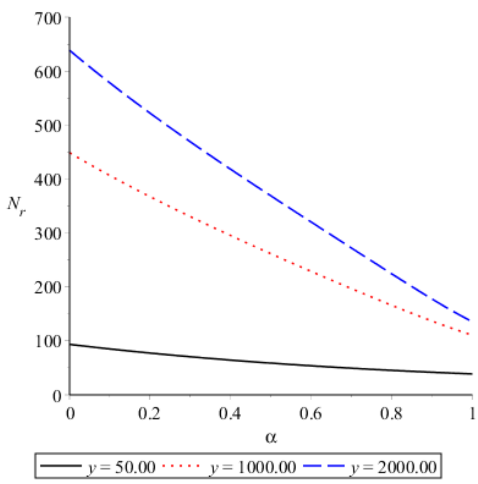

Figure 2-16 - The Effect of a Change in State of Bureaucratic Process on the Regulator's Reaction Function, $\eta = 0.1, \phi = 0.1, \gamma = 0.5$

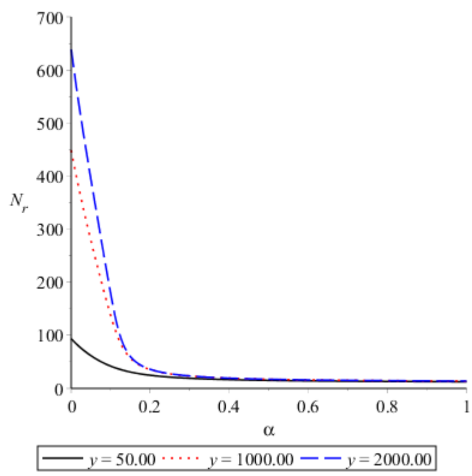

Figure 2-17 - The Effect of a Change in State of Bureaucratic Process on the Regulator's Reaction Function, $\eta = 0.1, \phi = 0.1, \gamma = 0.9$

The model shows that implementing deregulation policies may have different outcomes when the economy experiences different types of the regulator. This is an important point being shown in detail in this model.

To choose α, the lobby looks at the effect of a change in y in the firms' profit as well as the effect on the regulator's reaction function. Concerning the firms' profit, since the firms benefit from more profits when y is low, they can allocate higher α to the regulator. Concerning the regulator's reaction function, the lobby knows that, in case y increases, the regulator's reaction function shifts to the right and, hence, regardless of the amount being transferred from the lobby, the regulator determines higher industry size. Therefore, to keep the industry size as low as possible, firms would allocate higher fraction of their profit (α). They keep doing so for any increase in y until $y = \overline{y}$ where no incentive would remain for the firms to stay in the game. This could be seen in Figure 2-18 too, where there is a y at which $\alpha^* = 1$.

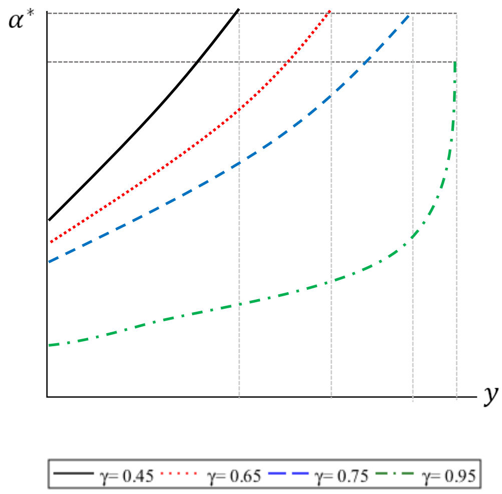

Figure 2-18 - Equilibrium Transfer vs. Deregulation for Different Levels of the Regulator's Selfishness, $c = 10, f = 20, \eta = 0.1, \phi = 0.1$

Less selfish regulators would $\overline{y}_1$ be mo re inclined to change the industry size when more deregulation is in the progress. In other words, deregulation, or a change in y, may have higher impact for a less selfish regulators, on both α^* and N^*. As shown in Figure 2-18, by an increase in the regulator's level of selfishness, the equilibrium transfer becomes flatter in y for most of the values of y. Since α^* is convex in y, as y gets closer to $\overline{y}$, α^* becomes steeper. Figure 2-19 shows how N^* would change in response to a change in deregulation for different types of the regulator's selfishness.

For the numerical exercise and comparative statics of the model, the benchmark values of the model's parameters are set to $a = 40, b = 2, c = 10, f = 20$. The corresponding industry size and social welfare, which are denoted by N_e^* and sw_e^* respectively, turns out to be

$$y_e^* = 30.9383, \qquad N_e^* = 53.79, \quad sw_e^* = 289.66$$

In the setting of chapter 1 where deregulation was not introduced, the same set of parameters' values resulted in the following values for industry size and social welfare:

$$N_e^* = 7.75, \quad sw_e^* = 100$$

Note that the structure of the cost function has changed here. Therefore, the main reason behind the increase in the first best industry size is due to much lower fixed cost in the current model. Remember that in case of $\tau = 0$, there is no interior solution for y_e^* and hence N_e^*. It is only when the tax is assumed to be $\tau = y/N > 0$ that the model shows interior solution for y_e^* and N_e^*. It turns out that $N_e^* = 53.79$, which means that no profit would remain for firms in the industry. As depicted in Figure 2-19, the industry size under the unregulated entry (first best) is always greater than the industry size under the lobby-regulator game. A more selfish regulator will also determine a lower industry size.

More deregulation does not lead necessarily to higher competition. As depicted in Figure 2-19, it depends on both the regulator's level of selfishness and level of deregulation. Following deregulation, while having a relatively high selfish regulator in the office (see the case of $\gamma = 0.95$ in Figure 2-19) may have very limited effect on the industry size and, hence, the competition among firms. According to Djankov et al. (2002, p. 25) 'data do not support the proposition that, in the subsample of poorer countries, heavier regulation of entry is associated with better social outcomes or more competition'. What is shown in Figure 2-19 echoes the result of Djankov et al. (2002), provided that poorer countries tend to have regulators that are more selfish. This can be followed in studies like that of Mitra et al. (2002) where they found that more democratic regimes tend to have regulators who care more about social welfare.

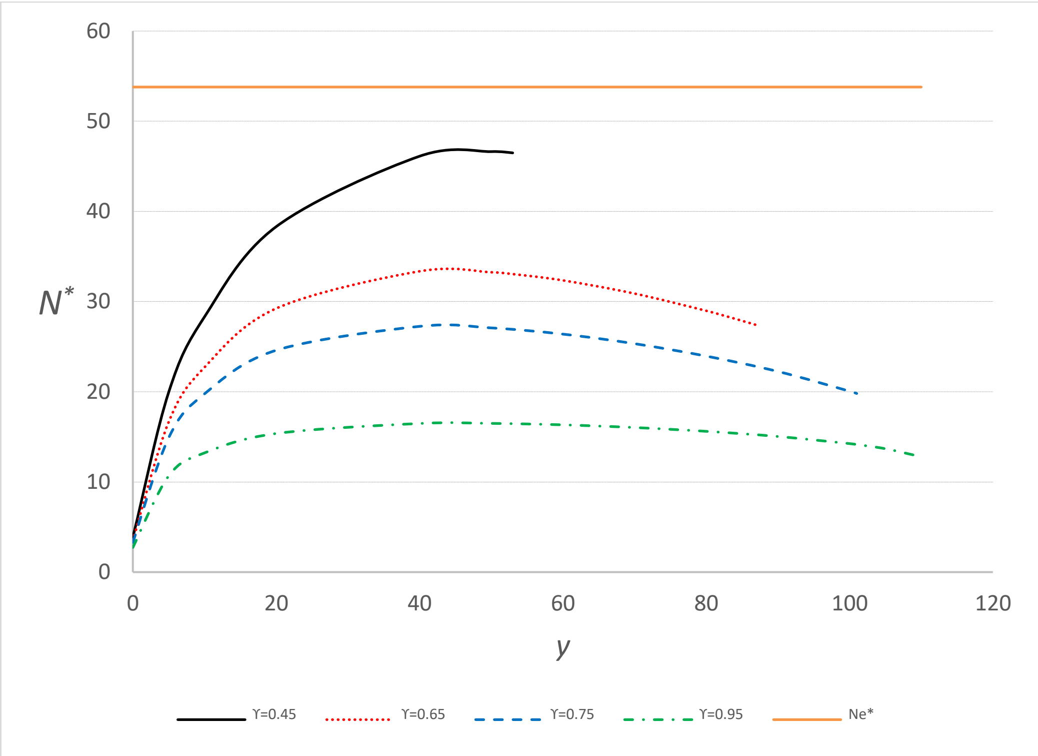

Figure 2-19–Industry size vs. Deregulation for Different Levels of the Regulator's Selfishness, $c = 10, f = 20, \eta = 0.1, \phi = 0.1$

Whether deregulation increases or decreases N^* depends on how y may change pw and sw. Depending on what type of regulator rules the office, the effects of y on pw and sw can be perceived differently. For instance, when $\gamma = 0.45$, the regulator decides more in favour of sw rather pw. Therefore, by an increase in deregulation he determines higher industry size which is not in favour of the lobby. This encourages the lobby to transfer more money to the regulator. However, this may not last forever. Even the one with $\gamma = 0.45$, might stop increasing N^* at some level of y. That is where $y = \bar{y}$. In the case of a more selfish regulator, like where $\gamma = 0.65$, the regulator will be convinced easier and may stop increasing N for lower level of y. Chapter 1 shows the same non-monotonicity of N^* in y for different γs.

Appendix 5 Effect of a Change in η on π^*, α^* and N^*

To be able to analyse the effect of a change in detection technology on corruption and social welfare, first we need to see the effects on the components of corruption and social welfare.

For a given level of γ, π^* is monotonically decreasing in η. Firms earn profit until η reaches to $\bar{\eta}$. At $\bar{\eta}$, firms transfer all they earn which is a very small value as shown in both Figure

2-20 and Figure 2-21. From the previous sections, we know that for a given level of η, any increase in γ ends to an increase in the typical firm's profit.

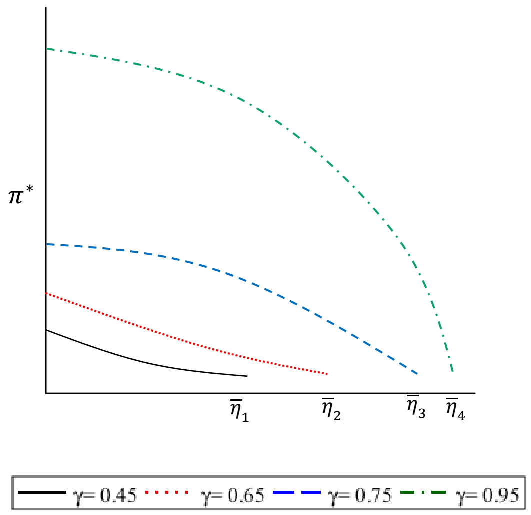

Figure 2-20 - Profit vs. Probability of Apprehension for Different Levels of The Regulator's Level of Selfishness, $c = 10, f = 20, \phi = 0.1, y = 30.94$

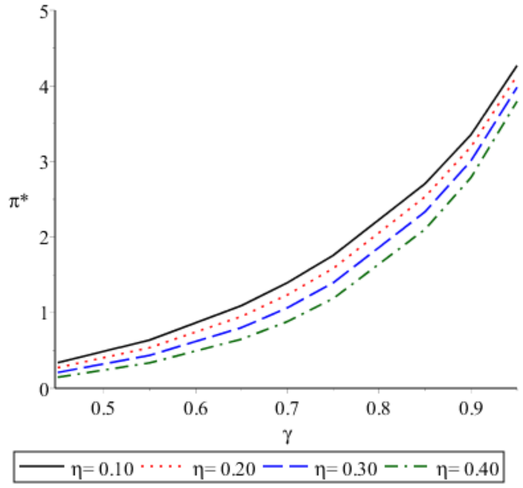

Figure 2-21 - Profit vs. The Regulator's Level of Selfishness for Different Levels of Probability of Apprehension, $c = 10, f = 20, \phi = 0.1, y = 30.94$

According to Figure 2-12, clearly we have $\bar{\eta}_1 < \bar{\eta}_2 < \bar{\eta}_3 < \bar{\eta}_4$ where $\gamma_1 < \gamma_2 < \gamma_3 < \gamma_4$. Therefore, $\partial\bar{\eta}/\partial\gamma > 0$, which means that when γ increases, higher probability of apprehension is needed to kill the incentives of firms.

Improvements in detection technology threaten the personal welfare of the regulator. Therefore, it is expected that the regulator's reaction function shifts to the right by an improvement in detection technology. This will be so because, by an improvement in detection technology, the regulator would be more under investigation and, hence, would have to act more in favour of social welfare. Hence, the regulator determines a higher industry size.

Introducing detection technology and the probability of being caught can decrease the potential results of the official's monopoly. This model assumes only one corruptible official who has a monopoly over government services. This can lead potentially to the socially worse results according to Shleifer and Vishny (1993). They discuss the role that a number of bribe-takers play in determining the equilibrium. They conclude that having an independent monopoly over government services can lead to the worst results compared to joint monopoly and competition.

In addition, it is expected to have a flatter reaction function of the regulator when the probability of apprehension increases. Intuitively, even a more selfish regulator, becomes more cautious in changing his choice of industry size based on an increase in his personal welfare upon being offered some bribe. Figure 2-22 shows the reaction function of the regulator in three different probabilities of apprehension. As depicted in Figure 2-22, the reaction function shifts to the right as η increases. In addition it becomes flatter in α; in other words, it gets less sensitive to transfers from the lobby. Therefore, among different economies with different detection technologies, in the one with higher probability of apprehension, the regulator determines the industry size less dependent on transfer

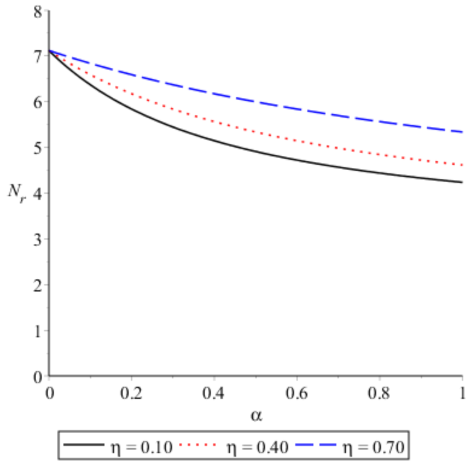

Figure 2-22 - The Regulator's Reaction Function for Different Levels of Detection Probability (η)

The lobby knows that if the regulator has more fear of being detected, the regulator is going to let more firms into the market. Having that in mind, the lobby will increase the transfer to stop the regulator from doing so. The regulator, as the last player of the game, monotonically increases industry size by an increase in η. Equilibrium transfer (α^*) turns out to be increasing in η. Also, equilibrium industry size (N^*) becomes flat in η after it reaches to some level. Figure 2-23 and Figure 2-24 show how α^* and N^* react to changes in η and γ.

As the regulator becomes more selfish, higher $\bar{\eta}$ would be needed to extract the highest fraction of the firms' profits or $\partial\bar{\eta}/\partial\gamma > 0$. In other words, the lobby would choose to increase its transfer to the regulator in case the probability of apprehension increases. The lobby would continue to transfer higher fraction of the cumulative profit to the regulator until all of it gets transferred to the regulator. For example for the benchmark values of the model where $a = 40, b = 2, c = 10, f = 20, y = 30.9$ and for the case where the regulator's selfishness is $\gamma = 0.45$, $\bar{\eta}_{\gamma=0.45} = 0.55$. When $\gamma = 0.50$ we will have $\bar{\eta}_{\gamma=0.5} = 0.63$. Finally, at an extreme case where $\gamma = 0.95$ the lobby will transfer all the profits when $\bar{\eta}_{\gamma=0.95} =$

0.98. In each case, as η reaches to $\overline{\eta}$, the lobby finds it in its favour to transfer all the firms' profit and protect their business from new rivals.

The lobby would be willing to transfer all the profits earned only when the probability of apprehension is almost 100%. However, in the case of a less selfish regulator ($\gamma = 0.5$), the lobby would do so as soon as η reaches to much lower value (63%). In other words, the profit will be transferred to convince the less selfish regulator. As the less selfish regulator is harder to convince, the firms' profit would be depleted for transfers in lower value of η. In other words, for $\eta > 0.63$, or generally when $\eta > \overline{\eta}$, the regulator may not receive anything more from the lobby.

Intuitively, the introduction of the probability of apprehension reduces the personal welfare part of the regulator's objective function. It has been discussed in full details in chapter one that in the case of a more benevolent regulator, the lobby would choose to transfer a higher fraction of its profit. The lobby will do that because they find it harder to convince a more benevolent regulator harder to convince. The introduction of the detection technology into the model definitely reduces the personal welfare of the regulator. Therefore, the lobby has to increase the transfer, even more, to encourage the regulator to act in the lobby's favour. Though the lobby cannot transfer more than all the cumulative profits of all firms. Hence, in the case of having a more benevolent regulator in the office, transfers are at its maximum ($\alpha = 1$) at lower value of probability of apprehension. For example $\bar{\eta}_{\gamma=0.45} = 0.55$ while $\bar{\eta}_{\gamma=0.95} = 0.98$.

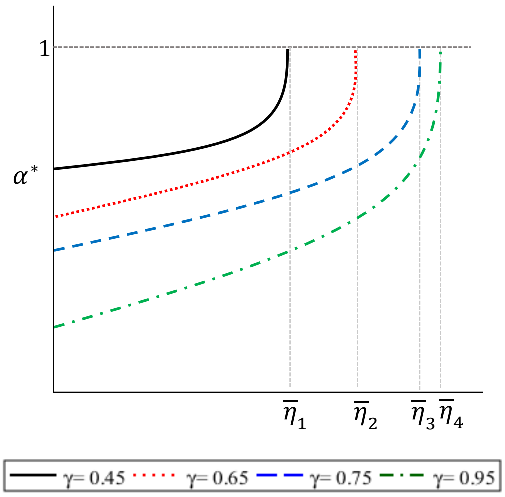

Figure 2-23 - Transfer vs. Probability of apprehension, $c = 10, f = 20, \phi = 0.1, y = 30.94$

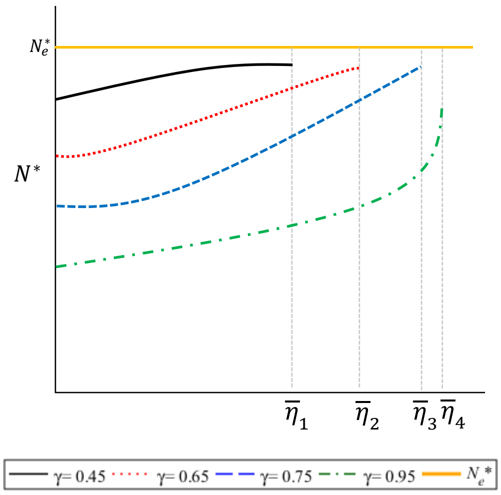

Figure 2-24–Industry Size vs. Probability of apprehension, $c = 10, f = 20, \phi = 0.1, y = 30.94$

CHAPTER 3

The Political Economy of Institutional Reforms: Optimising Deregulation versus Deterrence

Abstract

Chapter three presents a three-tier hierarchical model, comprising of three players: a politician, a regulator and a lobby. The politician's problem is to optimise the combination of two reform policies of deregulation and anti-corruption to maximise his chance of re-election. The politician's type is assumed to be a continuous variable in a range, which enables us to have a more detailed mapping of the comparative statics of changes in policymakers' types on the variables of interest. Based on the outcomes of the model, politicians can be categorised into four different types of oligarchic, semi-oligarchic, semi-populist and populist. Moreover, based on parameters of the model and namely the level of the politician's populism, the regulator can be either of zero- or positive-bribe types. The model shows that the regulator's selfishness may only harm semi-populist and populist politician's chance of success, not that of oligarchic and semi-oligarchic politicians. Comparative statics of the model also show that the players' characteristics are of lower importance when parameters of the model lie in extreme values. Therefore, the regulator's level of selfishness has almost no effect on relatively highly populist or relatively highly oligarchic politician. Policymakers of extreme values, whether the politician or the regulator, decides more independent of other parameters of the model. The model predicts that in two similar economies, the one with a higher level of the politician's populism may involve more of regulators in the bribery process. Moreover, a politician with a higher level of populism is more sensitive to the level of the regulator's selfishness. Therefore, the type of the politician matters as it also determines the sensitivity of other variables of interest to the regulator's level of selfishness. Whether having a more populist politician in the office ends up in lower corruption or not, depends on other parameters of the model, namely the regulator's level of selfishness.

3.1 Introduction

Policymakers in transition economies try to expedite the process of development that took centuries for Western Europeans. The experiences of East Asian economies show the possibility of acceleration in catching to the highest growth rate. However, transition economies might be confronted with some extra problems due to the volume of reforms required. There are certainly groups of insiders who are benefitting from the status quo. Hence, reform policies may bring up political oppositions which may make them politically less feasible (see for example Hoff and Stiglitz, 2004, 2005, 2008; Caselli and Gennaioli, 2008). This chapter contributes to the literature of privatisation by looking at the institutional requirements of the economy, without which the privatisation is unlikely to improve economic performance.

Chapter three takes the model of chapter two one step further by endogenising the two reform policies of deregulation and anti-corruption. Following Acemoglu *et al.* (2005, p. 389), 'economic institutions, and institutions more broadly, are endogenous; they are, at least in part, determined by society, or a segment of it'. To endogenise the two policy reforms, the politician is introduced as a new player. The model presented in chapter three comprises of a politician, a regulator and a lobby in a three-tier hierarchical model like that of Bó (2006) and Laffont and Tirole (1993). The model abstracts from the uncertainty and/or asymmetric information emphasised in their chapter. In this model, there are two players from the governmental body with different objective functions, which will create a more realistic picture of a government in the real world. As suggested by Shleifer and Vishny (1993), the relation between the top level of government, i.e. the politician and the secondary level of government, i.e. the regulator, adds some new insights. The regulator can be controlled by a central governor or a politician. This is one feature that is absent in the literature of political economy of entry (Perotti and Volpin, 2004).

Each player is limited by what other players determine. As Banerjee *et al.* (2012) point out, by assuming the hierarchy of bureaucrats, we do not let players free to make their own rules. In other words, it is mainly due to entrenched interests of different players in the real world that the implementation of the first best becomes unobtainable, even for a reform-minded government (Caselli and Gennaioli, 2008).

Successful implementation of economic reforms requires considering the institutional context. Moreover, it is important to investigate the equilibrium as a result of a political process rather than an independent variable; as relatively little is known about the political feasibility of different reform paths (Caselli and Gennaioli, 2008). According to Perotti and Volpin (2004) this approach of investigating the political process and institutional context, does not allow us to offer a generic recommendations in favour of economic reforms. Since any reform can be captured by players of the game, different outcomes can be achieved given different settings and contexts. Failure in privatisation in Iran (Nili, 2015) and failure in privatisation and liberalisation of the banking system in Mexico and Russia (Caselli and Gennaioli, 2008) can be explained according to this approach.

