

**The Economics of Public Policy: Interventions in Electoral
Representation, Information Transmission and Investment
Choices**

by

Rohini Pande

Submitted to the University of London
in partial fulfillment of the requirements for the degree of

PhD in Economics

at the

UNIVERSITY OF LONDON

July 1999

© Rohini Pande

The author hereby grants to UNIVERSITY OF LONDON permission to reproduce and to distribute copies of this thesis document in whole or in part.

UMI Number: U119116

All rights reserved

INFORMATION TO ALL USERS

The quality of this reproduction is dependent upon the quality of the copy submitted.

In the unlikely event that the author did not send a complete manuscript and there are missing pages, these will be noted. Also, if material had to be removed, a note will indicate the deletion.



UMI U119116

Published by ProQuest LLC 2014. Copyright in the Dissertation held by the Author.
Microform Edition © ProQuest LLC.

All rights reserved. This work is protected against
unauthorized copying under Title 17, United States Code.



ProQuest LLC
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106-1346

The Economics of Public Policy: Interventions in Electoral Representation, Information Transmission and Investment Choices

by

Rohini Pande

Abstract

This thesis consists of three papers on the economics of public policy. The first chapter of the thesis provides a selective overview of the existing political economy literature. The second chapter analyzes the relationship between the political representation afforded to members of a disadvantaged population group and public policies. The starting point of the analysis is the observation that disadvantaged groups tend also to constitute population minorities. The chapter examines the success of an electoral law which enhances the political power of a minority group by reserving seats for them in legislatures in promoting minority interests. It develops a theoretical model of the political process to analyze the policy impact of such a law. It also takes advantage of the existence of such a law in India to empirically test this prediction. Chapters 3 and 4 of the thesis turn to an analysis of the relationship between the control rights given to a government and policy outcomes. Chapter 3 examines the relationship between a government's redistributive preference and its ability to provide a public good— information. To do so, it develops a model in which a group of heterogenous individuals have to make private investment and labour supply decisions while relying on the government for information about investment returns. The government consists of an elected citizen who chooses a redistributive strategy in addition to providing information. The chapter identifies reasons why redistributive motives may limit the possibility of credible information transmission by elected governments and lead to under-exploitation of profitable investment opportunities. Chapter 4 of the thesis turns to an analysis of some of the economic and political determinants of industrialisation in underdeveloped agrarian economies. It develops a simple model of an economy in which industrialisation may be inhibited by an investment co-ordination failure amongst landowners. It then examines the possibility of government-led coordination of investment activity. The chapter identifies reasons why the possibility of successful coordination of investment activity on the part of elected governments is sensitive both to the economy's underlying income distribution and to the set of policy instruments available to the government.

Acknowledgements

In writing this thesis I have built up a number of debts. My greatest intellectual debt is to my advisor Tim Besley. I thank Tim for providing a sterling example of a great advisor. I am particularly grateful to Tim for helping me realise that economic research should consist of theory prompted by observation not theory prompted by desperation. Some of the research in this thesis (in particular Chapter 3) draws on joint work with Tim. I am grateful to Tim for working with me, and working with me again.

Tony Venables encouraged me to stay on at LSE for my PhD. I am grateful to Tony for his help and advice over the last four years.

Many friends have been generous with their time and thoughts. I am particularly grateful to Robin Burgess and Maitreesh Ghatak for much help. Thanks also to Jean Dreze, Maia Guell, Marc Henry, Alice Mesnard, Ted Miguel, Henry Overman for many helpful conversations, Cecilia Testa for crucial intellectual and food support and Anna Brown, Neel Mukherjee and Cathy Wheeler for never letting work get in the way of their distractions. I am also grateful to numerous government officials in India, especially Anil Bordia, for data help.

This thesis would never have been written without the financial support of various benefactors. I am grateful to the LSE, ORS, Royal Economic Society, Wingate Foundation and Rhodes Trust for invaluable financial support. I am particularly indebted to STICERD for financial support and for hosting me for the last three years.