In the model presented in this chapter, the politician's objective is to maximise his chance of re-election by choosing how to allocate the budget to the two reform policies of deregulation and anti-corruption. The budget to implement these two policies is fixed and is financed through taxes on firms. Hence, for instance, if the politician decides to invest more on deregulation, he has to deduct from investment on anti-corruption. Since usually in electoral systems, one candidate cannot be in the office for more than two consecutive periods, we can think of the politician's party as the last player. Considering the incumbent party rather than the politician enables us to compare the results of this chapter with those studies which consider political parties, like that of Andvig (2007). All of different experiences in the history of transition show the importance of the diversity of the politician. Andvig believes that 'the Party's emphasis on growth-related promotion criteria sometimes allowed the planned systems to achieve fairly high growth rates, as shown recently by China and Vietnam and by the Soviet Union in part of the Stalinist period'.

The model presented in chapter three follows the general argument of Blanchard and Shleifer (2001) and Sonin (2010) that central governments are less likely to be captured by incumbents due to their larger size and not been directly in contact by local firms. The politician in my model is like the central government, which is less likely to be captured. While the regulator can be regarded as a local government in their settings which could be bribed. One can find other names for the same concept in the literature, such as 'the government' or 'the constitution-maker' (Banerjee *et al.*, 2012) or 'founding fathers' (Laffont and Tirole, 1990).

The model differentiates different types of politicians by the weight he assigns on the two main components of social welfare: on one side of the spectrum, the model defines a populist politician who assigns higher weight on consumer surplus. On the other side of the spectrum, an oligarchic politician assigns higher weight on producer surplus. The politician's level of populism can also be a reflection of the importance of the Communist party in formerly centrally planned economies and generally the party's approach to economic growth (Andvig, 2007).

The two reforms that this chapter aims to investigate are deregulation and anti-corruption reform policies. The goal is to see how different parameters of the model, namely the regulator's level of selfishness and the politician's level of populism can affect these two reform policies and what would be the equilibrium social welfare and corruption. The framework assumes 'a *hierarchy of institutions*, with political institutions influencing equilibrium economic institutions, which then determine economic outcomes (Acemoglu *et al.*, 2005, p. 391)'. Deregulation has direct effects on reducing the fixed cost of entry and production. Deterrence or anti-corruption indirectly forces the government to pursue consumers-oriented policies through enhancing the probability of apprehension and ultimately competition. While some papers take the simple strategy of assuming the binary choice for reform policies or binary types of the players (Hoff and Stiglitz, 2008), this chapter assumes the politician's type to be a continuous variable in a range. This enables us to see a more detailed and accurate mapping of consequences of reforms with respect to other parameters of the model.

What is meant by anti-corruption policies is perfectly framed in Rousso and Steves (2007). They take the following three initiatives as the main initiatives of anti-corruption programmes: (i) the design and publication of an anti-corruption strategy; (ii) the development of an implementing anti-corruption action plan and (iii) the establishment of a national anti-corruption commission ombudsman, or similar authority. These three component indicators are the building blocks of the 'anti-corruption intensity index', which measures the extent the transition countries followed anti-corruption activities in the study of Rousso and Steves (2007). However, they emphasised the assumption that these types of policies have a lagged effect on levels of corruption. Probability of apprehension can be regarded as an indicator for one of the dimensions of the quality of governance. As was explained in chapter two, 'control of corruption' and 'rule of law' are two of the ingredients of the World-wide Governance Indicators by World Bank (Kaufmann *et al.*, 2009). For further details of the variables, see Appendix 1 to Appendix 3 of chapter two. It should be noted that since bribery is an illegal act, a higher quality of rule of law can enhance the probability of apprehension significantly.

In this model, the politician's decision on how much to invest on anti-corruption determines probability of apprehension, which ultimately affects the choices of all other players, i.e. the lobby and the regulator. This will determine the span of control that the higher-level supervisors exercise and is absent in some studies related to corruption and hierarchies, for instance in Mishra (2007). As he predicts, this feature has implications for corruption. The model shows that due to the oppositions of players, having a populist politician and/or a benevolent regulator in the office might end in higher corruption, which is a totally deadweight loss to the society.

The model also tries to find an answer to Jain's (2001) question to compare marginal utilities of anti-corruption policies and deregulation policies. The question Jain asks is that given the level of corruption in an economy, should the government pursue deregulation or anti-corruption policies? Moreover, the government needs to know the optimal level of intervention as, for instance, Klapper *et al.* (2004) show that entry regulations are neither benign nor welfare improving. Governments might choose rules that go against them because they may not be fully aware of the consequences (Banerjee *et al.*, 2012). For instance, chapter two shows that depending on parameters of the model, anti-corruption policies may end in higher corruption. Chapter two paved the first step towards answering this question. This chapter tries to shed light on more choices of the government in a setting which determines the policy choices as the outcome of the model endogenously.

As discussed in previous chapters, following Caselli and Gennaioli (2008), deregulation is defined as eliminating unnecessary setup costs, for instance by reducing the number of licenses needed to open a business, the number of agencies involved in issuing such licenses and the quantity of paperwork to be produced. By implementing deregulation policies, the government facilitates the entry and production through reducing the fixed cost.

Acemoglu (2008) investigates political economy of barriers of entry and analyses the economic performance under two political regimes of oligarchy and democracy. Although this chapter is similar to the Acemoglu model in its discussion about the deregulation and entry barriers, it is different from his in two aspects: (1) I distinguish different politicians with respect to their tendencies towards consumers rather producers. In this model, the oligarchic politician assigns higher weight to producer surplus compared to consumer surplus, while in Acemoglu's model, the oligarchic society is the one in which the majority of elite decide on the policies, not the majority of people. Therefore, in my model, it mainly refers to the strategy of the politician rather than the general rules of the game in the society. His chapter studies how different regimes may change endogenously, while I assume it as exogenous strategy of the politician. (2) My model is a three-tier hierarchical model in which two players are determining the policies while in Acemoglu's model, when the majority, either the society's majority or that of the elite, vote for something, that would be implemented. This chapter tries to give the process of deregulation a more real picture by assuming the regulator, which in real world can work for his own purpose and may or may not be aligned with the politicians' objectives.

However, this chapter does not assume the politician's intent to constraint the regulator to be purely in favour of the society, but rather he pursues it because it is in his interest to make a balance in his decision, such that his chance of re-election can be enhanced. The politician, or the highest governmental body in this model, may have different incentives to monitor other players of a lower level in the government.[32]

By assuming an electoral setting in which the politician tries to attract more votes, the model introduces a democratic setting with a flavour of checks and balances. In the setting provided, the politician can potentially constraint the regulator by limiting the chance of misusing his position to take bribe easily in exchange to implement policies that are more in favour of the producers.

The politician's tool to implement constraints on the regulator is mainly through improvement of detection technology and hence indirectly affecting the regulator to work more in favour of competition; which ultimately will result to higher welfare for consumers. As Djankov *et al.* (2002) mention, such a democratic procedure for governments, either will ease the regulation or will yield more visible social benefits. Anti-corruption policies are meant to be designed and implemented to reach to higher probability of apprehension. As regulators, who are responsible to determine the industry size, face with higher probability of apprehension, they may work less for their personal welfare. Consequently, they will be more devoted to social welfare, which is equivalent to higher industry size which lets new entrants in the market. However, it is obviously against the incumbent's interest to have higher investment on anti-corruption policies. This will bring their opposition as explained in some models (Caselli and Gennaioli, 2008; Perotti and Volpin, 2004). It is assumed that citizens by refusing to vote for the incumbent politician show their disagreement with his strategies. This is similar to the case of Shleifer and Vishny (1993) where citizens by refusing to re-elect corrupt and incompetent officials, show their disapproval through local elections.

The idea of investigating two institutional reforms together, was initially inspired by the model of Caselli and Gennaioli (2008). They investigate economic consequences and political feasibility of deregulation and financial reform as the two key institutional reforms to foster entrepreneurship. In their dynamic model, the two reforms assumed to be determined exogenously by the

[32] As mentioned by Laffont and Tirole (1990, p. 4), this monitor could be due to the conflict between the founding fathers and the public decision makers.

> *The public decision makers cannot be trusted to implement perfectly the founding fathers' intent because they may be self-interested, may have an intrinsically different view of social welfare, or may have an incentive to identify with specific interest groups. The founding fathers must 'stack the deck' in favour of their own objectives by constraining the public decision makers.*

governments. The static model provided in this chapter provides a setting that looks at the emergence of the same sort of policies in endogenous ways. The two institutional reforms Caselli and Gennaioli investigate are deregulation and financial reform which are both economic. In this chapter, however, one of the two institutional reforms, i.e. anti-corruption, does not have only economic aspect. The politician by pursuing anti-corruption aims to reduce corruption to attract more vote from the majority of voters, i.e. consumers.

Not all the political and economic decisions are made by one player. Unlike Perotti and Volpin (2004) where industry size is determined by the politician, this model assumes that the regulator is going to choose industry size, not the politician. Perotti and Volpin do not distinguish between different governmental bodies or policymakers.

The results of the model show that by considering different policymakers with different objective functions there is no simple pattern between the variables of interests and other exogenous parameters of the model. The model shows non-monotonic relations of level of populism with social welfare, corruption, probability of re-election and other variables of interest, which is like what Perotti and Volpin predict. They find that in more accountable countries, or in economies with higher levels of the politician's populism, entry is less while this model predicts that industry size, which is equivalent to the entry in their model, would be non-monotonic in the level of populism. Hence, the relation can be increasing or decreasing depending on regulator's level of selfishness.

By defining the players' type as a continuous variable in a range, the model shows cases in which an economy can reach to zero corruption even without benefitting from a completely benevolent regulator. In addition, generally, if the politician finds the type of regulator to be complement to his own type, he may stop pursuing consumer-oriented policies. However, the model shows that the opposite can take place even without having a completely populist politician. Even semi-oligarchic politicians may choose to invest on anti-corruption even if they face with a completely selfish regulator.

The road map of the chapter is as follows. Section 3.2 introduces the model. Section 0investigates comparative statics of changes in γ and δ. This section later summarizes the presented comparative statics into two results and provides some policy implications. Section 3.4 concludes.

3.2 Model

This is a state capture model with three players: the politician, the regulator, and the association or the lobby, which is comprised by all operating firms in a market. The timeline of the game between players is as the followings:

1. First stage - The politician determines two things: (1) amount of investment on deregulation; (2) amount of investment on anti-corruption policies. This can be presented as if the politician determines total expenditure on institutional reforms and the share allocated to each of deregulation and anti-corruption policies.
2. Second stage - the regulator chooses the industry size.
3. Third stage - the lobby (association) chooses the level of transfer to the regulator.
4. Fourth stage - Firms compete in Cournot fashion.

The equilibrium can be found by going backward from the fourth stage.

3.2.1 Firms, the Regulator and the Lobby

The inverse demand function and the cost function are the same as (1.1) and (2.1) in chapters one and two. The regulator's problem is also the same as in chapter two. Similar to chapter two, firms may establish an association to follow the interest of the industry by convincing the regulator to keep the doors of the market closed. The lobby's problem is the same as in chapter two.

3.2.2 The Politician

The politician's ultimate goal is to maximise his chance of being re-elected. The model investigates the role of the politician in improving two specific institutions: deregulation, y, and anti-corruption policies, z. The politician needs to finance the total expenditure of implementing these two reform policies through tax. Hence, it is assumed that T is the total tax or total amount of money to implement y and z. Therefore,

$$T = y + z$$

$$y = \mu T, \mu \in [0,1].$$

The politician is the top level in the hierarchy of the government. Therefore, he can monitor or appoint the regulator, who is of a lower level in the body of government. The politician understands that investment on both anti-corruption policies and deregulation policies will increase social welfare and hence his chance of maintaining the office.[33]

Deregulation (y), is the same as in chapter two. Probability of apprehension is likely to depend on the monitoring intensity or supervisory effort of the player with higher rank (Mishra, 2007), which in this model is the politician. Hence, probability of apprehension, η, is assumed to be determined by the effort of the politician to fight with corruption. The success of anti-corruption measures is likely to depend on both the honesty as well as monitoring effort of the agents (Mishra, 2007). This model encompasses both aspects by letting the players in the governmental section to be varied in type and also by assuming that the efforts of the politician determines the probability of apprehension.

The politician's investment on anti-corruption (z) determines the probability of apprehension (η) through the following function

$$\eta = \frac{1 + hz}{k_c + hz} \tag{3.1}$$

There are two constants in (3.1). The first one, h, reflects the fixed factors of a society that affects the probability of apprehension.[34] It also gives us a full range of η between 0 and 1. In each setting, there is an initial probability of apprehension, $\eta(z = 0) = 1/k_c$, which is determined by k_c, which is another constant to make η a number between 0 and 1. These two can be referred to some other relevant fixed factors recognised in the literature; for instance, general features of transition countries, some general characteristics of the initial transition stage (Hoff and Stiglitz, 2004; Andvig, 2007), and the role of supporting institutions that affects the anti-

[33] Unlike the model presented in Andvig (2007), my model does not take into account plan-determined prices or plan-allocated output, which are the main concerns for early stages of transition from centrally planned to market-oriented economies. The model rather investigates the problems of the elite after some reform when the government does not interfere in the market but they still have power in determining the industry size.

[34] As shown by the model of Hoff and Stiglitz (2008), it is hard to create a demand for rule of law from scratch. The constant h can represent all those that Hoff and Stiglitz mention as factors that reduce demands for rule of law. For the case of Russia, they note to 'lack of experience of a market economy, an historical legacy of corruption, a corrupt privatisation, abundant natural resources, open capital markets and a hyperinflation in that by destroying private savings aggravated the consequences of imperfect capital markets and made asset stripping appear relatively more attractive'. All mentioned factors can exogenously change h and hence the probability of apprehension. Almost all of the above are present in Iran, Venezuela and a number of other resource-abundant economies in the last few years as well.

corruption programmes and cannot be put in place overnight (Rousso and Steves, 2007). According to Hoff and Stiglitz (2004), k_c can also reflect the pessimism about policies implemented by the government and whether or not they have been associated with corrupt privatisation.[35]

The politician's objective function is to maximise the probability of re-election by choosing y and z. As was discussed earlier, this chapter benefits from distinguishing two levels of policymakers. Moreover, the objective functions of these two are assumed to be different. Perotti and Volpin (2004) relax the assumption of having just one policymaker but the objective functions of the policymakers are assumed to be same. In other words, they do not let a hierarchy and hence different objective functions among policymakers.

In case the economy benefits a healthy electoral system, nothing can enhance the politician's chance of re-election like an increase in social welfare. Therefore, the objective function of the politician can be framed as the following format.

$$\max_{y,z} E = \frac{\delta.cs + (1-\delta).(ps - Tr)}{k_e + \delta.cs + (1-\delta).(ps - Tr)} \tag{3.2}$$

k_e is a constant which makes the probability of re-election in $[0,1]$ and can be regarded as a reflection of the institutional settings of an economy in status quo. For instance, following Hoff and Stiglitz (2004) this constant can show the presence of civil society institutions, such as a free press, churches and political clubs, with countervailing power to hold the state to account.

The numerator of (3.2) is '*political welfare*' and is defined as follows.

> Definition 3-1 Political welfare is the weighted sum of consumer surplus and producer surplus net of transfers, where weights reflect the politician's strategy on how important is consumer surplus versus producer surplus net of transfers.

δ is the weight that the politician assigns to the cs. The more populist politician cares more about the consumers rather than producers. Definitely, $1-\delta$ shows the importance of the ps

---

[35] The model is different in defining the indicator of good governance from that of Hoff and Stiglitz in a sense that in my model higher indicator will be achieved as the politician invests more on it. Whereas in their model, the main determinant of rule of law, and hence good governance, is the number of demanders. In other words, I assume that demand for good governance will show itself in the pressure from the social welfare side. It is assumed that in this economy what is needed is more investment in enhancing quicker and fairer legal system to punish wrongdoers.

in the politician's eyes. Following Campante and Ferreira (2007) and Acemoglu (2008) we consider high δ as a more populist politician and the low one as a more oligarchic politician. In this regard, a populist politician sets his strategy to address more the consumers' concerns. Hence, he has a base among consumers.[36] On the other hand, an oligarchic politician's strategy is to target the producers' concerns and therefore, he has a base among producers.[37] For instance, a politician with lower δ is expected to follow import-substitution policies in a way which can protect the business of the rich elite.[38]

I take δ exogenous while in the framework presented by Acemoglu (2008), one can investigate the endogenous regime transition between oligarchy and democracy. This can be done when the model considers the within-elite conflict.[39]

Different types of the politician choose different combination of y and z to maximise the probability of re-election. Failing to make this balance will endanger the politician's reputation.

Depending on the parameters of the model, we can think of other simpler versions of the politician's objective function.[40]

---

[36] These days the word populism is being used to describe right wing politicians like Trump while some leftist politicians such as Maduro and Corbyn are also considered as populists. What this mainly refers to the left wing politicians who mostly favour consumer surplus and are obviously different from the right wing politicians.

[37] What I mean by the politician's level of populism is similar to what Perotti and Volpin (2004) introduce as measures of 'political accountability' like constraints on the executive. They define 'political accountability' as sensitivity to voter preferences. In their work, the degree of accountability is proxied by the number of independent legislators. Hence, like Perotti and Volpin (2004), as the political system becomes more democratic, politicians become more 'accountable' to voters and δ increases. Following another suggestion of Perotti and Volpin, δ can be interpreted as a measure of voter education, which allows us to test for variety of other results.

[38] Acemoglu (2008) notes that the classification of societies into 'democratic' and 'oligarchic' categories does not necessarily coincide with the democracy scores used in the empirical literature. Therefore, for empirical studies a more accurate look into this issue would be required.

[39] In cases of formerly central planned economies, δ can represent the role of the Communist Party as discussed in (Andvig, 2007). Since the Communist party used to combine 'the economic roles of entrepreneurship, planning and capital markets with the political functions of security, repression and participation', it helps to understand the workings of the European centrally planned economies. The party in some economies had to act somewhat like an entrepreneur and sometime as a social planner. According to Andvig (2007), one can see the following three patterns in the transition economies: (i) the Communist Party could keep its power, like the case of China and Vietnam, or (2) the Communist Party loses its power and have no established replacement, like the formerly Soviet Union countries (except Estonia, Latvia and Lithuania), Romania and – partly – Bulgaria, or (iii) The Communist Party loses its power and there are alternative, established political forces, like the Czech Republic, Hungary and Poland. Andvig believes that only in the first one, the rate of institutional change was a policy variable and in the other two cases, the speed of change was not under anyone's control.

[40] For instance, when the politician assigns equal weight to cs and ps, $\delta = 0.5$, and hence equation (3.2) can be re-written as

3.2.3 Equilibrium

In order to derive the subgame perfect equilibrium, I follow backward induction. Therefore, firms solve their problem assuming a Cournot competition among themselves, given the outcome of the game between other players. The result is the equilibrium quantity and price of a typical firm which is the same as what presented in chapter one.

Then the game between the lobby and the regulator will start. Hence, the lobby finds the reaction function of the regulator and will plug it into his objective function. So, to find α_{re}, the lobby will find N_{re} by solving the regulator's problem which is exactly the same as the regulator's objective function in chapter two.

$$\max_{\mathrm{N}} G = (1-\gamma).cs + (1-(1-\alpha(1-\eta))\gamma)ps \tag{3.3}$$

Following the first order condition for the regulator we have

$$G'_N = (1-\gamma)cs'_N + (1-(1-\alpha(1-\eta))\gamma)ps'_N = 0 \tag{3.4}$$

and hence

$$-\frac{cs'_N}{ps'_N} = 1 + \frac{\alpha\gamma(1-\eta)}{1-\gamma}. \tag{3.5}$$

since $cs'_N > 0$ and $ps'_N < 0$, the regulator determines higher industry size as long as the marginal effect of one more licence on consumer surplus is higher than marginal effect on producer surplus.

By solving (3.4) for N, we can get the regulator's reaction as a function of α, y and z.

$$N_{re} = N_{re}(\alpha, y, z), \partial N_r/\partial\alpha < 0 \tag{3.6}$$

By plugging the regulator's best response into the lobby's objective function and following the first order condition we have

---

$$\max_{\mathrm{y,z}} E(\delta = 0.5) = \frac{sw_a}{k_e + sw_a}$$

Also, it is assumed that the politician takes into account the effect of corruption. A simpler version can definitely be the case where corruption may not be considered as an effective issue in voting for the politician. In such a case, the politician's objective function is as follows

$$\max_{\mathrm{y,z}} E(Tr = 0) = \frac{\delta.cs + (1-\delta).ps}{k_e + \delta.cs + (1-\delta).ps}$$

Similarly, in this case, the politician can assign the same weight to cs and ps which gives the following simple version of the politician's objective function.

$$\max_{\mathrm{y,z}} E(\delta = 0.5, Tr = 0) = \frac{sw}{k_e + sw}$$

$$L'_\alpha = (1-\eta\phi)(-N\pi + (1-\alpha)\underbrace{N'_\alpha}_{-}\underbrace{(\pi + N\pi'_N)}_{+/-}). \tag{3.7}$$

L'_α might be zero only if $\pi + N\pi'_N < 0$ in which the lhs is elasticity of profit with respect to industry size. The specification of the model requires to have the Assumption 1, presented in chapter one, satisfied. In case Assumption 1 is violated then we will have $L'_\alpha < 0, \forall\alpha$ and hence the lobby may not see the transferring process in favour of its members.

By solving (3.7) for α, we can get the lobby's best response as a function of y and z.

$$\alpha_{re} = \alpha_{re}(y,z) \tag{3.8}$$

Now the regulator can plug back α_{re} to find N_{re} just as a function of y and z.

The final problem is that of the politician to take the reaction functions of other players of the game and solve his own problem.

$$\max_{y,z} E = E(\alpha_{re}(y,z), N_{re}\,(y,z), y, z) = E(y,z) \rightarrow y^*, z^*$$

Following the first order conditions ($\partial E/\partial y = 0$ and $\partial E/\partial z = 0$), y^* and z^* can be found.[41]

Depending on the values of γ and δ there might be corner solution or interior solutions to the problem of the politician. In the following section, it will be discussed that in what cases and under what values of the parameters of the model, we might end up with a corner solution or an interior one. Then by plugging back y^* and z^* into other reaction functions, we can work out q^*, α^*,and N^*.

Before starting to investigate the policy effects, we need a set of definitions. It turns out that equilibrium profit is strictly decreasing in industry size or $\partial\pi^*/\partial N < 0$. This is a confirmation of the business-stealing effect, which was discussed and presented in chapters one and two.

Definition 3-2—Depending on other parameters of the model, there is a level of the regulator's selfishness, which is called *benevolence threshold* and is denoted by $\underline{\gamma}$, such that the

[41] The point is maximum if at that point we have the followings satisfied.

$$\partial^2 E/\partial T^{*2} < 0 \text{ and } (\partial^2 E/\partial T^2)(\partial^2 E/\partial\mu^2) - (\partial^2 E/\partial T\partial\mu)^2 > 0.$$

I used Maple software and manually did a flavour of 'branch and bound' method to ensure the output is the maximum point. Fishback (2009) provides a full explanation of using this method in Maple.

outcome of the game between the regulator and the lobby becomes no transfer for all regulators with lower than $\underline{\gamma}$. Formally, it could be written as follows

$$\underline{\gamma} = \{\gamma: \alpha^*(\gamma < \underline{\gamma}) = 0 \; and \; \alpha^*(\gamma > \underline{\gamma}) > 0\}. \tag{3.9}$$

To make it simpler, when for a regulator $\gamma < \underline{\gamma}$, he has no incentive to participate in the game. According to other parameters of the model, $\underline{\gamma}$ may differ. It would be better to distinguish regulators according to $\underline{\gamma}$. Further results can be explained better in light of this separation.

Definition 3-3—The regulator is zero-bribe if the outcome of the model is zero transfer ($\alpha^* = 0$). Referring to the definition of $\underline{\gamma}$ in (3.9), zero-bribe regulators are those with $\gamma < \underline{\gamma}$. Consequently, positive-bribe regulators are those with $\gamma > \underline{\gamma}$.

Obviously, positive-bribe regulators are more selfish than zero-bribe regulators.

There are also two more levels of γ that are important. First, there is a level of selfishness at which the politician starts to invest on anti-corruption policy

$$\underline{\underline{\gamma}} = \{\gamma: z^* \, (\gamma < \underline{\underline{\gamma}}) = 0 \; and \; z^* \, (\gamma > \underline{\underline{\gamma}}) \geq 0\}. \tag{3.10}$$

For all level of selfishness lower than $\underline{\underline{\gamma}}$ the politician invests nothing on anti-corruption. The next relates to the level of selfishness at which, again, the politician sets the investment on anti-corruption to zero[42].

$$\overline{\overline{\gamma}}_z = \{\gamma: z^*(\overline{\overline{\gamma}}) = 0\} \tag{3.11}$$

Depending on parameters of the model, there is a level of total expenditure, $\overline{T}$, at which no incentive remains for firm. Increasing in total expenditures improves the chance of investing on both deregulation, y, and anti-corruption, z. As was discussed in chapter 2, An increase in y, on one hand decreases the fixed cost (profit-enhancing effect), but on the other hand, it burdens more expenses on firms in terms of taxes (Efficiency-enhancing effect). Decreasing the fixed

[42] It can be of two types:

1. when $\delta < 0.6$. In this case we won't have $y^* = \bar{y}$.
2. when $\delta > 0.6$. In this case $y^* = \bar{y}$ and $\pi^* = ps^* = 0$. This is the level at which industry size would set to unregulated one. In this case no profit would remain for firms or they will transfer all their profit.

cost can potentially increase the industry size until it reaches to the industry size under an unregulated entry, N_e. Similar to chapter two, the industry size under an unregulated entry case is the number of firms (N_e) that remain with no profit for firms in this market.

$$N_e = \{N: \pi^*(N_e) = 0\} \tag{3.12}$$

Alternatively, the total tax burden can be increased until the profit becomes equal to zero. Formal definition of $\overline{T}$ is as the following

$$\overline{T} = \min_{T}\{[T: \pi^*(\overline{T}) = 0], [T: N^*(\overline{T}) = N_e]\}. \tag{3.13}$$

Similarly, given other parameters of the model, there might be a maximum of y (or μ) at which, like $\overline{T}$, firms are encountered with either zero profit or the case at which they transfer all their profits to the regulator. As soon as y reaches to a level that can satisfy either of the above, there will be no incentive to make transfer. $\overline{y}$ represents that level and can be formally introduced as the following

$$\overline{y} = \min_{y}\{[y: N^*(\overline{y}) = \overline{N}], [y: N^*(\overline{y}) = N_e]\}. \tag{3.14}$$

It is clear that γ and δ are of high impacts on $\overline{y}$. These two conditions in (3.14) are inspired by $\partial\pi^*/\partial N < 0$ and $\partial N_e/\partial y > 0$. $\overline{y}$ as introduced in (2.17) is the minimum of y that makes the industry size equal to either N_e or $\overline{N}$.

Similar to the previous chapters, to guarantee the formation of the lobby, we need to have Assumption 2 satisfied. Assumption 2 says that firms may only have the incentive to form the lobby provided that the expected profit after forming the lobby is greater than or equal to the profit under the first best number of industry size.

3.3 Policy Effects

In this section, I will first look at how the model may react to changes in γ when the politician is neutral or $\delta = 0.5$. Then the comparative statics of changes in both δ and γ will be investigated in Section 3.3.2 . Based on the results, then the politicians will be categorised into different types.

3.3.1 Neutral Politician, $\delta = 0.5$

I first start with a simple case in which the politician assigns equal weight to consumer surplus and producer surplus in his objective function. This makes the political welfare, defined in Definition 3-1, equal to social welfare. This exercise of the neutral politician enables us to look more carefully to the mechanics of the model. For instance, this section looks at how reaction functions might be changed according to changes in other parameters of the model.

In the first stage, the politician chooses y^* and z^* based on the reaction functions of the other players of the game. In the second stage, other players will see the politician's choices and the resulted probability of apprehension based on those. Then the regulator, according to the lobby's reaction function and the politician's choices, will chose N^*. The lobby will then choose how much to transfer (α^*). At the final stage, given all the choices of other players, firms will compete in Cournot fashion.

Assuming a neutral politician in the office, investments on both deregulation and anti-corruption, respectively y^* and z^*, turns out to be non-monotonic in the regulator's level of selfishness, γ. This is in line with the empirical finding of Klapper et al (2004) that entry regulations are neither benign nor welfare improving. Consequently, total tax or T^* turns out to be non-monotonic as well. When the regulator is extremely selfish (here in our case, $\gamma > 0.91$), y^* and z^* are decreasing in γ because the regulator becomes less sensitive to the politician's choices of y^* and z^*. In other words, the regulator is going to set the industry size less dependent on the politician's and the lobby's choices. The politician knows that the extremely selfish regulator may not pay attention to his choices of y^* and z^* and that he is going to set lower industry size whatsoever. We know the politician's success depends heavily on social welfare ($sw = cs + ps$). Since the lower industry size may reduce consumer surplus anyway, the politician will try not to pressure firms by burdening more tax ($T = y + z$). Therefore, both y^* and z^* reduce. Appendix 1 discusses how different combinations of y^* and z^* may affect the probability of re-election and its contours.

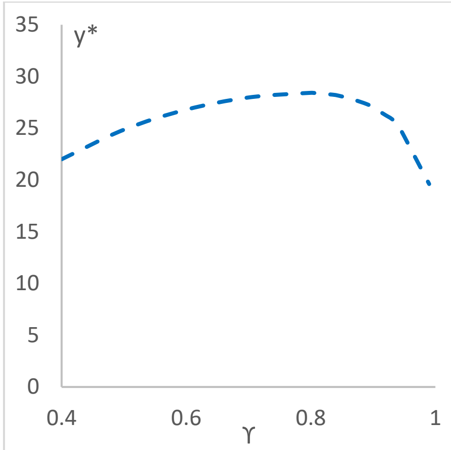

Figure 3-1 - Investment on Deregulation vs. Regulator's Level of Selfishness, case of $\delta = 0.5$.

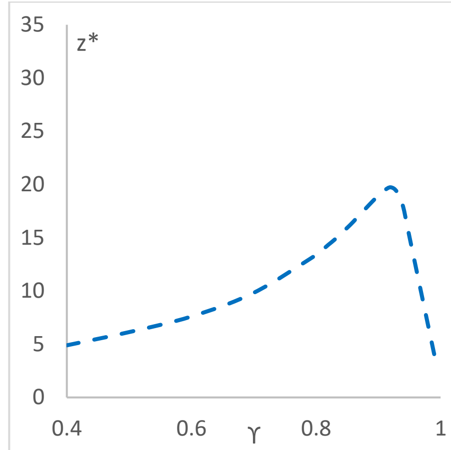

Figure 3-2 - Investment on Anti-Corruption vs. Regulator's Level of Selfishness, case of $\delta = 0.5$.

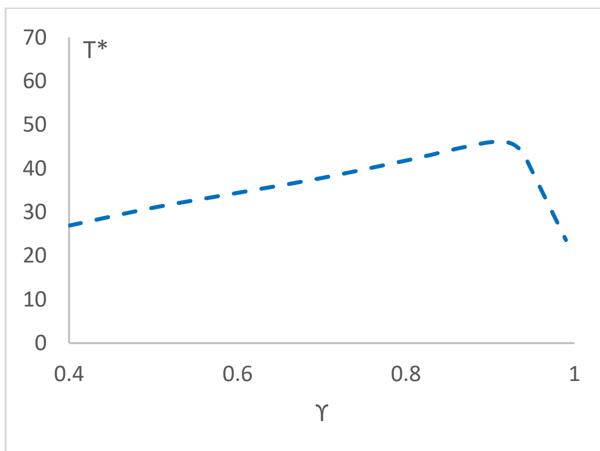

Figure 3-3 - Total Expenditures on Institutional Reforms vs. Regulator's Level of Selfishness, case of $\delta = 0.5$.

The lobby may also reduce his choice of α when the regulator is extremely selfish. Intuitively, this is so because the lobby understands that even if they reduce α, the extrermely selfish regulator is going to choose lower industry size, which is in line with the lobby's intention. Hence, at the end, N^* and α^* will be lower.

By investigating the changes in reaction functions, we can see the reason behind the described behaviour. Based on the lobby's reaction function presented in (3.8), it is expected that both γ and the equilibrium y and z affect reaction function of the regulator.[43] Before going further, it

[43] In order to be able to analyse the behaviour of the politician, I need to have $N_{re} = N_{re}(y, z)$ and $\alpha_{re} = \alpha_{re}(y, z)$, reaction functions of the regulator and the lobby, respectively. In order to have these two, we first need

would be better to see what would be the effect of a change in γ on reaction functions of the regulator given other variables, including T^*, are fixed. Then we can fix γ to see the effect of a change in T on the reaction functions.

A more benevolent regulator would work more in favour of social welfare rather than his personal welfare. So, as depicted in Figure 3-4, given a relatively benevolent regulator in the office, upon an increase in γ, a higher industry size will be determined. Also, as the level of selfishness increases, the regulator becomes more sensitive to the transfer from the lobby.

$$\frac{\partial N_r(\alpha)}{\partial \gamma} < 0, \frac{\partial^2 N_r(\alpha)}{\partial \gamma^2} > 0$$

The effect of a change in total tax (T^*) on reaction function of the regulator is opposite to that for γ. As the politician determines higher total tax, the industry size determined by the regulator increases. The regulator knows that when the politician allocates more resources (higher T^*), it is going to enhance the detection technology or deregulation or both.

$$\frac{\partial N_r(\alpha)}{\partial T} > 0, \frac{\partial^2 N_r(\alpha)}{\partial T^2} > 0$$

---

to find $N_{re} = N_{re}(\alpha, y, z)$ and then plug it into the lobby's obective function and solve for α to find $\alpha_{re}(y, z)$, the lobby's reaction function. Then, we need to plug this into the regulator's problem to have $N_{re} = N_{re}(y, z)$.
In order to realize the effect of a change in exogenous variables, like γ, we need to have the contours of α and N in the space of y and z. Then we can track the changes of γ on these two.
Due to problems to solve the model symbolically, I cannot draw the contours of α_{re} and N_{re}. One option to find the reaction functions would be to run the model for numerous combinations of the parameters and then sort them by α^* or N^* in order to be able to draw the contours of α and N for different combinations of y and z.

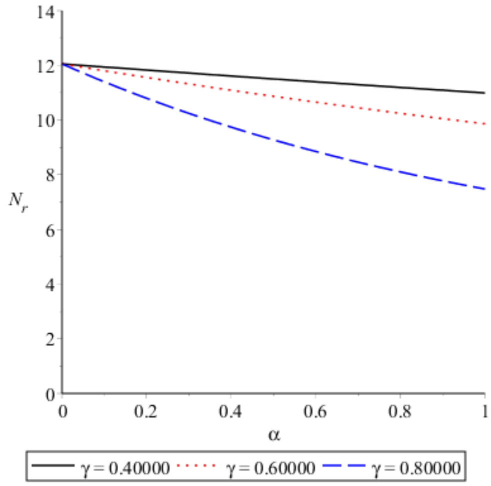

Figure 3-4 - The Regulator's Reaction Function for Different Levels of the Regulator's Selfishness

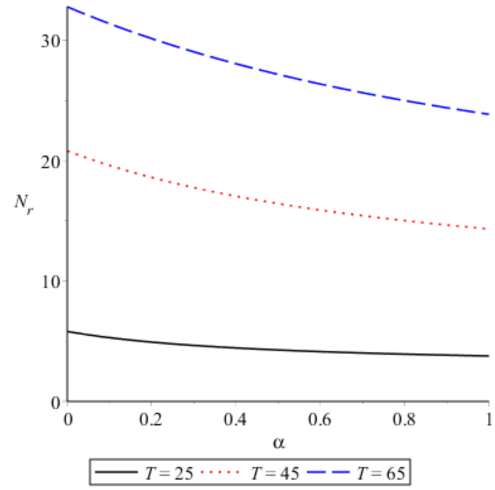

Figure 3-5 - The Regulator's Reaction Function for Different Levels of Total Tax

Now that the effect of γ and T on the reaction functions are investigated separately, we can look at the combination of both. By a change in γ, we will have a new equilibrium combinations of (y^*, z^*) and, hence, a new equilibrium T^*. The following sections will discuss how changes in parameters of the model affect y^* and z^* in details. According to these new combinations, the reaction function of the regulator would shift. However, the direction of shift is different for different combinations of (y^*, z^*), which will be explained below.

When $\gamma < 0.91$, the reaction function would shift as suggested in the Figure 3-6 and when $\gamma > 0.91$, the reaction function would shift as in Figure 3-7.

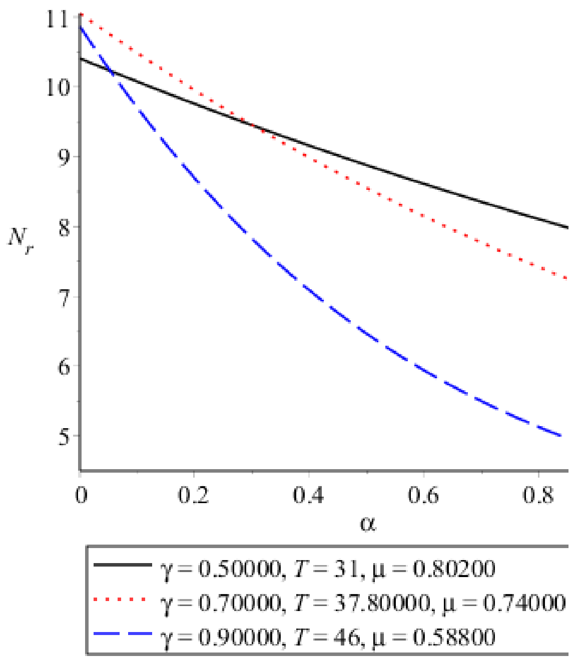

Figure 3-6 - Changes of Reaction Function of the Regulator, when $\gamma < 0.91$.

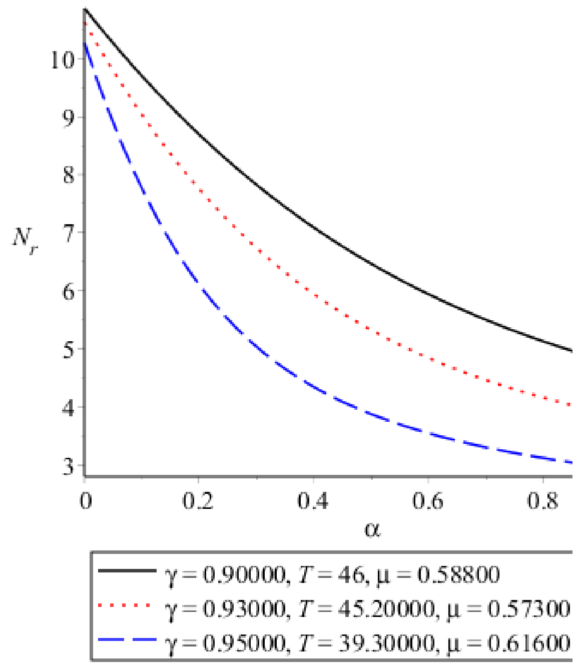

Figure 3-7 - Changes of Reaction Function of the Regulator, when $\gamma > 0.91$.

Knowing how the reaction function reacts to changes in y and z, as depicted in Figure 3-6 and Figure 3-7, the equilibrium $(\alpha^*,\ N^*)$ will be resulted. According to the findings, when $\gamma < 0.91$, by an increase in $\gamma,\ N^*$ is decreasing and α^* is increasing in γ. Then for $\gamma > 0.91$, N^* remains decreasing and α^* becomes decreasing too.

Reaction functions of the regulator gets affected by the chosen combination of (y^*, z^*) as depicted in Figure 3-8 and Figure 3-9. In the first case, as γ increases, α^* increases and N^* decreases. In the second case where $\gamma > 0.91$, increase in γ results to lower α^* and N^*. The common thing in both cases is that industry size will be always lower under a more selfish regulator, but the behaviour of transfer (α^*) depends on the value of γ and whether it lies below or above 0.91.

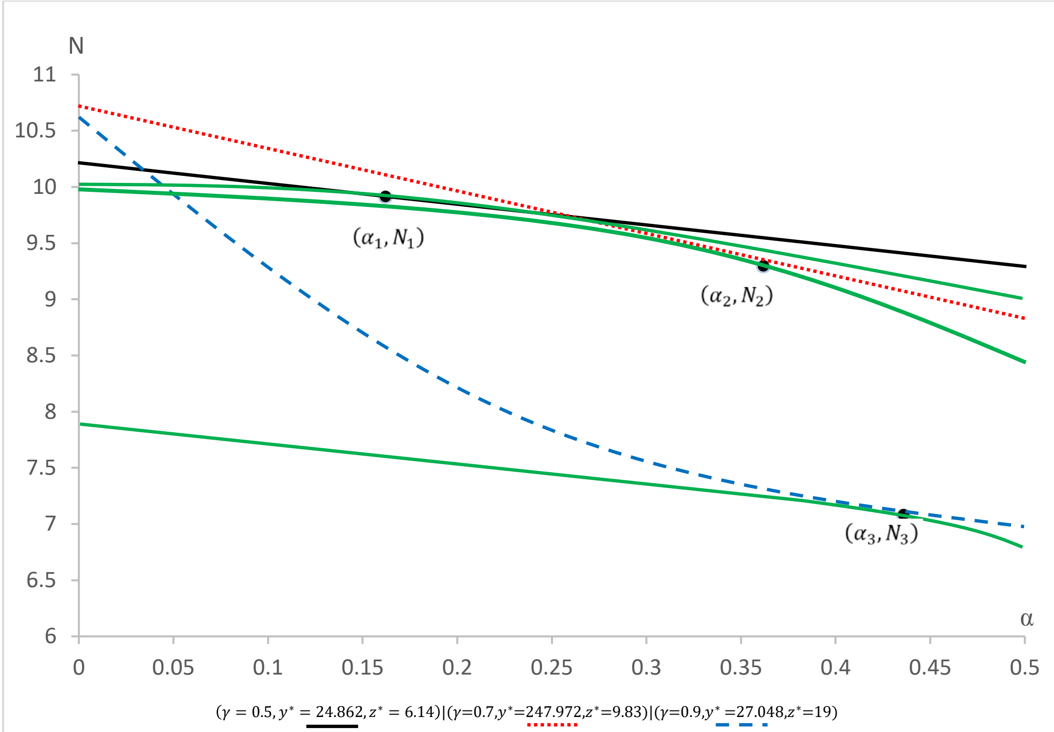

Figure 3-8 - Equilibrium Industry Size and Transfer, $\gamma < 0.91$

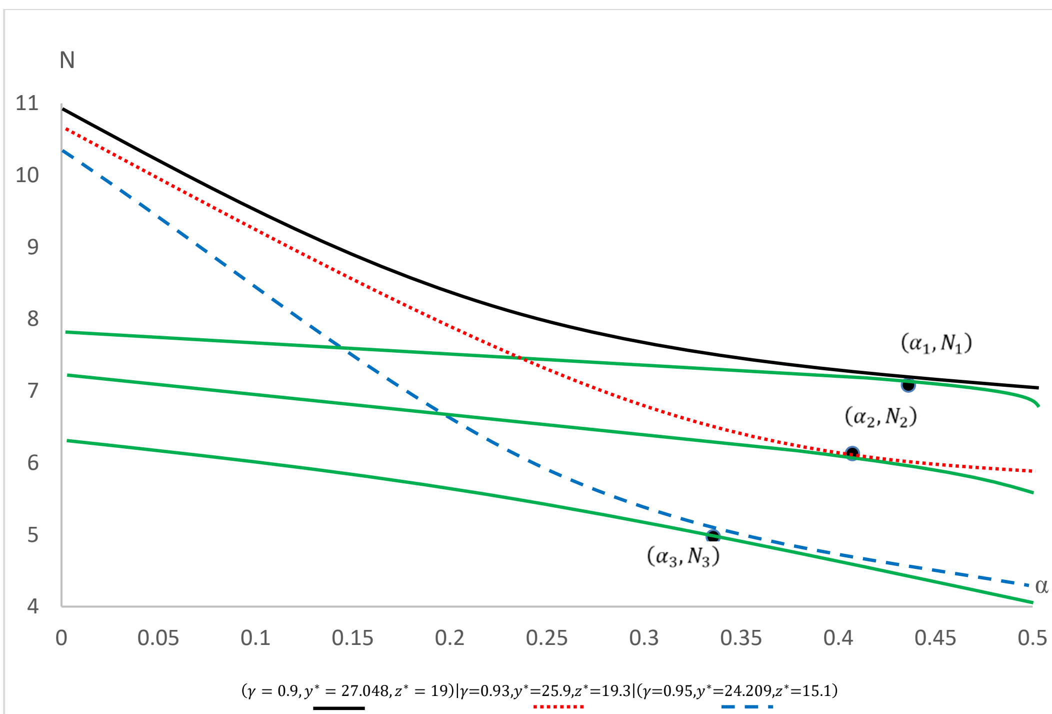

Figure 3-9 - Equilibrium Industry Size and Transfer, The case of extremely selfish regulator, $\gamma > 0.91$

As the next step, we should see how α^* may change. As expected, the lobby anticipates that a higher T will be spent to improve the institutional framework. Given better institutional frameworks, it is expected that the regulator increases the industry size upon an increase in T. Therefore, the lobby's response to all the described changes is an increase in α^*, or the regulator's share from the firms' profit.

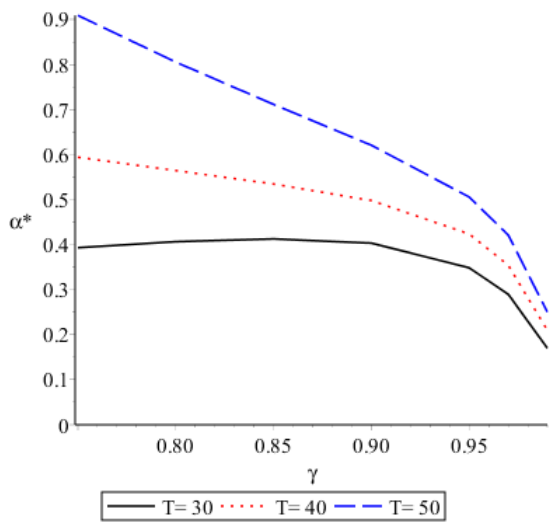

Figure 3-10 - Equilibrium Transfer vs. the Regulator's Level of Selfishness for Different Levels of Total Tax; ($\mu = 0.8, \phi = 0.7$)

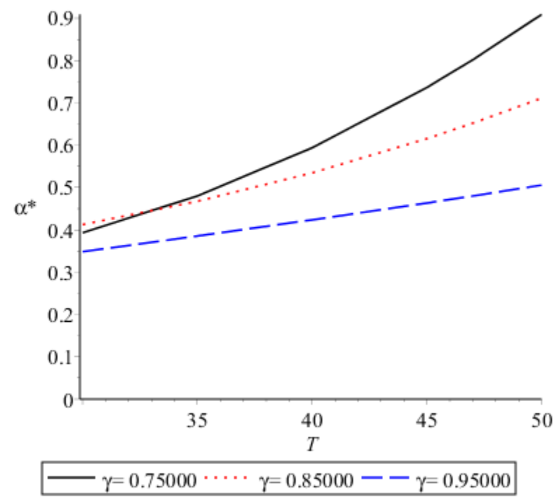

Figure 3-11 - Equilibrium Transfer vs. Total Tax for Different Levels of the Regulator's Selfishness; ($c = 100, F = 100, \phi = 0.7$)

What this exercise shows is that given fixed δ, the outcome of the model differs for different values of γ. This echoes Perotti and Volpin (2004) finding that by taking into account the political process and institutional context, one cannot offer a generic recommendation on economic reforms.

This exercise was done to show how the equilibrium can change according to changes in y^* and z^*. I will postpone investigating the effects on Tr^*, sw^* and E^* to the following sections.

3.3.2 Effects of Politicians' Type (Changes in δ)

This section aims to investigate the comparative statics of changes in δ and γ. First, I will present a summary of the economic story behind the outcomes, and then the outcomes of the model under different types of politicians will be elaborated in more details.

The model shows that the behaviour of the variables of interest are different for extreme types of the politician and the regulator. In extreme cases of the key parameters of the model, other parameters are not as important as they are in the medium cases. For instance, consider the two main exogenous variables of the model, the regulator's level of selfishness, γ, and the politician's level of populism, δ. Among these two, the politician with a very low or very high δ is less sensitive to values of γ. Likewise, this type of politician has less of an impact on the choices of the extreme types of the regulator. This can be taken as an extension for the result of Perotti and Volpin (2004) that more accountable countries are less subject to changes in other parameters of the model and specifically political interference. The following are comparative statics of changes in γ given fixed δ.

Based on the similar behaviours in different variables, the model enables us to distinguish four different groups of politicians: (1) oligarchic politicians; (2) semi-oligarchic politicians; (3) semi-populist politicians and (4) populist politicians. This distinction of politicians is mainly based on how z^* and sw^* behave in different regions of δ and γ. It will be discussed that we cannot determine fixed ranges of δ to each type of the politician. It will be shown that, depending on the parameters of the model, the corresponding ranges of δ to each type of the politician will be varied. Therefore, whether a politician is regarded as populist or not, depends on his behaviour with respect to changes in other parameters.

In terms of investment on anti-corruption, an oligarchic politician stops investing on anti-corruption for higher levels of the regulator's selfishness. However, the semi-oligarchic politician insists more on investing in rule of law and may continue to do so even for a completely selfish regulator.

What distinguishes the first two types of the politician from the other two is the behaviour of social welfare. Oligarchic and semi-oligarchic politicians are the types who can benefit from a higher level of the regulator's selfishness. The outcome of the model shows that social welfare is non-monotonic in γ for oligarchic and semi-oligarchic politicians, but it turns out to be monotonically decreasing in γ for semi-populist and populist politicians.

Political welfare which was defined in Definition 3-4 as weighted social welfare, is the main determinant of the politician's probability of re-election. Having said the behaviour of sw^*, the probability of re-election can be increasing in γ for the first two groups of politicians. However, for semi-populist (including neutral) and populist politicians, the probability of re-election turns out to be monotonically decreasing in γ.

The politician might have the chance to utilise the regulator's selfishness to increase his chance of re-election. An oligarchic politician assigns a higher weight on producer surplus. In case he faces a zero-bribe regulator or a relatively more benevolent regulator, he knows that the regulator works more in favour of the public rather than his own interests. In this case, it turns out that marginal effect of cs on the politician's chance of re-election is higher than that of ps. Therefore, the politician does not stop investing on anti-corruption. An oligarchic politician knows that when γ exceeds some level, the main concern of the regulator would be to guarantee his own personal welfare, not that of the public. This is where an oligarchic politician can benefit from having a more selfish regulator in the office. In this case, the politician knows that between consumers and producers, the latter might benefit more from the regulator's choice. Hence, the regulator's choice coincides with the oligarchic politician's intention, which is to maximise his chance of re-election, mainly through ps rather than cs. The politician stops investing in anti-corruption to make some space for the lobby to convince the regulator to work more in favour of producers. Thus, the transfers will be made and consequently the industry size will be dropped. This will end with an increase in producer surplus, which will be more than the decrease in consumer surplus. Hence, the outcome will be an increase in social welfare. Moreover, the oligarchic and semi-oligarchic politician assigns a higher weight on producer surplus, and therefore, for higher values of γ the probability of re-election will increase in γ.

Whether the regulator can be considered as zero-bribe or positive-bribe depends on the politician's type. A semi-populist politician is more in support of investing on anti-corruption. He always tries to set policies more in favour of consumers. Hence, the regulator's selfishness does not work towards the main intention of this type of the politician. Consequently, the politician's chance of re-election might be endangered. This means that the story is opposite to that of oligarchic and semi-oligarchic politicians.

Appendix 3 presents the behaviour of variables in more details. In light of the results presented in Appendix 3, the next section compares all the different types of politicians. In other words, Appendix 3 discusses the details and the next section provides a more general picture that empowers us with a detailed mapping.

3.3.2.1 Comparing Different Politicians

This section presents a more general picture by comparing different politicians. The goal is to see how different variables of interest behave for different politicians. Given the outcomes discussed earlier, it should be started by looking at the politician's choice of y^* and z^* and then investigating the lobby's α^*, and the regulator's N^* and the resulted Tr^*, sw^* and E^*. To make the main text shorter, the first few steps are presented in Appendix 3. Based on the definition of total transfer, presented in (1.10), we need to know the behaviours of α^*, N^* and π^*. Therefore, given the behaviour of basic variables of y^*, z^*, α^* and N^* which are discussed in Appendix 3, I continue this section by investigating the behaviour of corruption. Table 1 in Appendix 4 tries to summarise the changes in all interesting variables for different values of γ and δ.

By introducing δ, we may see some changes in the outcomes of the model. For instance, Tr^* shows different behaviour for different ranges of δ and γ. This section examines the outcomes under different values of δ. The following analysis may help to answer the question that, assuming all parameters fixed, how the changes in the regulator's selfishness and the politician's level of populism, may change the behaviour of corruption. First, we should see in what cases the lobby and the regulator may play the bribery game. In other words, we would like to know whether the economy always experiences positive corruption or is there a case with no corruption. After that the magnitude and the trend of corruption will be investigated.

Figure 3-12 depicts the behaviour of corruption for different types of politicians. Clearly, there is no need to have a completely benevolent regulator to benefit from zero corruption as it is zero even for the regulators with $\gamma > 0$. However, the politician's level of populism affects the level of benevolence threshold. The following Remark summarizes the above.

> Remark 9 (1) To reach to zero corruption, an economy does not need to have a completely benevolent regulator. (2) The type of the politician changes the benevolence threshold and hence the group of positive-bribe regulators.

A more populist politician, $\delta \in (0.32,1)$, decides more in favour of the consumers and, hence, works such that finally the industry size increases. This is not in the lobby's interest, and it requires the lobby's action to convince the regulator to stop the trend; even if the regulator does not welcome transfers. Therefore, the model predicts that as the politician gets more populist, more benevolent regulators might be involved in bribery process. In other words, those who were not involved in the bribery process under the case of a relatively more oligarchic politician, might get involved due to an increase in δ.

It is clear that the discontinuity in z^* and consequently α^*, discussed in Appendix 2 section I, makes Tr^* discontinuous too. Given that the regulator is selfish enough to have the lobby-regulator game started, corruption can be discontinuous. Now, two more questions remain to be answered: (1) does a more selfish regulator increase corruption? and (2) would corruption be reduced given a more populist politician, who supposedly assumed to be more supportive of anti-corruption? The first question should be answered by looking at the trend of corruption in Figure 3-12. Answer to the second question lies in comparing magnitudes of corruption in Figure 3-12.

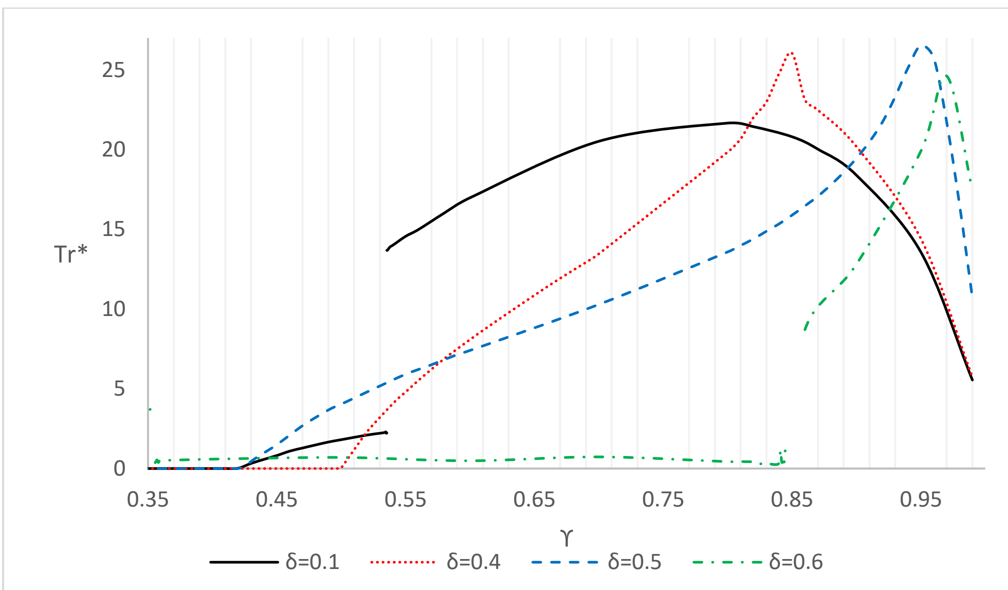

Figure 3-12 - Corruption vs. the Regulator's Level of Selfishness for Different Values of the Politician's Level of Populism

In terms of the general trend of Tr^*, for all different levels of δ, corruption is non-monotonic in γ. Chapter one shows the same result. To see the reason of the non-monotonicity of Tr^*, we need to look back into the components of corruption, i.e. α^*, N^* and π^*.[44] In short, the reason lies in the marginal effect of each of the components on Tr^*. As in chapter one, for extremely high γ, by a rise in γ, N^* would be determined very low. This will have two effects: (1) the lobby

[44] Figure 3-58 to Figure 3-60 in Appendix 3 present the behaviour of these three with respect to changes in γ and δ.

is happy for the decline of N^* and hence shares less of its profit. Therefore, α^* will be determined low as well; (2) Due to business-stealing effect, profit would be higher. The effects of N^* is negative and the effect of α^* and π^* are positive on Tr^*. Note that $(1-\alpha)$ appears in Tr^*. The marginal effect of α^* and the marginal effect of higher π^* are lower than the marginal effects of N^*. Therefore, Tr^* would be decreasing for very high γ.

In terms of the magnitude of corruption, generally, a more populist politician invests higher stakes on anti-corruption, which will increase the probability of apprehension. Therefore, the general intuition is to expect lower corruption given a more populist politician in the office. However, the model reveals that a more populist politician may or may not cause lower corruption. An economy with a more oligarchic politician might end up with a lower level of corruption, compared to a relatively more populist politician. That happens when the regulator is either very selfish or very altruistic. For medium values of selfishness, which in our case turns out to be $\gamma \in (0.6,0.9)$, corruption under a more oligarchic politician is higher compared to other politicians. Therefore, only for the specified range of γ, the outcome of the model is in line with the general intuition, not for all values of γ.[45] Increasing the relation of industry size in δ is consistent with the main result of Perotti and Volpin (2004). They show the same relation both theoretically and empirically. However, α^* might behave differently depending on the value of γ. Consequently, an extremely oligarchic politician may burden less corruption to the economy when it is being ruled by an extremely selfish regulator.

Scale-neutral corruption is depicted in Figure 3-13. This figure confirms that whatever found on the behaviour of corruption is not due to scales and even scale-neutral corruption has the same pattern of change.

[45] To be more accurate, by having a look at Figure 3-58 to Figure 3-60 in Appendix 2, one can find that an increase in δ increases N^* and reduces π^*, regardless of the value of γ.

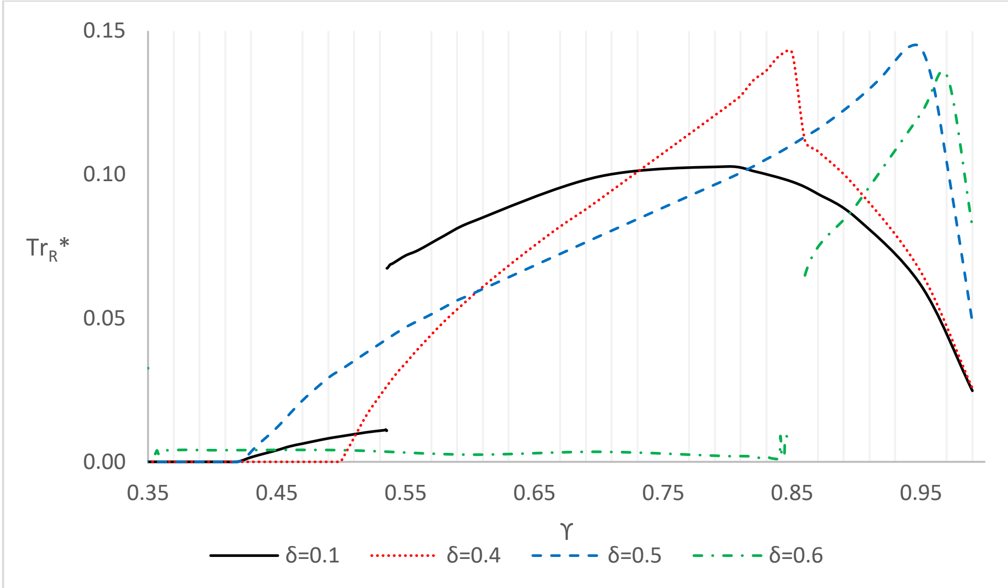

Figure 3-13 - Scale-neutral Corruption vs. the Regulator's Level of Selfishness for Different Values of the Politician's Level of Populism

In an economy with a relatively more populist politician, higher probability of apprehension is expected. Therefore, the lobby will try harder to convince the regulator. The outcome is that the regulators become of the positive-bribe type with lower level of γ when they expect a more populist politician. In other words, regulators with lower level of selfishness could be engaged in the bribery process when the politician who rules the office is relatively more populist. It was previously discussed in (3.16) that the benevolence threshold is decreasing in δ for semi-oligarchic politicians.

It is important to note that a politician with higher level of populism is more sensitive to the level of the regulator's selfishness. Therefore, the type of the politician matters as it determines the sensitivity of α^*, N^* and z^* to γ. These three are more sensitive to γ for a more populist politician.

Result 1 *Higher levels of the politician's populism decreases corruption only if both the politician's level of populism and the regulator's level of selfishness do not lie in extreme values.*

In other words, Result 1 implies that when the regulator is either very benevolent or very selfish, an economy with a less oligarchic politician experiences higher corruption.

Usually it is expected to have more investment on anti-corruption policies when a more populist politician rules the office. However, the model shows that depending on other parameters of the model having a more populist politician, and hence, a higher investment on anti-corruption policies may end up with higher corruption. This model provides a framework which can explain the theory behind the empirical finding of Rousso and Steves (2007) in which the sharp decline of corruption between 2002 and 2005 in the transition countries, is not associated with the intensity of short-term anti-corruption initiatives in the preceding period (1999–2002).

In terms of policy implication, Result 1 and the point mentioned in the preceding paragraph show that: (1) When the regulator's selfishness is extremely high, there is no need to invest more on anti-corruption. The regulator chooses the industry size more independent of the parameters of the model. Therefore, players lose their incentive to participate in the bribery. (2) The decline in corruption in the case of extremely selfish regulators is not due to the politician's policies, but rather is due to the fact that a highly selfish regulator decides such that those who are prone to be positive-bribe regulators may see their goal fulfilled even without making higher offers of bribery.

It should be noted that, as Rousso and Steves (2007) emphasised, anti-corruption initiatives are not quick fixes and are mainly effective in the longer term. Hence, to empirically investigate the policy implications of this model on corruption, one should take into account longer-term effects of anti-corruption policies.

Social welfare is another interesting variable to be investigated after corruption. To find how changes in γ and δ affect sw^*, we need to first check the behaviour of cs^* and ps^*, which are the components of sw^*.[46] The regulator's level of selfishness has opposite effects on cs^* and ps^*. For almost all values of γ, $\partial cs^*/\partial\gamma < 0, \partial ps^*/\partial\gamma > 0$. Therefore, the effect on sw^* depends on the magnitude of each effect; by an increase in γ, if the positive effect of γ on cs^* is bigger than that on ps^*, then sw^* becomes increasing in γ. In the opposite case, sw^* becomes decreasing in γ. The aggregate effect is shown in Figure 3-14.

In terms of magnitude, an increase in δ ends to higher cs^* and lower ps^*. However, it is clear that the effect of δ on cs^* almost always outweighs that on ps^*. Therefore, social welfare is greater for a more populist politician regardless of the regulator's level of selfishness.

[46] Figure 3-61 and Figure 3-62 in Appendix 3 present the behaviour of cs^* and ps^* in response to changes in γ and δ.

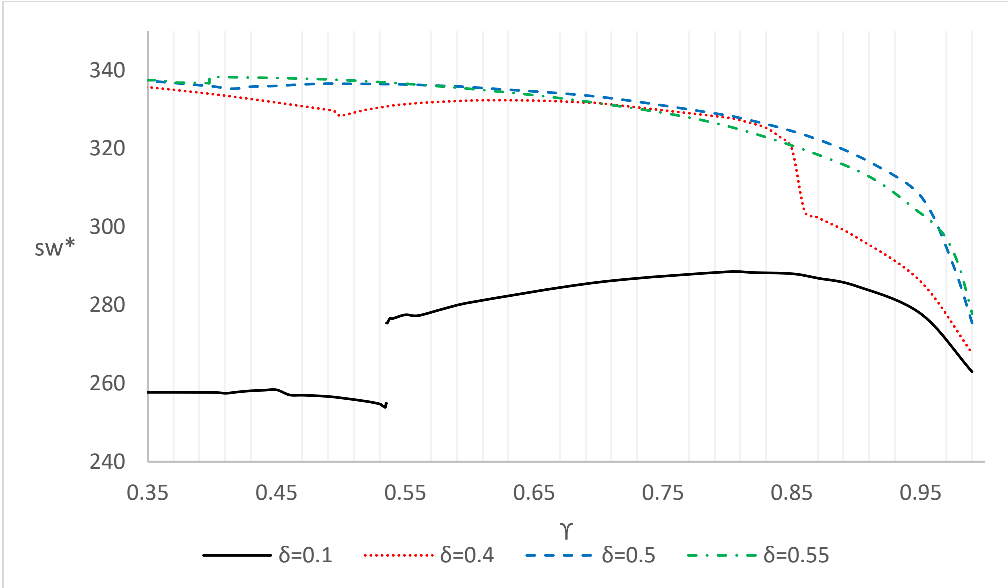

Figure 3-14 - Equilibrium Social Welfare vs. the Regulator's Level of Selfishness for Different Types of the Politician

The economic indicator of social welfare, which was introduced in (1.11), shows the same behaviour. However, the effect of γ would be lower. In other words, social welfare is still increasing in γ when an oligarchic politician rules the office, but the sensitivity to the regulator's selfishness is lower compared to the case of accounting social welfare.

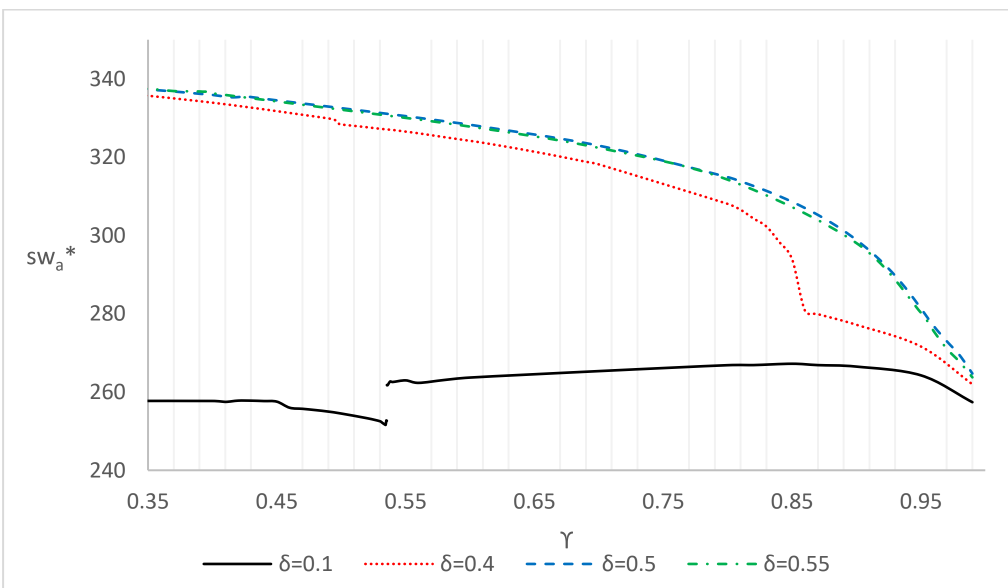

Figure 3-15 - Equilibrium Social Welfare Net of Transfers vs. the Regulator's Level of Selfishness for Different Types of the Politician

In light of the behaviour of sw^*, we can compare how E^* reacts to changes in γ and δ for different types of politician. It was mentioned that a relatively more populist politician will be less affected by the regulator's selfishness. In technical words, the sensitivity of E^* to γ is lower for higher δ. However, a more careful consideration of E^* shows that for medium levels of δ ($\delta = 0.4$), E^* is almost constant for all levels of the regulator's selfishness. For relatively higher levels of δ ($0.5 < \delta < 0.6$), E^* is decreasing in γ. This means that the politician prefers to have a less selfish regulator in the office to increase his own chance of success. In other words, a populist politician may have lower chance of success in case the economy experiences a relatively more selfish regulator. Intuitively, higher levels of populism in the politician necessitates a higher investment on detection technology and, hence, an improvement in the probability of apprehension.

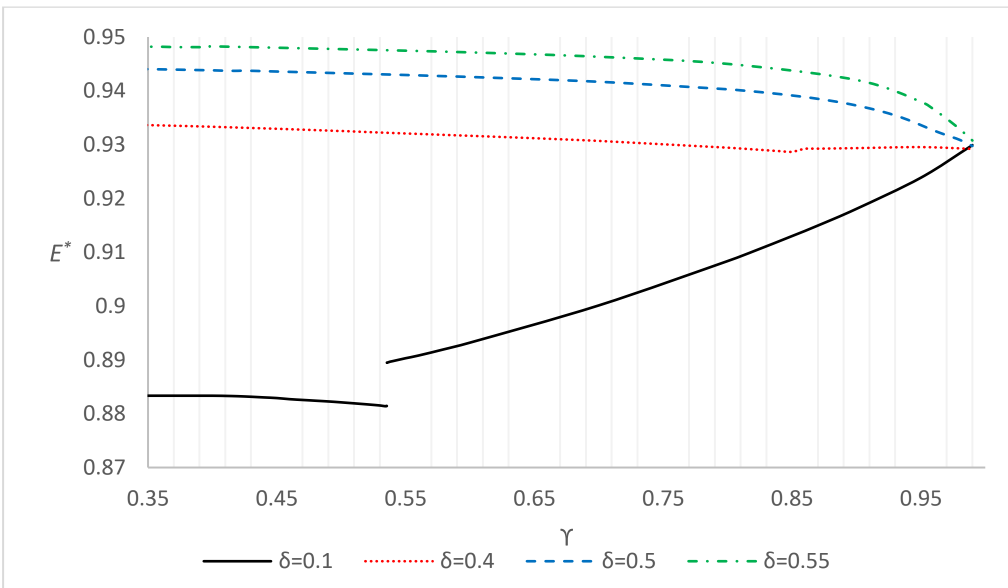

Figure 3-16 - Probability of Re-election vs. the Regulator's Level of Selfishness for Different Values of the Politician's Level of Populism

Not surprisingly, by assuming γ fixed, a more populist politician has a higher chance of success in election. Intuitively, this is expected because a populist politician invests more on consumer-oriented policies like anti-corruption, which ultimately enhances social welfare.

Figure 3-16 shows that, as expected, E^* is higher for higher δ. In addition, probability of re-election for a more populist politician is less sensitive to the regulator's level of selfishness. This means that, in general, the economy in which a populist politician rules would be less vulnerable to the regulator's level of selfishness.

For low levels of δ ($\delta = 0.1$ and $\delta = 0.3$), it is in the politician's interest to have a more selfish regulator in the office. In other words, an oligarchic politician ends up to higher probability of success when a relatively more selfish regulator is in the office.

This is mainly due to the politician's level of populism. A populist politician assigns a higher weight to cs and less weight to ($ps - Tr$). cs^* is monotonically decreasing in γ for all different values of δ. On the other hand, ps^* is monotonically increasing in γ for all values of δ. Even after deducting Tr^*, the graph of ($ps^* - Tr^*$) remains increasing for a wide range of γ. Low δ causes the cs^* part to be dominated by the ($ps^* - Tr^*$) part.

Remark 10 Depending on the politician's type, social welfare can be non-monotonic in γ.

Both accounting and economic definitions of social welfare are decreasing in γ for all types of the politician except the extremely oligarchic ones. Intuitively, it is expected to have lower social welfare when an economy experiences a more selfish regulator. However, the model shows that having a more selfish regulator does not necessarily end in lower social welfare. Since the goal of an oligarchic politician and a selfish regulator are the same, upon an increase in γ, the increase in ps can surpass the decrease in cs which ultimately ends with higher social welfare and, hence, non-monotonic sw^* in γ.

Result 2 *Higher level of selfishness in the regulator would enhance the politician's chance of re-election only if the politician is either semi-oligarchic or oligarchic. For relatively more populist politicians, higher levels of the regulator's selfishness endangers the politician's chance of re-election.*

Result 2 is the direct consequence of Remark 10 because social welfare is the main determinant of probability of re-election. Result 2 says that E^* turns out to be non-monotonic in γ for relatively more oligarchic politicians.

Intuitively, it is expected to have lower chance of re-election in case the economy experiences a more selfish regulator. However, the model shows that an oligarchic politician will be benefitted by a more selfish regulator. Since a more selfish regulator works in favour of an oligarchic politician, he can enhance the politician's chance of re-election. Result 2 says that the regulator's selfishness may only harm semi-populist and populist politicians' chances of success, not that of oligarchic and semi-oligarchic politicians. The policy implication of the above is that, given an oligarchic politician in the office, he may benefit more from a selfish regulator rather than a benevolent one.

3.4 Conclusion

The model presented in this chapter comprises of a politician, a regulator and a lobby in a three-tier hierarchical model. The politician maximises his chance of re-election by determining the combination of two policy reforms of deregulation and anti-corruption. The model assumes the space of the politician's type to be a continuous variable in a range. The different types of politicians assign different weighs on the two main components of social welfare; consumer surplus and producer surplus. On one side of the spectrum, a populist politician assigns higher weight to consumer surplus, and on the other side, an oligarchic politician assigns higher weight on producer surplus. In the investigation of the formerly centrally planned economies, the politician's level of populism can show the role of the Communist party (Andvig, 2007). The regulator's type, like in chapters one and two, also varies from selfish to benevolent, depending on the weight he assigns to his personal welfare compared to social welfare.

By assuming the type of the politician and the regulator to be a continuous variable in a range, the model enables us to have a more detailed picture of comparative statics of changes in policymakers' type on outcomes of the model. Depending on parameter, outcomes of the model help us to distinguish the specific range of each of the four different types of politicians: oligarchic, semi-oligarchic, semi-populist and populist. Moreover, based on parameters of the model, and namely the level of politician's populism, the model helps us to determine the specific range of two general types of the regulator: zero-bribe or positive-bribe.

Comparative statics of the model also show that an economy can experience zero corruption even without a completely benevolent regulator. Moreover, players' characteristics or preferences are of lower importance when parameters of the model lie in extreme values. Therefore, the regulator's level of selfishness has almost no effect on relatively highly populist or relatively highly oligarchic politician. Policymakers of extreme values, whether it is the politician or the regulator, decide more independently of other parameters of the model. This can be regarded as an extension to the results of Perotti and Volpin (2004), in which more accountable countries are less subject to other parameters of the model. As another implication, provided that the level of politician's populism is high enough and not necessarily at its highest, he cares less about the regulator's selfishness. As a result, an economy can benefit from positive investment on anti-corruption regardless of the value of other parameters, even without a completely populist politician.

The model predicts that as the politician gets more populist, regulators that are more benevolent might be involved in bribery process. Moreover, a politician with a higher level of populism is more sensitive to the level of the regulator's selfishness. Therefore, the type of politician matters as it determines the sensitivity of other variables of interest to the regulator's level of selfishness.

The results of the model show that by considering different policymakers with different objective functions there would be no simple pattern between the variables of interests and other exogenous parameters of the model. The model shows that the relation of level of populism with social welfare, corruption, probability of re-election and other variables of interest, is not monotonic. This echoes the suggestion of Perotti and Volpin (2004) that by considering the political process and institutional framework, we cannot offer a generic recommendation of an economic reform. Hence, a general policy implication of the results is to adjust expectations for outcomes of the model. For instance, when an oligarchic politician is in the office, the regulator's role in determining the industry size is less than the case when a more populist politician holds the office. Therefore, in comparing two similar cases with an oligarchic politician but with different regulators, we might not see much of difference in outcomes of the model.

According to the results of the model, the regulator's selfishness may only harm semi-populist and populist politicians' chance of success, not that of oligarchic and semi-oligarchic politicians. This shows that an oligarchic or a semi-oligarchic politician can have higher chance of re-election in those economies with more selfish regulators.

Whether having a more populist politician will end up in lower corruption or not depends heavily on the regulator's level of selfishness. Among very selfish or very benevolent regulators, as the level of populism increases, the economy with a more populist politician experiences higher corruption. Since a more populist politician invests more on anti-corruption policies, this result can be regarded as a theoretical justification of what Rousso and Steves (2007) found empirically, that the sharp decline of corruption between 2002 and 2005 in the transition region, is not associated with the intensity of anti-corruption activity in the preceding period (1999–2002).

Between two economies under two extremely oligarchic politicians, the one under a more oligarchic one experiences lower corruption. Thus, having a more oligarchic politician does not necessarily lead to higher corruption. It can even end with lower corruption. Yet another confirmation on the fact that providing generic estimation and recommendation can be mis-leading.

3.5 References

Acemoglu, D., 2008. Oligarchic Versus Democratic Societies. Journal of the European Economic Association 6, 1–44.

Acemoglu, D., Johnson, S., Robinson, J.A., 2005. Institutions as a Fundamental Cause of Long-Run Growth. Elsevier, pp. 385–472.

Andvig, J., 2007. Corruption in China and Russia compared: different legacies of central planning, in: International Handbook on the Economics of Corruption. Edward Elgar Publishing, p. 278.

Banerjee, A., Mullainathan, S., Hanna, R., 2012. Corruption (Working Paper No. 17968). National Bureau of Economic Research.

Blanchard, O., Shleifer, A., 2001. Federalism with and without Political Centralization: China Versus Russia. IMF Econ Rev 48, 171–179. https://doi.org/10.2307/4621694

Bó, E.D., 2006. Regulatory Capture: A Review. Oxford Review of Economic Policy 22, 203–225. https://doi.org/10.1093/oxrep/grj013

Campante, F.R., Ferreira, F.H.G., 2007. Inefficient lobbying, populism and oligarchy. Journal of Public Economics 91, 993–1021. https://doi.org/10.1016/j.jpubeco.2006.12.006

Caselli, F., Gennaioli, N., 2008. Economics and Politics of Alternative Institutional Reforms. Quarterly Journal of Economics 123, 1197–1250.

Djankov, S., Porta, R.L., Lopez-de-Silanes, F., Shleifer, A., 2002. The Regulation of Entry. The Quarterly Journal of Economics 117, 1–37.

Fishback, P.E., 2009. Linear and Nonlinear Programming with Maple: An Interactive, Applications-Based Approach. Chapman and Hall/CRC, Boca Raton, FL.

Hoff, K., Stiglitz, J.E., 2008. Exiting a Lawless State*. The Economic Journal 118, 1474–1497. https://doi.org/10.1111/j.1468-0297.2008.02177.x

Hoff, K., Stiglitz, J.E., 2005. The Creation of the Rule of Law and the Legitimacy of Property Rights: The Political and Economic Consequences of a Corrupt Privatization (Working Paper No. 11772). National Bureau of Economic Research.

Hoff, K., Stiglitz, J.E., 2004. After the Big Bang? Obstacles to the Emergence of the Rule of Law in Post-Communist Societies. The American Economic Review 94, 753–763.

Jain, A.K., 2001. Corruption: A Review. Journal of Economic Surveys 15, 71–121. https://doi.org/10.1111/1467-6419.00133

Kaufmann, D., Kraay, A., Mastruzzi, M., 2009. Governance Matters VIII: Aggregate and Individual Governance Indicators, 1996-2008 (SSRN Scholarly Paper No. ID 1424591). Social Science Research Network, Rochester, NY.

Klapper, L., Laeven, L., Rajan, R., 2004. Business Environment and Firm Entry: Evidence from International Data (Working Paper No. 10380). National Bureau of Economic Research.

Laffont, J.-J., Tirole, J., 1990. The Politics of Government Decision Making: Regulatory Institutions. Journal of Law, Economics, & Organization 6, 1–31.

Laffont, J.-J., Tirole, J., 1993. A Theory of Incentives in Procurement and Regulation. MIT Press.

Mankiw, Whinston, M., 1986. Free Entry and Social Inefficiency. Rand Journal of Economics 17, 48–58.

Mishra, A., 2007. Corruption, hierarchies and bureaucratic structure, in: International Handbook on the Economics of Corruption. Edward Elgar Publishing, pp. 189–215.
Nili, M. (Ed.), 2015. Where Is the Iranian Economy Heading Towards? Donyay-e Eghtesad, Tehran.
Perotti, E.C., Volpin, P.F., 2004. Lobbying on Entry (SSRN Scholarly Paper No. ID 592404). Social Science Research Network, Rochester, NY.
Rousso, A., Steves, F., 2007. The effectiveness of anti-corruption programs: preliminary evidence from the post-communist transition countries, in: International Handbook on the Economics of Corruption. Edward Elgar Publishing, p. 247.
Shleifer, A., Vishny, R.W., 1993. Corruption. The Quarterly Journal of Economics 108, 599–617. https://doi.org/10.2307/2118402
Sonin, K., 2010. Provincial protectionism. Journal of Comparative Economics 38, 111–122. https://doi.org/10.1016/j.jce.2009.04.009

3.6 Appendices

Appendix 1 How y and z can affect probability of re-election

The following figures show how exogenous variables of γ and δ can affect the optimum combination of y and z, and then how each combination can change probability of apprehension and its contours. Since $y = \mu T$ and $z = (1 - \mu)T$, the politician's control variable can be μ and T rather than y and z.

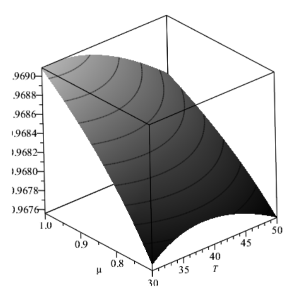

Figure 3-17 - Probability of Re-election vs. Total Tax and Share of Deregulation, given γ_1 and δ_1

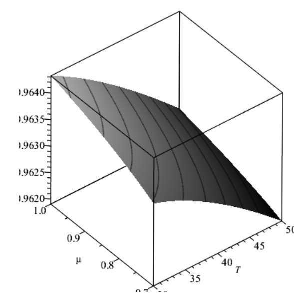

Figure 3-18 - Probability of Re-election vs. Total Tax and Share of Deregulation, given γ_2 and δ_2

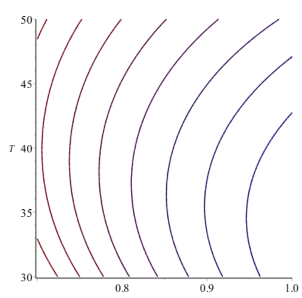

Figure 3-19 - Contours of Probability of Re-election vs. Total Tax and Share of Deregulation, given γ_1 and δ_1

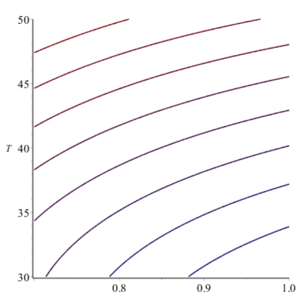

Figure 3-20 - Contours of Probability of Re-election vs. Total Tax and Share of Deregulation, given γ_2 and δ_2

Appendix 2 Outcomes Under Different Types of Politicians

I. Oligarchic politicians

Depending on the value of parameters, we may have different regions of δ for oligarchic politician. For instance, in my numerical experiment, those politicians with $\delta \in (0,0.32)$ are called oligarchic. As was mentioned earlier, what distinguishes different politicians is the behaviour of

z^* and sw^*. The model shows that depending on the politician's type, there would be a discontinuity in z^*. Consequently, this causes discontinuity in α^* and other variables. Once the equilibrium changes from $z^* > 0$ to $z^* = 0$, there will be a jump in α^*. These are depicted in Figure 3-22 to Figure 3-31.

This section shows that an oligarchic politician is different in his behaviour of y^*, z^* and T^*. The comparative statics of changes in γ for this type of the politician is as follows.

i Zero-bribe regulator ($\gamma < \underline{\gamma}$)

When an oligarchic politician rules the office at the same time as a relatively benevolent regulator, there would be an incentive incompatibility of pursuing the same type of policies among them. An oligarchic politician tends to set policies in favour of producers while a zero-bribe regulator prefers to determine higher industry size to support consumers. Given this setting, the politician determines $z^* > 0$. As γ increases, z^* increases and y^* is either fixed or decreasing. Figure 3-23 depicts that given $\delta = 0.1$, when $\gamma \in (0, 0.532)$, z^* is increasing in γ. Figure 3-22 shows that for the same set of parameters y^* is either fixed or decreasing in γ.

z^* is either fixed or increasing in γ for zero-bribe regulators ($\gamma < \underline{\gamma}$). z^* would be fixed if the regulator is extremely benevolent but it is increasing in γ even for zero-bribe regulators for higher levels of γ. That means the politician invests in anti-corruption even when $\alpha^* = 0$. Now the question is why should the politician burden more expense on firms by increasing investments on anti-corruption while there is no bribery between the lobby and the regulator?

To answer this question, we need to know if transfer is the only variable that makes the regulator to change his decision on industry size. The short answer is no. It should be noted that the regulator changes his choice of industry size based on his level of selfishness as well as the transfer. In other words, the regulator does not necessarily need transfer to change the industry size. A more selfish regulator tends to determine lower industry size, even in case of no transfer from the lobby. The politician knows this behaviour of the regulator. Therefore, upon a change in the level of the regulator's selfishness, the politician increases the investment on anti-corruption, even if the outcome of the model is zero transfer.

An oligarchic politician works more in favour of producers. Industry size is almost fixed for oligarchic politician when $\gamma < \underline{\gamma}$. For further explanation, see the section below.

The case where $z^* > 0$ while $\alpha^* = 0$

There is a range of γ at which no transfer will be made while, due to the regulator's willingness to change the industry size, the politician reacts by increasing z^* ($\alpha^* = 0$ and $z^* > 0$). The politician determines y^* and z^* knowing that a more selfish regulator generally decreases the industry size.

Where $\delta \in (0{,}32)$ and $\gamma \in (\underline{\underline{\gamma}}, \underline{\gamma})$, although no transfer is being made from the lobby, the regulator changes his choice of N^* as a result of a change in γ. The politician predicts the reaction of the regulator and hence changes his choice of y and z accordingly. The politician will start investing on the rule of law ($z^* > 0$). This is to increase the probability of apprehension because it is expected from a more selfish regulator to reduce the industry size. The politician wants to prevent the regulator to work more in favour of the producers. Hence, he decides to increase z^*. On the other hand, the lobby and the regulator know the choice of the politician. Ultimately, this means that the regulator would change his decision due to the change in y^* and z^*. The result would be that the politician starts investing on rule of law ($z^* > 0$) even though $\alpha^* = 0$.

Therefore, when $\gamma \in (\underline{\underline{\gamma}}, \underline{\gamma})$, even when all other parameters are held fixed, we still have $\partial N^*/\partial\gamma < 0$. However, as shown in the Table 1 when $\gamma \in (0, \underline{\underline{\gamma}})$ we have $\partial N^*/\partial\gamma = 0$.[47] That means that in the FOC it is the product of z and γ that matters, which affects N^* only when $z \neq 0$.

To test further, I took the range of gamma over which both $z^* = 0$ and $\alpha^* = 0$ in the 3-way game. It turns out that it is always the case that over these values of γ, N^* is always higher in the complete 3-way game than when z is set at zero exogenously.

I think this means that the industry size is changing with z, and not with γ. However, the reason behind the change in z is γ. So, I may need to find out what would be the effect of a change in γ on the regulator's reaction function. Figure 3-21 shows how reaction function reacts to changes in γ.

---

[47] By rounding N^* to 5 digits, there would be no change in N^* when γ changes. However, some changes could be witnessed when we take more than 5 digits.

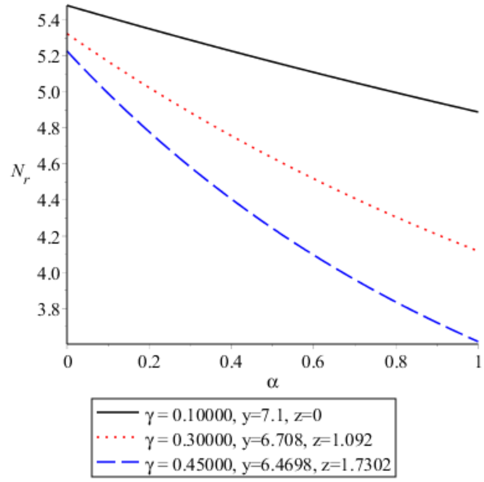

Figure 3-21 - The Regulator's Reaction Function for Different Levels of γ and the corresponding y and z

As shown in Figure 3-21 the intercept of the regulator's reaction function changes as y^* and z^* change. That is why the regulator may change the industry size even when $\alpha^* = 0$. In other words, it is the politician who changes his choices of y and z when γ changes. Consequently, a regulator with a different level of selfishness, changes his choice of industry size when he knows that the changes in γ will definitely change the politician's choice. In other words, the regulator knows his level of selfishness. Also, he knows what would be the consequences of a change in the level of selfishness. Hence, knowing all these, he will change his choice of industry size.

It should be noted that this change in the intercept corresponds to the change in y not z. This is so because when $\alpha^* = 0$, probability of apprehension does not change the industry size. However, the changes in y will change the cost and consequently other variables of the model.

In case of an oligarchic politician, for all zero-bribe regulators, sw^* turns out to be monotonically decreasing in γ. Also, probability of re-election is monotonically decreasing in γ and T^* is monotonically increasing in γ regardless of the level of δ.

ii Positive-bribe regulator ($\gamma > \underline{\gamma}$)

Probability of re-election is increasing in γ for all positive-bribe regulators ($\gamma > \underline{\gamma}$) under oligarchic politicians. Among all of the different combinations of δ and γ, that of an oligarchic politician and a positive-bribe regulator is the only case in which there is such a relation between sw^* and γ and, hence, between E^* and γ. Note that political welfare is the main determinant of E, not sw. In other words, this type of the politician can take the advantage of higher levels of the regulator's selfishness, which other types of the politician cannot. Therefore, upon having a complementary regulator who supports producers rather than consumers, an oligarchic politician would stop investing on anti-corruption, which is also a producer-oriented policy. If the regulator's level of selfishness exceeds some value, then the politician will stop investing on anti-corruption ($z^* = 0$). The politician will do so because he knows that the regulator's selfishness will enhance producer surplus, which ultimately will surpass the effect of the consumer surplus. The outcome will be increasing probability of re-election (E^*) in γ when $\gamma > \underline{\gamma}$. Having $z^* = 0$, probability of apprehension reduces to its initial level ($\eta_0 = 1/k_c$), which can be perceived as an incentive for the lobby and the regulator to bring their game to fruition by transferring money and setting the industry size accordingly higher. Hence, as soon as the outcome of the model is $z^* = 0$, a jump in α^* and accordingly, a fall in N^* will be witnessed. In brief, the politician sets $z^* = 0$ and y^* becomes increasing in γ. For positive-bribe regulators ($\gamma > \underline{\gamma}$), this could be regarded as another policy in favour of producers by oligarchic politician when his rule in the office coincide with the rule of a positive-bribe regulator.

sw^* is first increasing and then becomes decreasing because the effect of ps is greater than that of cs. It should be noted that we can see this effect because our definition of sw encompasses both cs and ps. Some models do not take into account ps as part of welfare or more generally, social welfare (Mankiw and Whinston, 1986). Some others (Perotti and Volpin, 2004) attach a weight to cs and ps, based on the number of consumers and producers.[48]

A more populist politician can induce higher corruption given that the politician is oligarchic and the game is being played, i.e. when $\gamma > \underline{\gamma}$. This sounds counter-intuitive as what is expected from a politician with less of oligarchic intensity is less of corruption. However, as was previously explained, when it ends to no investment in anti-corruption, then the increase in α^* and N^*, as a result of a an increase in δ, surpasses the decrease in π^* which ultimately results to higher corruption. In conclusion the behaviour of corruption for oligarchic politician is as the following: In comparing two economies under the rule of an extremely oligarchic politicians, the one with a relatively higher level of populism experiences higher corruption.

[48] sw^* can turn out to be monotonically decreasing if I follow the latter group and give each of cs and ps a weight according to the number of people belong to each group. Generally, the conventional weights of cs and ps in the literature are 0.5.

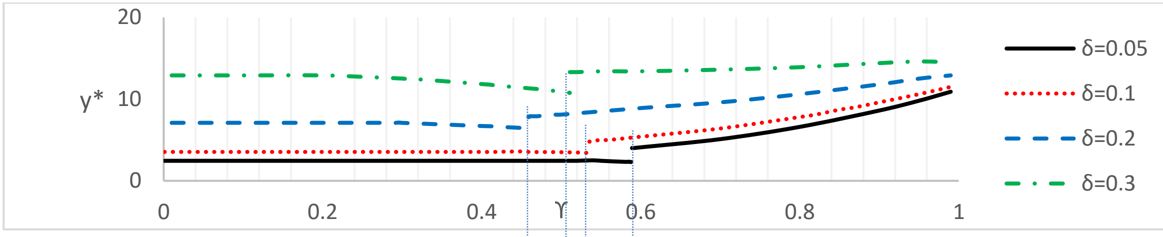

Figure 3-22 - Investment in Deregulation vs. Regulator's Level of Selfishness, Oligarchic Politician

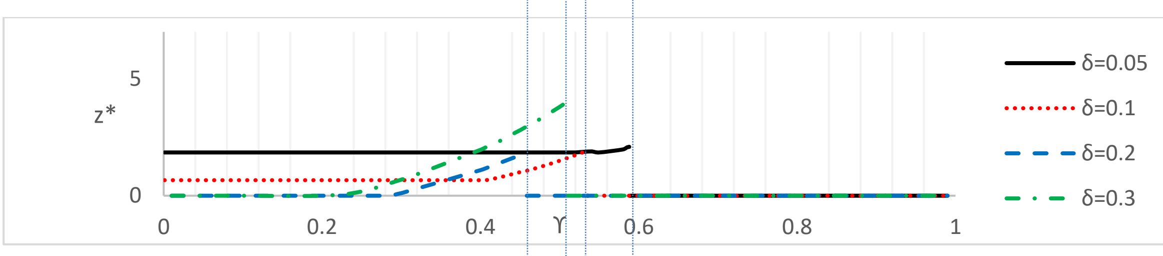

Figure 3-23 - Investment in Anti-corruption vs. Regulator's Level of Selfishness, Oligarchic Politician

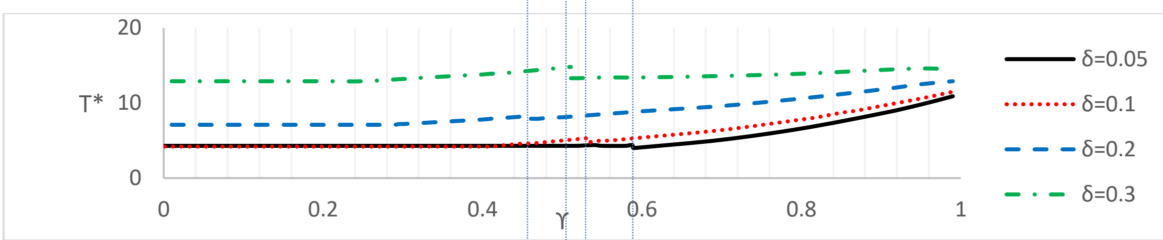

Figure 3-24 - Total Tax vs. Regulator's Level of Selfishness, Oligarchic Politician

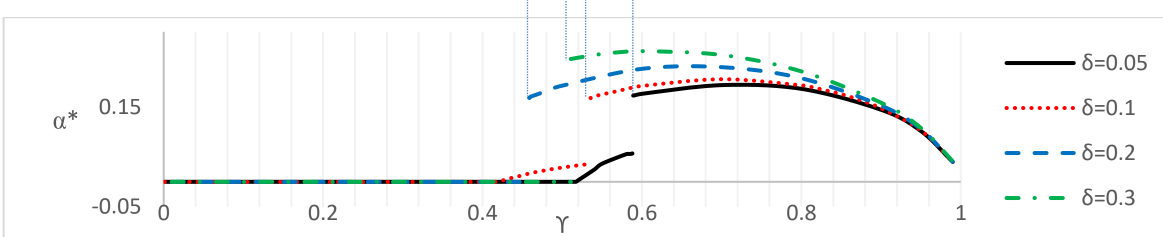

Figure 3-25 - Transfer vs. Regulator's Level of Selfishness, Oligarchic Politician

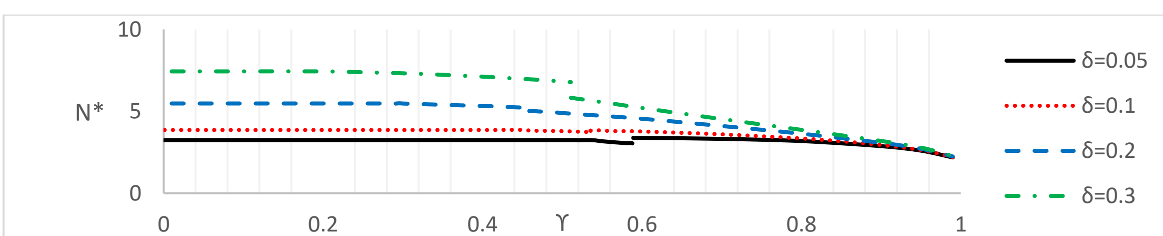

Figure 3-26 - Industry Size vs. Regulator's Level of Selfishness, Oligarchic Politician

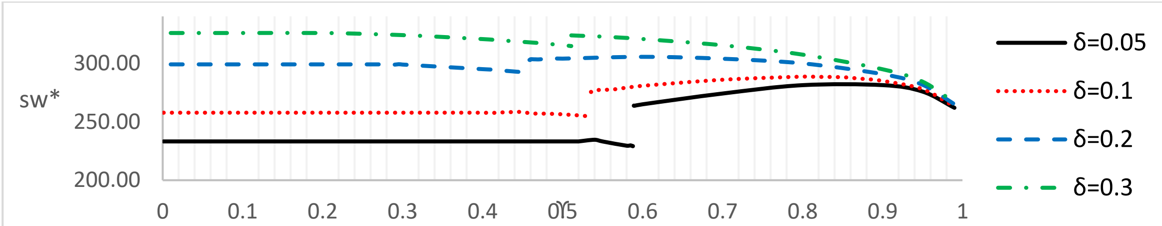

Figure 3-27–Social Welfare vs. Regulator's Level of Selfishness, Oligarchic Politician

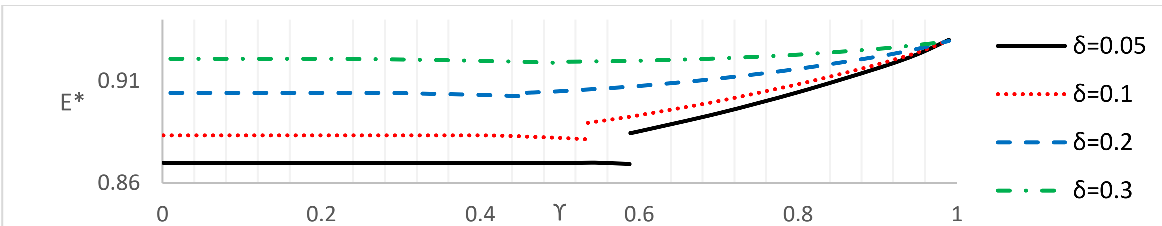

Figure 3-28 - Probability of Re-election vs. Regulator's Level of Selfishness, Oligarchic Politician

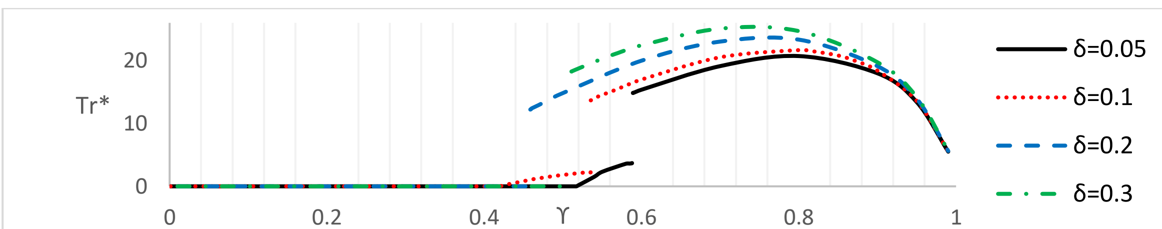

Figure 3-29 - Corruption vs. Regulator's Level of Selfishness, Oligarchic Politician

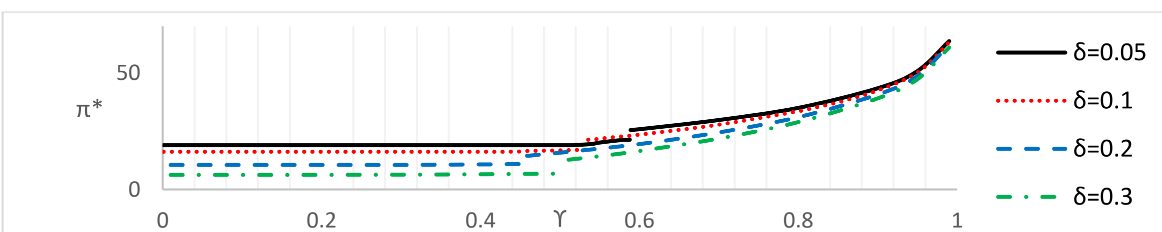

Figure 3-30 - Equilibrium Profit vs. Regulator's Level of Selfishness, Oligarchic Politician

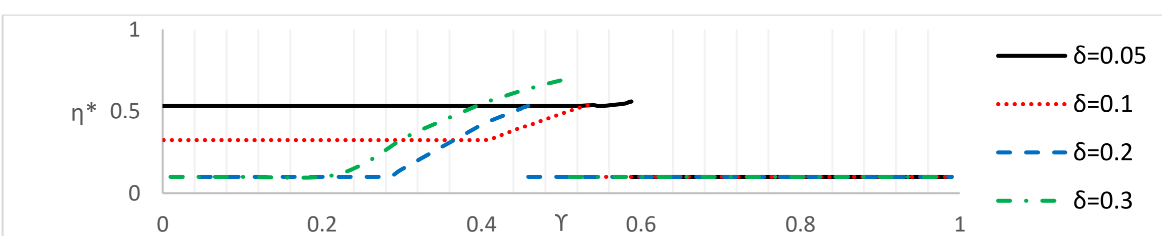

Figure 3-31 - Equilibrium Probability of Apprehension vs. Regulator's Level of Selfishness, Oligarchic Politician

II. Semi-oligarchic politicians

In brief, a semi-oligarchic politician does not set $z^* = 0$. He is more independent of other parameters of the model. Remember that I distinguish different politicians based on the behaviour of z^*. For semi-oligarchic politician, z^* turns out to be mostly continuous. By having a continuous z^*, there would be no discontinuity in other variables of the model. In brief, semi-oligarchic politicians are those who decide less dependent on other parameters compared to oligarchic politician and hence will keep investing on z^* even when they face with very selfish regulators. In other words, unlike an oligarchic politician who can benefit from having a more selfish regulator, a semi-oligarchic politician is more determined about his choices, even with more selfish regulators who tend to set lower industry size.

In my numerical experiment, politicians with $\delta \in (0.32,0.5)$ are called semi-oligarchic. Compared to the oligarchic politician, this type of the politician decides more in favour of the consumers rather than producers. For instance, it turns out that throughout this region, the politician sets $z^* > 0$ in most of the range of γ.

Making distinction based on zero-bribe and positive-bribe regulator for a semi-oligarchic politician, may not be as helpful as it was in the previous case. The behaviour of y^* and z^* for zero-bribe regulators remains the same as in the case of oligarchic politician and zero-bribe regulator. The only difference is in their magnitude, which will be discussed further in more details when we compare different politicians. A semi-oligarchic politician sets lower y^* and higher z^* compared to an oligarchic politician.

Higher levels of populism in the politician ends with more investment on anti-corruption policies, even if the regulator is extremely selfish. A semi-oligarchic politician keeps $z^* > 0$, which will be regarded as a sign of a higher probability of apprehension. The politician does not stop investing on anti-corruption and therefore, unlike the case of oligarchic politician, there will be no discontinuity in z^* and, hence, no jump in α^* once the transfer is being made. Therefore, a relatively more populist politician ($\delta > 0.45$), who assigns higher weight on cs, will never find it in his interest to set $z^* = 0$. What was discussed above intuitively, can be written formally as follows

$$\frac{\partial \overline{\overline{\gamma}}_z}{\partial \delta} > 0, \forall \delta \in (0.32,0.5),$$

where $\bar{\bar{\gamma}}_z$ was defined in (3.11) as the level of γ at which the outcome of the model is $z^* = 0$.

In addition, if the politician's level of populism exceeds 0.45, he will continue investing on anti-corruption even if the regulator's selfishness reaches to its maximum. Formally, that means

$$\bar{\bar{\gamma}}_z(\delta > 0.45) = 1.$$

In other words, for those politicians with $\delta > 0.45$ we will not have $z^* = 0$, regardless of the level of γ. Depending on the level of $\bar{\bar{\gamma}}_z$, probability of re-election is either monotonically decreasing or non-monotonic. A relatively more oligarchic politician in this region ($\delta < 0.45$) may find $z^* = 0$ in his favour which can enhance his chance of being re-elected. Therefore, an economy does not need very populist politician to be benefitted from consumer-oriented policies, namely anti-corruption regardless of the regulator's type. Formally, that means the following

$$\begin{cases} \frac{\partial E^*}{\partial \gamma} < 0, \gamma < \bar{\bar{\gamma}}_z \ (or\ z^* > 0) \\ \frac{\partial E^*}{\partial \gamma} > 0, \gamma > \bar{\bar{\gamma}}_z \ (or\ z^* = 0) \end{cases}. \tag{3.15}$$

According to (3.15), probability of re-election can be decreasing in γ if $\gamma < \bar{\bar{\gamma}}_z$ and can be increasing in γ if $\gamma < \bar{\bar{\gamma}}_z$. The second part of (3.15) where $\gamma > \bar{\bar{\gamma}}_z$ shows that a higher γ can still help the politician to achieve a higher chance of re-election.

It can be concluded that when $\bar{\bar{\gamma}}_z = 1$, which happens for relatively more populist politician (in our case, $\delta > 0.45$), probability of re-election is monotonically decreasing in γ. This shows that even for the semi-oligarchic politician, regulator's level of selfishness can enhance the politician's chance of re-election, depending on level of the regulator's selfishness. Formally, this means that the second part of (3.15) does not exist for the case where $\bar{\bar{\gamma}}_z = 1$ and hence for such a case, we always have $\partial E^*/\partial \gamma < 0$.

A semi-oligarchic politician works more in favour of consumers compared to the oligarchic politician. This can be interpreted by all players that it would be harder to convince the regulator to work in favour of the industry under a semi-oligarchic politician. Having said that, the model shows that, given a semi-oligarchic politician is ruling, some regulators with a lower γ might be involved in the bribery game and, hence, $\alpha^* > 0$ for a bigger range of γ compared to an economy with an oligarchic politician in the office. Formally, this means that the benevolence threshold that was defined in (3.9) is decreasing in level of populism for semi-oligarchic politicians.[49]

$$\frac{\partial \gamma}{\partial \delta} < 0, \forall \delta \in (0.32,0.5) \tag{3.16}$$

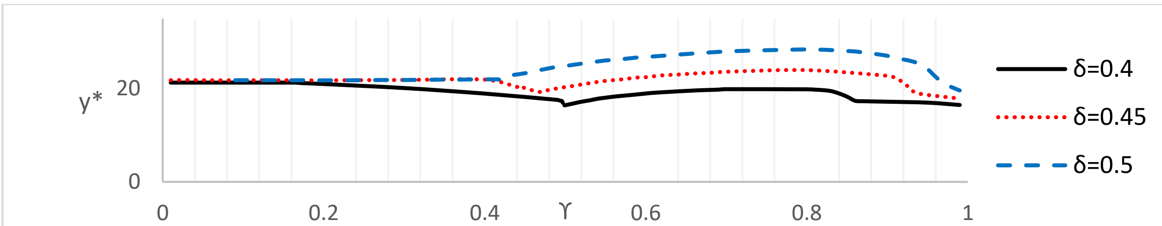

Figure 3-32 - Investment in Deregulation vs. Regulator's Level of Selfishness, Semi-oligarchic Politician

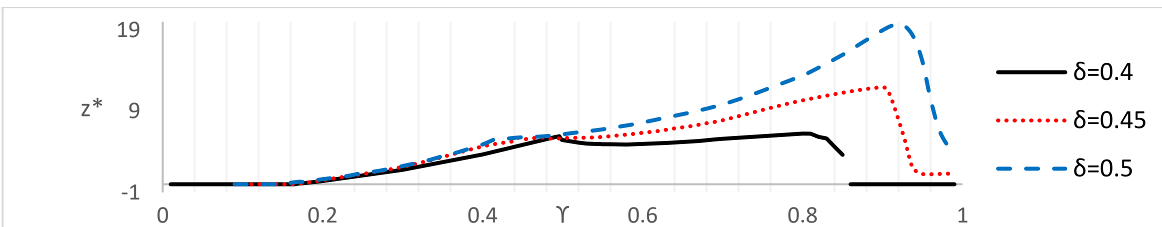

Figure 3-33 - Investment in Anti-corruption vs. Regulator's Level of Selfishness, Semi-oligarchic Politician

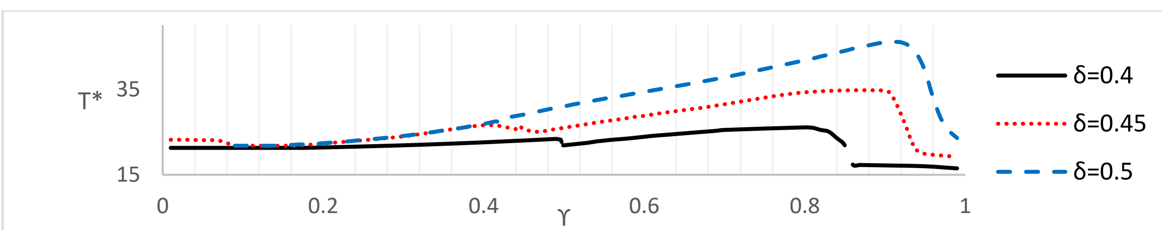

Figure 3-34 - Total Transfer vs. Regulator's Level of Selfishness, Semi-oligarchic Politician

[49] Assuming $\delta \in (0.1,0.32)$, in economies with a relatively more populist politician, it requires a more selfish regulator to have $\alpha^* > 0$. In other words, among oligarchic politicians, the lower-bound of the range of γ for positive-bribe regulators is higher a relatively more populist politician. Formally this means that $\partial \underline{\gamma}/\partial \delta > 0$ for $\delta \in (0.1,0.32)$.
Assuming $\delta \in (0.32,1)$ in economies with a relatively more populist politician, it does not require more selfish regulator to take bribes. In other words, even when $\delta \in (0.32,1)$, having a relatively more populist politician in the office, makes more of benevolent regulators involved in the bribery process. Formally we will have $\partial \underline{\gamma}/\partial \delta < 0$ when $\delta \in (0.32,1)$.

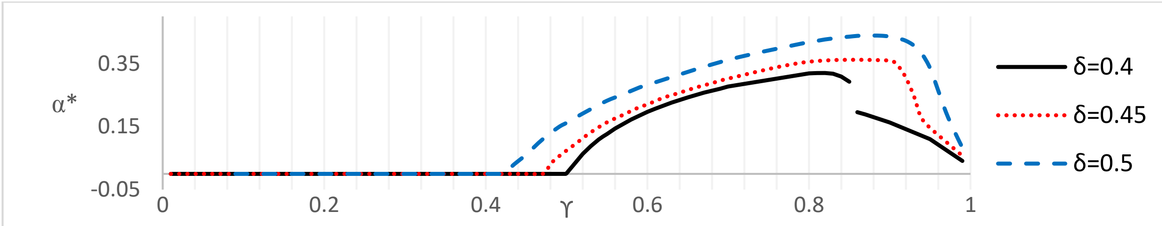

Figure 3-35 - Transfer vs. Regulator's Level of Selfishness, Semi-oligarchic Politician

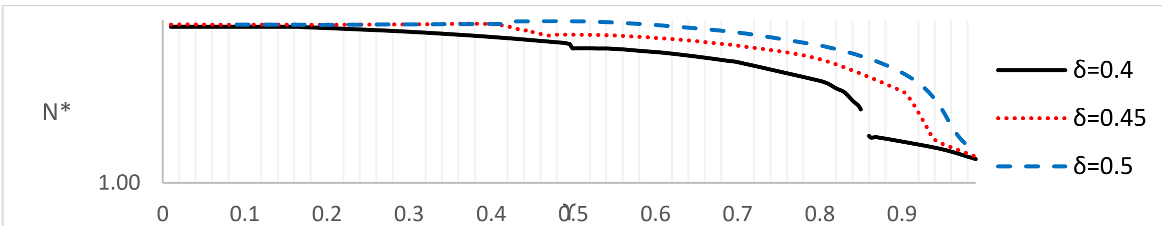

Figure 3-36 - Industry size vs. Regulator's Level of Selfishness, Semi-oligarchic Politician

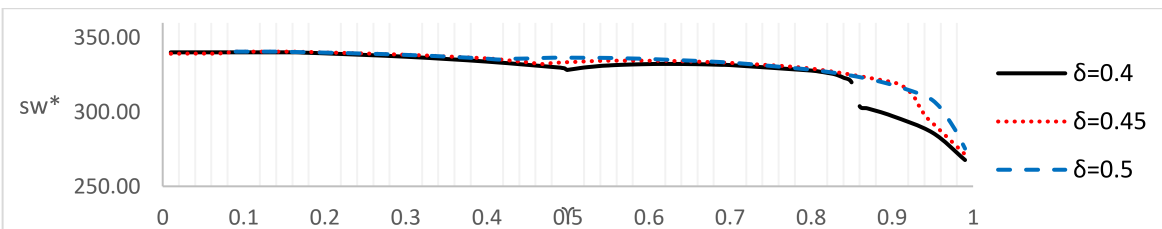

Figure 3-37 - Social Welfare vs. Regulator's Level of Selfishness, Semi-oligarchic Politician

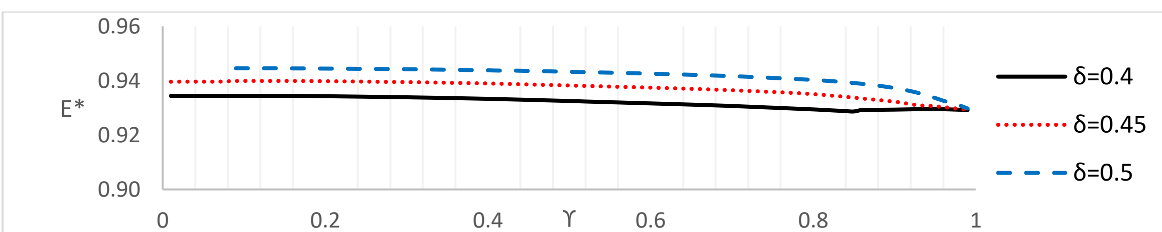

Figure 3-38 - Probability of Re-election vs. Regulator's Level of Selfishness, Semi-oligarchic Politician

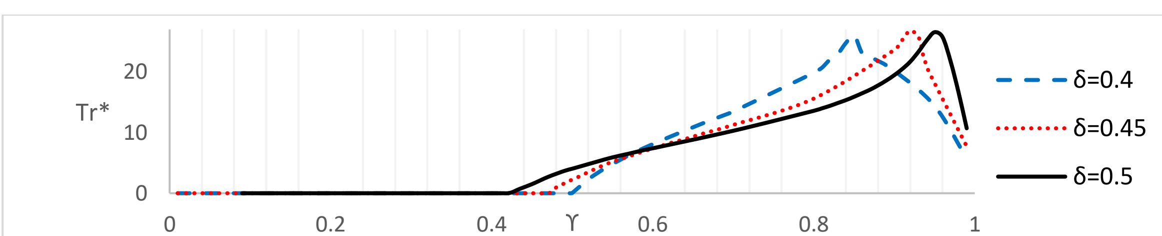

Figure 3-39 - Corruption vs. Regulator's Level of Selfishness, Semi-oligarchic Politician

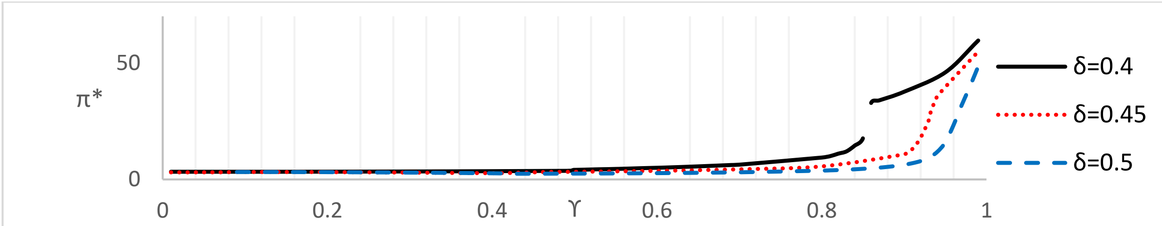

Figure 3-40 - Equilibrium Profit vs. Regulator's Level of Selfishness, Semi-oligarchic Politician

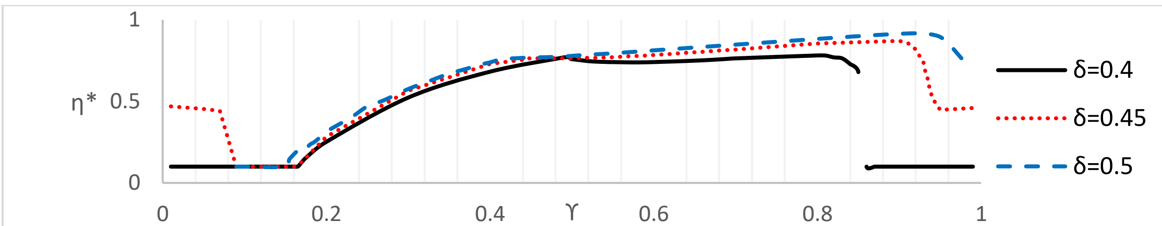

Figure 3-41 - Equilibrium Probability of Apprehension vs. Regulator's Level of Selfishness, Semi-oligarchic Politician

III. Semi-populist politicians

In my numerical experiment, semi-populist politicians are those with $\delta \in (0.5, 0.6]$. The model shows that given a semi-populist politician in the office, there will be more policies in favour of the consumers. It was discussed that even for high values of γ, a semi-oligarchic politician will support consumer-oriented policies. For instance, a semi-oligarchic politician invests on anti-corruption for all levels of the regulator's selfishness.

As was mentioned earlier, z^* and sw^* differentiates politicians. In the last two cases of oligarchic and semi-oligarchic politicians, depending on other parameters of the model, sw^* can be non-monotonic. Here in the case of a semi-populist politician, sw^* is monotonically decreasing in γ. Consequently, E^* turns out to be monotonically decreasing too, which was not the case for the first two groups of politicians. In other words, higher levels of selfishness in the regulator endangers the politician's chance of re-election provided that the politician is either semi-populist or populist, which will be discussed later. This means that unlike the case of semi-oligarchic politician, the behaviour of E^* remains monotonically decreasing in γ. For a semi-oligarchic politician, depending on the value of γ, E^* becomes non-monotonic or monotonically decreasing in γ.

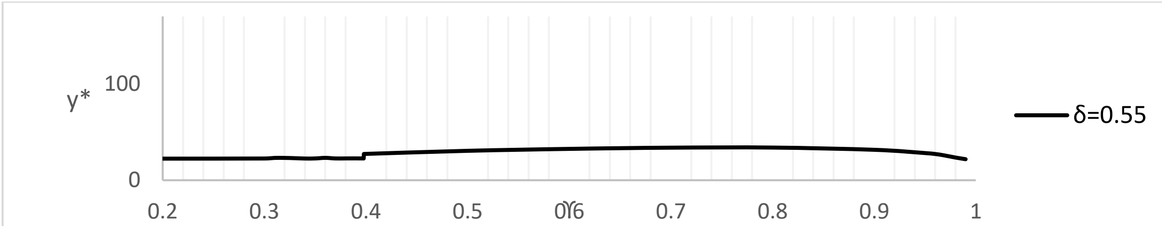

Figure 3-42 - Investment in Deregulation vs. Regulator's Level of Selfishness, Semi-populist Politician

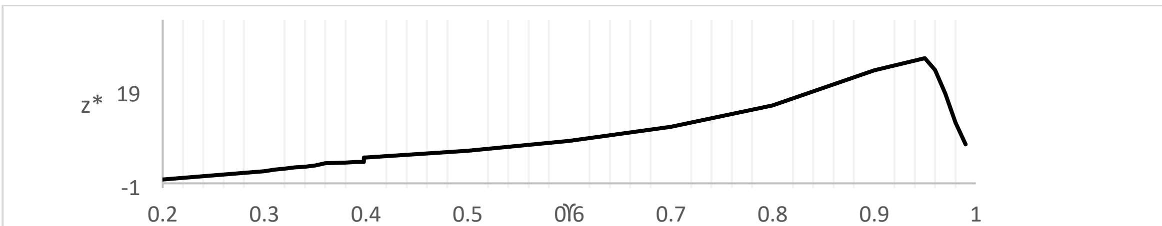

Figure 3-43 - Investment in Anti-corruption vs. Regulator's Level of Selfishness, Semi-populist Politician

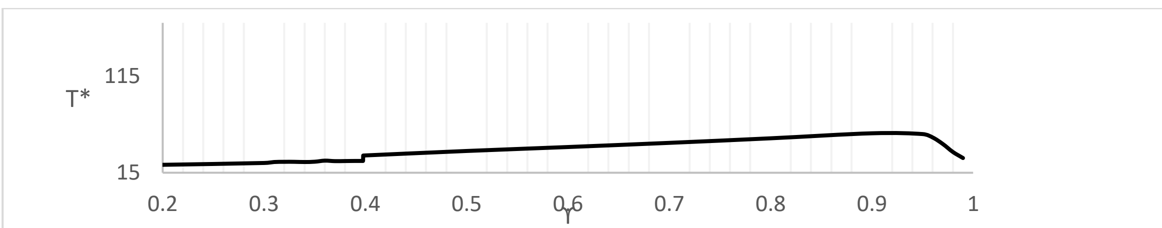

Figure 3-44 - Total Transfer vs. Regulator's Level of Selfishness, Semi-populist Politician

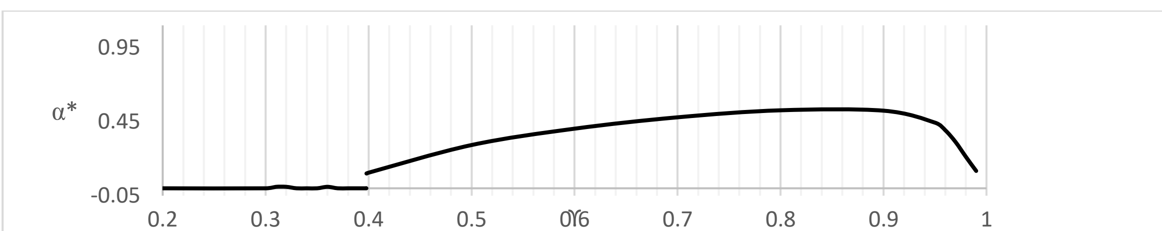

Figure 3-45 - Transfer vs. Regulator's Level of Selfishness, Semi-populist Politician

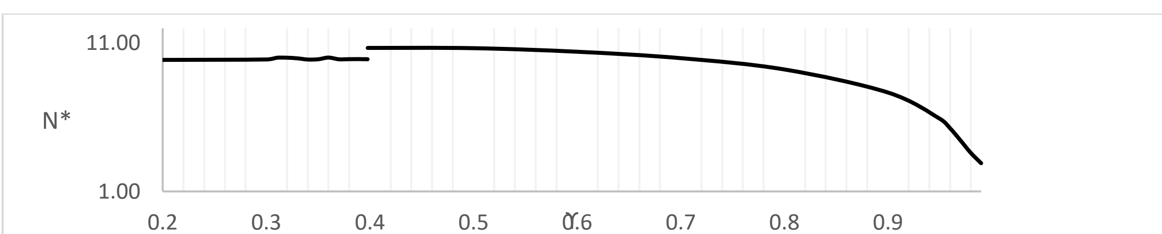

Figure 3-46 - Industry Size vs. Regulator's Level of Selfishness, Semi-populist Politician

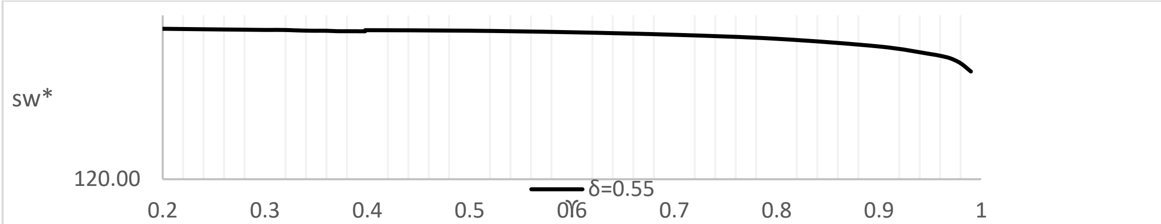

Figure 3-47 - Social Welfare vs. Regulator's Level of Selfishness, Semi-populist Politician

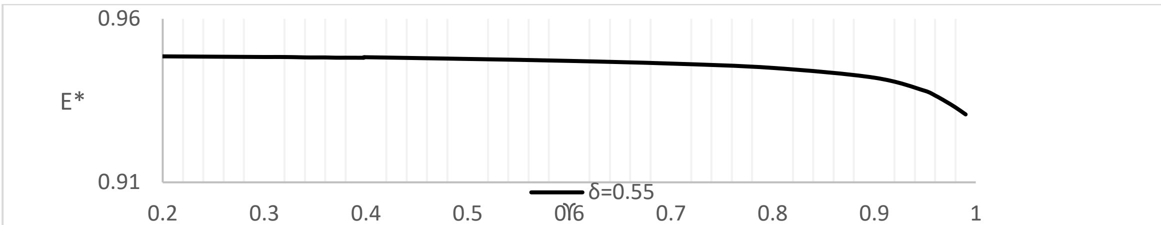

Figure 3-48 - Probability of Re-election vs. Regulator's Level of Selfishness, Semi-populist Politician

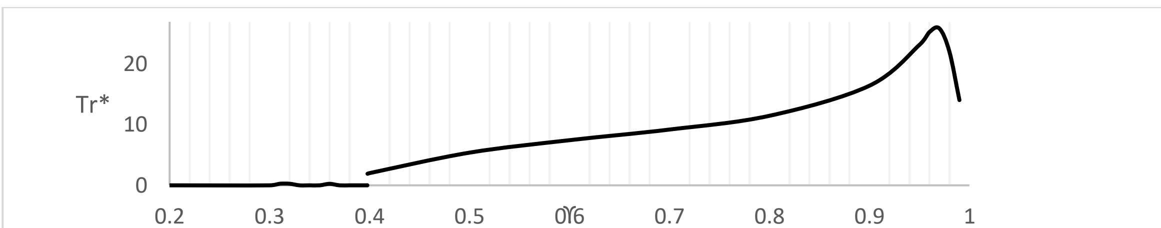

Figure 3-49 - Corruption vs. Regulator's Level of Selfishness, Semi-populist Politician

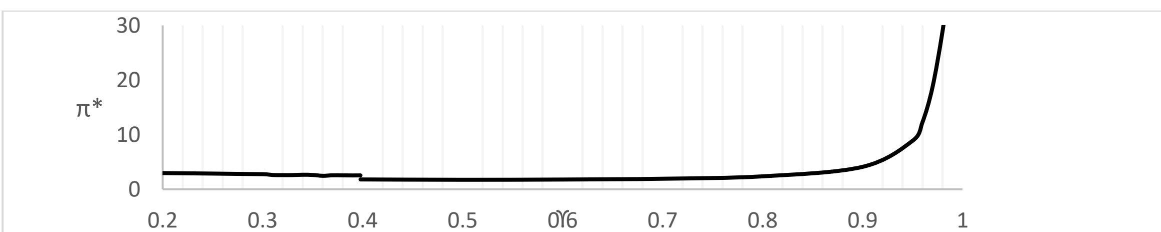

Figure 3-50 - Equilibrium Profit vs. Regulator's Level of Selfishness, Semi-populist Politician

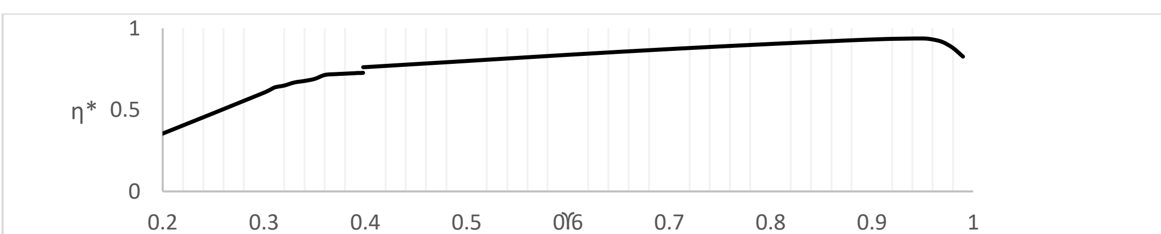

Figure 3-51 - Equilibrium Probability of Apprehension vs. Regulator's Level of Selfishness, Semi-populist Politician

IVPopulist politicians

For the values chosen in my numerical experiment, populist politicians turn out to be those with $\delta \in (0.6,1)$. Unlike the previous three types of the politician, the problem of a populist politician ends to a corner solution rather than an interior one.

The case of a populist politician is somehow opposite to the case of an oligarchic politician. In these two extreme cases, the other parameters of the model, namely γ, are not as significant as they are in the medium cases. As was previously mentioned, this is in line with the result of Perotti and Volpin (2004), that a country with high value of accountability is less subject to political interference. Likewise, in this model, the value of γ plays almost no role in how the politician is going to determine y^* and z^*. Hence, for most of the values of γ, a populist politician picks the highest possible y^*. It could be interpreted as if the populist politician is being helped by the regulator's benevolence, which will end in a low ps^* and high cs^*. Since the populist politician is more consumer-oriented, he will not invest on anti-corruption except for very high values of γ. He will do so because his investment on deregulation will fulfil the underlying goal of reducing the producer surplus to zero.

The main feature of a populist politicians is that they choose $y^* = \bar{y}$ for almost all values of γ, except for extremely high ones. According to definition of $\bar{T}$and $\bar{y}$ in (3.13) and (2.17), that leaves no incentive for firms to participate in the lobby-regulator game anymore. In other words, $\pi^* = 0$.

When γ is very high, there will be an interior solution for y^*. In the range of $\gamma \in (0.9,1)$, y^* turns out to be decreasing in γ.

A populist politician does not invest on anti-corruption almost for all types of the regulator except for very selfish ones. It is expected to have higher investment on anti-corruption in case of a populist politician but it turns out to be 0. However, the whole idea behind investing on anti-corruption is to increase cs and decrease ps. Since $y^* = \bar{y}$, we have $\pi^* = 0$ and hence $ps^* = 0$.

When γ is very high, there is an interior solution for z^*. In the range of $\gamma \in (0.9,1)$, z^* turns out to be increasing in γ.

In an economy under the rule of a populist politician, the members of the lobby transfer almost all of their earnings to the regulator. In other words, it turns out that the equilibrium transfer is determined around 1.

Although the highest y^* may not be necessarily in favour of the producers, it definitely enhances social welfare.

In terms of industry size, Figure 3-59 shows that it will be more sensitive to the regulator's level of selfishness when a relatively more populist politician is in the office. In other words, in case of an oligarchic politician, industry size is less dependent on the regulator's selfishness. The policy implication would be that in the presence of an oligarchic politician, the regulator's role in determining the industry size is less than the case when a more populist politician holds the office. Therefore, in case of an oligarchic politician, we might not see much of a difference in the outcomes of the model when a different type of regulator rules the office. In brief, the general policy implication of such a result has this message for policymakers that upon having a populist politician in the office, they have to adjust their expectations for the policies they follow.

Appendix 3 Outcomes of the model for different types of politicians

This section aims to see how different variables of interest behave for different politicians. Given the outcomes discussed earlier, it should be started by looking at y^* and z^*.

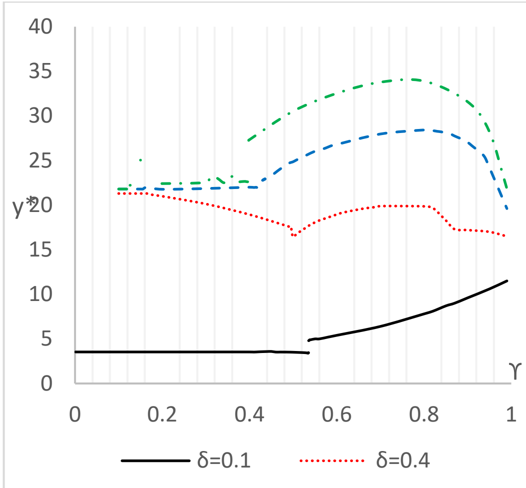

Figure 3-52 - Investment on Deregulation vs. Regulator's Level of Selfishness for Different Politicians

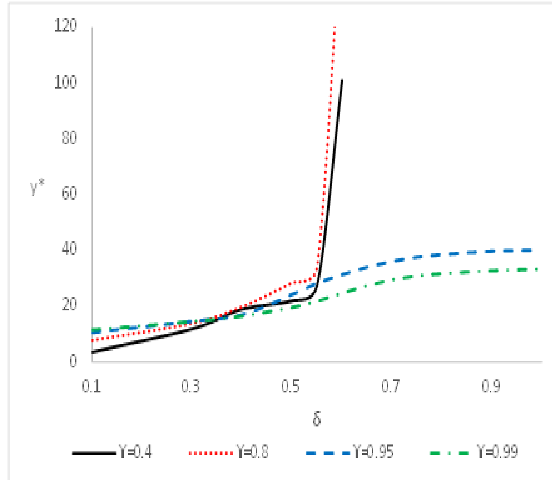

Figure 3-53 - Investment on Deregulation vs. Politician's Level of Populism for Different Levels of Regulator's Selfishness

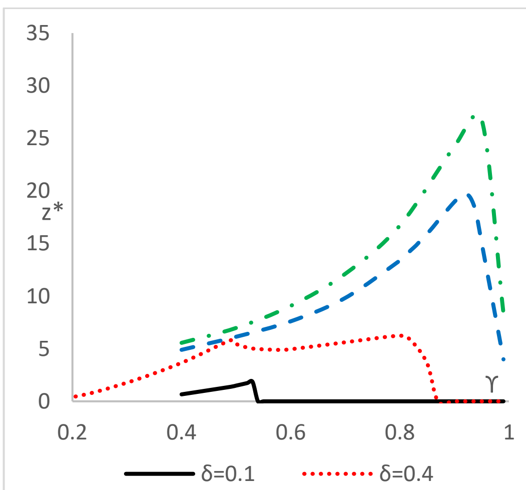

Figure 3-54 - Equilibrium Level of Investment on Anti-corruption vs. the Regulator's Level of Selfishness for Different Types of Politicians

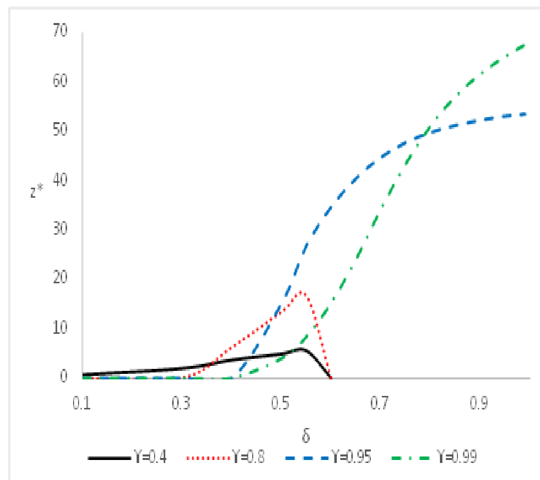

Figure 3-55 - Investment on Anti-corruption vs. Politician's Level of Populism for Different Levels of Regulator's Selfishness

Figure 3-52 shows the outcome of the model when we have interior solution. In other words, if we continue to show the figures for the cases with $\delta \geq 0.6$, then we can see different behaviour.

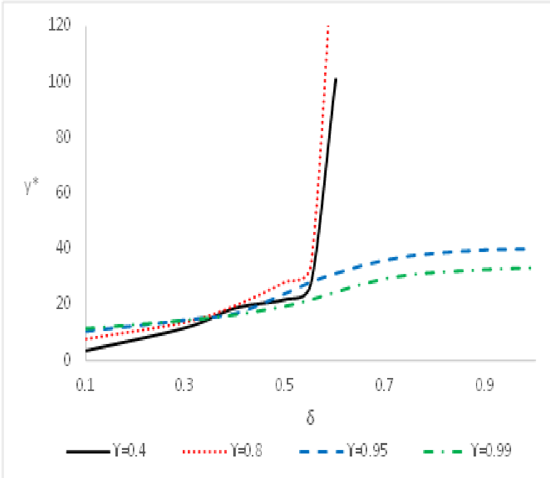

Figure 3-53 depicts that when an economy is being ruled by an extremely selfish regulator, the politician's choice of y^* may be less sensitive to the politician's type.

Moreover, it could be concluded that a more populist politician is more sensitive to the regulator's level of selfishness.

After investigating each of the two institutional reforms separately, one might ask about the total sum of expenditures, or $T^* = y^* + z^*$. Total expenditure on institutional reforms is the simple sum of investment on deregulation and anti-corruption. In general, a more populist politician spends less of money on institutional reform when a relatively selfish regulator is in the office. Hence, when the total expenditure is lower, both y^* and z^* will be lower.

The behaviour of total expenditure follows mainly that of the investment on deregulation and hence depends heavily on γ and δ. Assuming γ fixed, T^* turns out to be higher for a more populist politician. In other words, T^* is monotonically increasing in δ for all different values of γ.

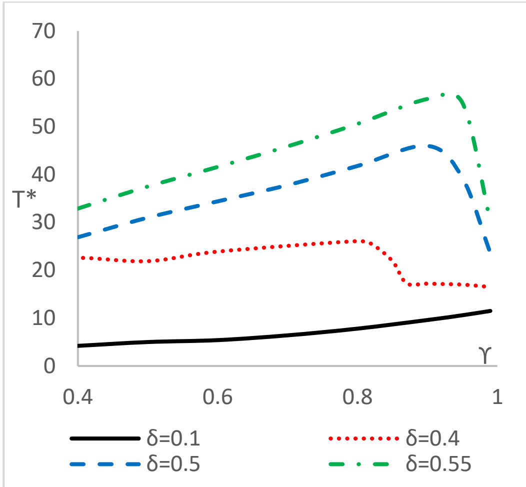

Figure 3-56 - Equilibrium Total Expenditure vs. the Regulator's Level of Selfishness for Different Types of Politicians

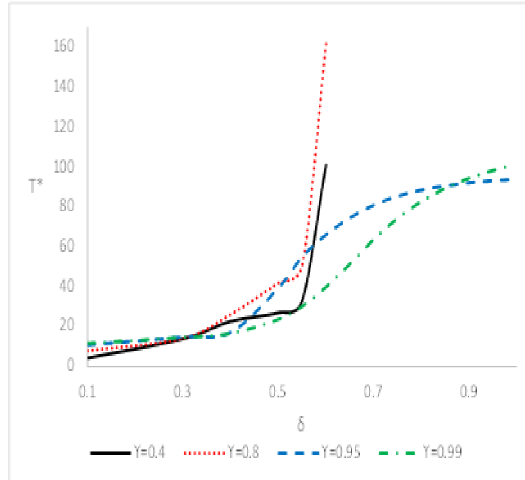

Figure 3-57 - Equilibrium Total Expenditure vs. Politician's Level of Populism for Different Levels of Regulator's Selfishness

For the set of the parameters chosen, when $\delta < 0.6$, no matter what is the value of the regulator's level of selfishness, we have the interior solution for the politician. When $\delta > 0.6$, depending on the level of γ, we might have interior solution or corner solution. When $\delta > 0.6$, if $\gamma < \overline{\gamma}$, we have corner solution and when $\gamma > \overline{\gamma}$, we have interior solution. For the set of parameters chosen, $\overline{\gamma}$ turns out to be around 0.9.

This implies that the politician may invest as much as possible for all different sorts of the regulator except the extreme cases. An extremely selfish regulator is insensitive to the politician's choice, and hence, the politician may choose lower than maximum possible amount on institutional reforms. Remember that the maximum possible amount is the amount at which no incentive remains for the lobby to participate in the game with the regulator.

Figure 3-56 also shows that in terms of the trend of T^*, each politician considers the regulator's level of selfishness. Formally, $\partial T^*/\partial \gamma > 0$ and $\partial T^*/\partial \delta > 0$. For instance, for the case of a relatively oligarchic politician, T^* is monotonically increasing in γ. Intuitively, this is due to the fact that in case of a relatively oligarchic politician, all players will always benefit from improvements in institutional framework. Although, a relatively more populist politician may increase T^* for a wide range of γ, he may stop that for relatively higher γ. It depends when we have $T^* = \overline{T}$. Figure 3-56 shows that $\partial T^*/\partial \gamma > 0$. Therefore, only a relatively more populist politician may stop increasing total expenditure when the regulator turns out to be extremely selfish.

In other words, a relatively populist politician always invests on institutional reform as much as he can unless the sector is being ruled by a relatively selfish regulator. When the regulator is of a very selfish kind, then the politician may find investment on institutional reform useless; because the regulator becomes insensitive to what the politician is investing in. Moreover, the populist politician may want to invest on institutional reforms as much as possible. However, this may not be possible because an improvement in institutional framework may leave no incentive for firms due to an increase in industry size.

By reconsidering T^* and z^* we may find that when T is the highest possible one, $z^* = 0$. However, the opposite is not true. In other words, when there is a corner solution for z^* (i.e. when $\mu^* < 1$ and hence $1 - \mu^* > 0$), we might have either corner solution for T or interior solution.

The following figures show how α^*, N^* and π^* may change as a result of a change in both γ and δ.

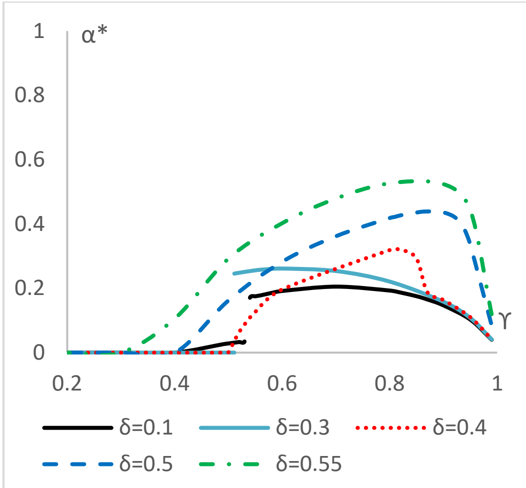

Figure 3-58 - Equilibrium Transfers vs. the Regulator's Level of Selfishness for Different Values of the Politician's Level of Populism

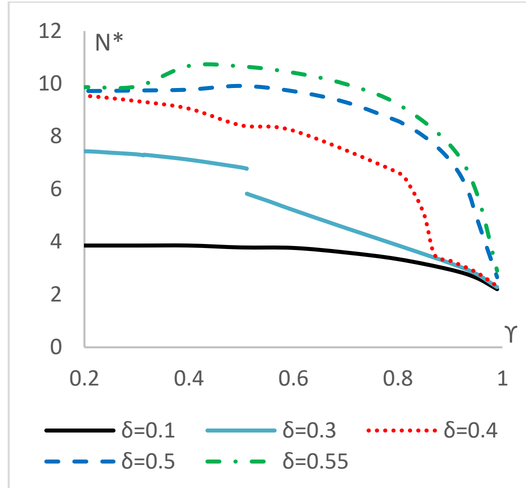

Figure 3-59 - Equilibrium Industry Size vs. the Regulator's Level of Selfishness for Different Values of the Politician's Level of Populism

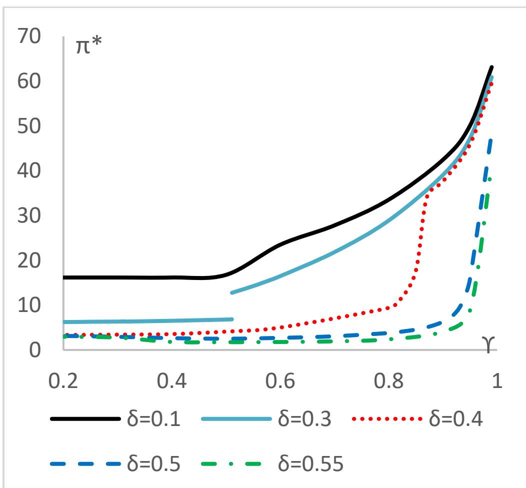

Figure 3-60 - Equilibrium Profit vs. the Regulator's Level of Selfishness for Different Values of the Politician's Level of Populism

It should also be noted that when $\delta > 0.4$, the industry size is the same for all extreme values of γ. In other words, industry size would be different only for medium values of γ and hence industry size converges for all different δs when the regulator is either very benevolent or very selfish.

To investigate the behaviour of sw^*, we need to know how its components, i.e. cs^* and ps^* behave with respect to changes in γ and δ. The following figures shows how cs^* and ps^* react to changes in γ and δ.

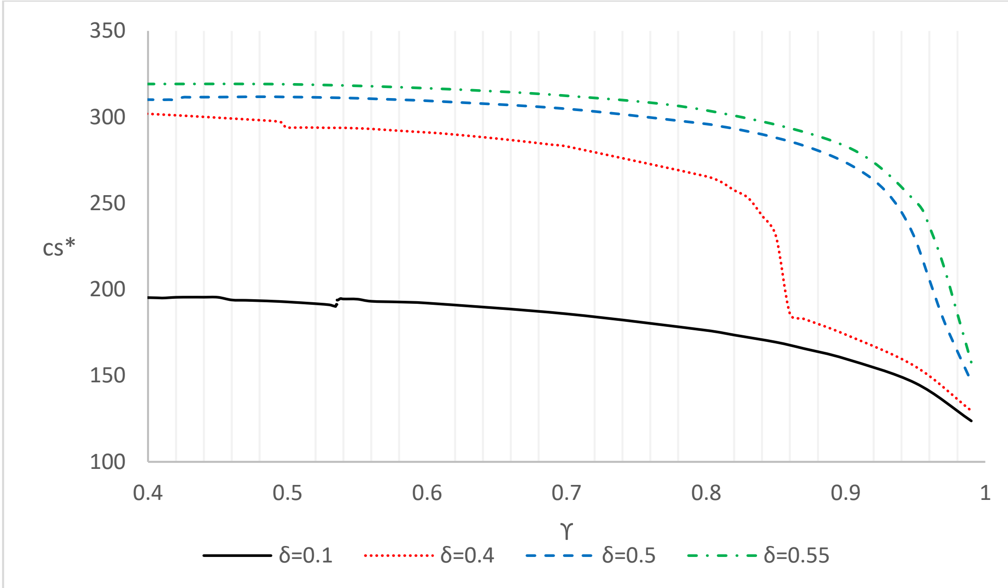

Figure 3-61 - Equilibrium Consumer Surplus vs. Regulator's Level of Selfishness for Different Types of Politicians

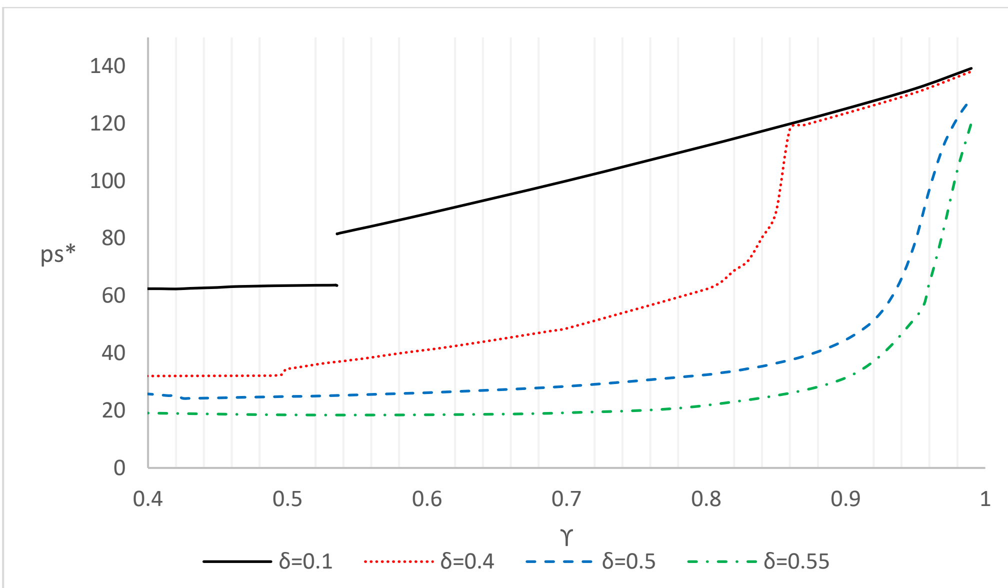

Figure 3-62 - Equilibrium Producer Surplus vs. Regulator's Level of Selfishness for Different Types of Politicians

Appendix 4 Table of outcomes

Table 1 - Comparative Statics of changes in δ and γ–The effects on the main four variables

	δ	γ	y^*	z^*	T^*	α^*	N^*	sw^*	Tr^*	E_3^*
1	(0,0.32)	$(0,\underline{\underline{\gamma}})$	$\partial y^*/\partial\gamma = 0$	0	Increasing	0	$\partial N^*/\partial\gamma = 0$	Monotonically dec.	0	Monotonically dec.
2		$(\underline{\underline{\gamma}},\underline{\gamma})$	$\partial y^*/\partial\gamma < 0$	$z^* > 0$ $\partial z^*/\partial\gamma > 0$ Drops to 0	Increasing	0	$\partial N^*/\partial\gamma < 0$			
3		$(\underline{\gamma},1)$	$\partial y^*/\partial\gamma > 0$	0	Discontinuous at $\bar{\gamma}$ Increasing	$\alpha^* > 0$ $\partial\alpha^*/\partial\gamma > 0$ $\partial^2\alpha^*/\partial\gamma^2 < 0$ Non-mon.	$\partial N^*/\partial\gamma < 0$	Non-monotonic	Non-monotonic	Monotonically inc.
4	(0.32,0.5)	$(0,\underline{\underline{\gamma}})$	$\partial y^*/\partial\gamma = 0$	0 (Non-zero for $\gamma < 0.1$)	$\partial T^*/\partial\gamma = 0$	0	$\partial N^*/\partial\gamma = 0$	Monotonically dec.	0	Monotonically dec.
5		$(\underline{\underline{\gamma}},\underline{\gamma})$	$\partial y^*/\partial\gamma < 0$	(1) Discontinuous (2) Increasing up to around $\underline{\gamma}$	Non-monotonic/ Mostly increasing/	0	No single behaviour			
6		$(\underline{\gamma},1)$	$\partial y^*/\partial\gamma > 0$ $\partial^2\alpha^*/\partial\gamma^2 < 0$ Non-mon.	(1) Non-mon for $\gamma > \underline{\gamma}$ (2) Inc for most of the region (3) Very low for very high γ	Discontinuous at $\bar{\gamma}$/Drops/ Increasing in γ	$\alpha^* > 0$ $\partial\alpha^*/\partial\gamma > 0$ $\partial^2\alpha^*/\partial\gamma^2 < 0$ Non-mon.	$\partial N^*/\partial\gamma > 0$ $\partial^2 N^*/\partial\gamma^2 < 0$ Non-mon. Mostly Dec. in γ	Non-monotonic	Non-monotonic	1) Non-monotonic for lower γ 2) Monotonically dec. for higher γ
7	(0.5,0.6)	$(0,\underline{\underline{\gamma}})$	No single behaviour	Mostly 0/ No single behaviour	No single behaviour/ Discontinuity/ Fixed for low δ/ Increasing both before and after discontinuity	0	$\partial N^*/\partial\gamma = 0$	No single behaviour/ Unknown	0	Monotonically decreasing
8		$(\underline{\underline{\gamma}},\underline{\gamma})$	No single behaviour	Non-mon/ First decreasing then increasing	Increasing	$\alpha^* \geq 0$ Corner solution/ Close to 0	Discontinuous due to corner solutions in α^* $\partial N^*/\partial\gamma < 0$			
9		$(\underline{\gamma},0.9)$	No single behaviour	First zero Then non-mon First increasing then decreasing	Corner solution at $\bar{T}$ Increasing	$\alpha^* > 0$ $\partial\alpha^*/\partial\gamma > 0$ $\partial^2\alpha^*/\partial\gamma^2 < 0$ Non-mon.	$\partial N^*/\partial\gamma > 0$ $\partial^2 N^*/\partial\gamma^2 < 0$ Non-mon.	Monotonically dec.	Non-monotonic	
		(0.9,1)			Interior solution No single behaviour	Mon. dec.	Mon. dec.			
10	(0.6,1)	$(0,\underline{\underline{\gamma}})$	Corner solution at $\bar{y}$ Increasing in γ	0	1) Interior for $\gamma < 0.3$; 2) Corner solution at $\bar{T}$ for $\gamma \in (0.3,\underline{\underline{\gamma}})$ Increasing	Discontinuous and Different	Decreasing Ends to $N^* \sim 2$			
11		$(\underline{\underline{\gamma}},1)$	Interior solution Decreasing in γ	Increasing in γ	Discontinuous at $\underline{\underline{\gamma}}$/ 1) First Corner solution at $\bar{T}$ for $\gamma \in (\underline{\underline{\gamma}},0.9)$ Increasing 2) Then interior solution for $\gamma \in (0.9,1)$	Dec. for $\gamma \in (\underline{\underline{\gamma}},1)$ Inc. from before $\underline{\underline{\gamma}}$/ Max. α^* at $\underline{\underline{\gamma}}$/ Generally Non-mon	Discontinuous at $\underline{\underline{\gamma}}$/ Sharp jump/ Decreasing after			

Appendix 5 Numerical outcomes

$\boldsymbol{\delta}$	$\underline{\underline{\boldsymbol{\gamma}}}$	$\underline{\boldsymbol{\gamma}}$	$\boldsymbol{\alpha}^*(\underline{\boldsymbol{\gamma}})$	$\overline{\overline{\gamma}}_z$	**Average** $\boldsymbol{\eta}$	**Comments**
0.05	<0.001	0.518	$\alpha^*(\underline{\gamma}) = 0.0006$ $\alpha^*(\gamma = 0.589) = 0.17244$	0.589	0.43	Discontinuity at $\gamma = 0.589$
0.1	<0.001	0.42	$\alpha^*(\underline{\gamma}) = 0.00033$ $\alpha^*(\gamma = 0.5354) = 0.1677$	0.535435	0.31	Discontinuity at $\gamma = 0.535435$
0.15	0.3	0.44	$\alpha^*(\underline{\gamma}) = 0.00414123535$ $\alpha^*(\gamma = 0.48997) = 0.1649$	0.48996	0.30	Discontinuity at $\gamma = 0.48997$
0.2	0.290	0.45856195415	$\alpha^*(\underline{\gamma}) = 0.168063$	$=\underline{\gamma}$	0.28	Discontinuity at $\gamma = \underline{\gamma} = 0.4585619$
0.25	0.0999	0.479	$\alpha^*(\underline{\gamma}) = 0.20659917036$	$=\underline{\gamma}$	0.21	Discontinuity at $\gamma = \underline{\gamma} = 0.4790$
0.3	0.25	0.510871647	$\alpha^*(\underline{\gamma}) = 0.245674$	$=\underline{\gamma}$	0.3377	Discontinuity at $\gamma = \underline{\gamma} = 0.510871647$
0.32	0.24	0.5182	$\alpha^*(\underline{\gamma}) = 0.0005846281$ $\alpha^*(\gamma = 0.519725) = 0.25827$	0.51972	0.3110	Discontinuity at $\gamma = 0.519725$
0.34	0.210	0.5156	$\alpha^*(\underline{\gamma}) = 0.0001480219$	0.56	0.453	No discontinuity in α^*
0.36	0.200	0.512	$\alpha^*(\underline{\gamma}) = 0.0004911999$	0.64	0.498	No discontinuity in α^*
0.38	0.185	0.508	$\alpha^*(\underline{\gamma}) = 0.0011012468$	0.8	0.43	No discontinuity in α^*
0.39	0.175	0.504	$\alpha^*(\underline{\gamma}) = 0.0013467438$	0.8	0.5128	No discontinuity in α^*
0.4	0.170	0.500	$\alpha^*(\underline{\gamma}) = 0.00107$	0.86	0.5694	No discontinuity in α^*
0.45	0.165	0.475	$\alpha^*(\underline{\gamma}) = 0.0097085634$	1	0.6531	No discontinuity in α^*
0.5	0.155	0.425	$\alpha^*(\underline{\gamma}) = 0.0058848128$	1	0.7587	No discontinuity in α^*
0.55	0.118875	0.39793	$\alpha^*(\underline{\gamma}) = 0.1000692$	1	0.5068	Discontinuity at $\gamma = \underline{\gamma} = 0.39793$
0.575	<0.01	0.37131	$\alpha^*(\underline{\gamma}) = 0.15676802945$ $\alpha^*(\gamma = 0.574) = 0.99140$	1	0.7062	Discontinuity at two points: (1) $\gamma = \underline{\gamma} = 0.37131$; (2) $\gamma = 0.574$
0.6	<0.1	0.32723	$\alpha^*(\underline{\gamma}) = 0.09$ $\alpha^*(\gamma = 0.35558) = 0.2224$	1	0.5465	Discontinuity at two points: (1) □ $= \underline{\gamma} = 0.32723$; (2) $\gamma = 0.35558$
0.65	0.88	0.2	$\alpha^*(\underline{\gamma}) = 0.98282$	1	0.32	
0.7	0.89	0.1	$\alpha^*(\underline{\gamma}) = 0.9273$	1	0.3139	
0.75	0.90	0.1	$\alpha^*(\underline{\gamma}) = 0.9273$	1	0.3346	
0.8	0.90	0.1	$\alpha^*(\underline{\gamma}) = 0.9273$	1	0.2725	
0.85	0.90	0.1	$\alpha^*(\underline{\gamma}) = 0.9273$	1	0.3593	
0.9	0.90	0.1	$\alpha^*(\underline{\gamma}) = 0.9273$	1	0.3361	
0.95	0.90	0.1	$\alpha^*(\underline{\gamma}) = 0.9273$	1	0.2528	
0.99	0.90	0.1	$\alpha^*(\underline{\gamma}) = 0.9273$	1	0.2528	