I am grateful to my parents for letting their daughter steer her own course, even when this led to the study of an obscure subject in a far away country.

Finally, I'd like to thank Dominic Leggett for giving logic and coherence to my more fanciful imaginings, and for his valiant attempts to prove that all of economics can be derived from a casual read of 'the Guardian'.

Needless to add, I remain solely responsible for any errors in this thesis.

Contents

1	Introduction	8
1.1	The Economics of Public Policy	9
1.1.1	Government identity	9
1.1.2	Citizen Identity	14
1.1.3	Political Institutions	16
1.2	Thesis Outline	21
2	Minority Representation and Policy Choices: The Significance of Legislator Identity	24
2.1	Introduction	24
2.2	Related Literature	28
2.3	Theory	29
2.3.1	Economic Environment	30
2.3.2	Policy Choices	33
2.3.3	Analyzing Minority Representation	35
2.3.4	Generalizing the Results	39
2.3.5	Empirical Predictions	41
2.4	The Context: Political Reservation in India	41
2.5	Testing for the Determinants of Policy Choices	44
2.5.1	Empirical Model	47
2.5.2	Basic Results	49
2.5.3	Further Results	51

2.6	Concluding Remarks	56
2.7	Appendix	58
2.7.1	Mathematical Appendix	58
2.7.2	Data Appendix	64
3	Read My Lips: The Political Economy of Information Transmission¹	79
3.1	Introduction	79
3.2	The Model	81
3.3	Full Information	84
3.4	Incomplete Information	88
3.5	Political Economy and Welfare Analysis	94
3.6	Discussion	98
3.7	Concluding Comments	100
3.8	Appendix	102
4	Technology Adoption in Agriculture and Industrialisation: Analysing the Role for Government Intervention	111
4.1	Introduction	111
4.2	The Model	115
4.2.1	Economic Environment	116
4.2.2	Choice of Technology	118
4.3	Coordination, Welfare and the Political Process	123
4.3.1	Socialisation of Investment	127
4.3.2	Decentralised Investment and Coordination	130
4.4	Discussion	134
4.5	Appendix	136

¹This chapter is joint with Tim Besley.

List of Tables

2.1	Legal Identification of Minority Groups in India	68
2.2	Economic Characteristics of Minority Groups in India	69
2.3	Representation of Minority Groups in Unreserved Seats of Indian State Legislatures	69
2.4	Main State Economic and Demographic Variables	70
2.5	Descriptive Statistics for All Variables	71
2.6	Minority Representation and Policy Choices	72
2.7	Minority Representation and Policy Choices: Controlling for Omitted Variables .	73
2.8	The Population-Reservation Relationship	74
2.9	Political Reservation and Party Performance	75
2.10	Party Identity and Caste Identity	76
2.11	North South Differences	78

List of Figures

4-1	Capital Labour Ratio in Agriculture	141
4-2	Share of Agricultural Labour Force	141
4-3	Change in Agricultural Productivity versus Change in Capital Labour Ratio . . .	142

Chapter 1

Introduction

In the idealised world of traditional public economics government interventions in public policy are prompted only by a desire to implement an optimal welfare outcome. In the real world, this clearly doesn't happen. This is because elected policy-makers don't make public policy decisions only on the basis of some given social welfare function. Instead, a policy-maker operates in a complicated market where in choosing a public policy intervention she seeks to maximise the welfare of different voter groups, her own party's interest and her own policy preferences. As with any other economic market, the relationship between the potentially diverse policy interests of these groups and observed policies depends crucially on the form of existing political institutions and the identity of participants in the political process.

However, until recently analyses of the political process were rare in mainstream economics. This lacuna was particularly glaring given economists' preoccupation with questions such as the design of policies which increase growth, and the design of policies to alleviate mass poverty and improve individual well-being.

This thesis seeks to provide an economic analysis of some elements of the political process, with a specific emphasis on development. The key argument put forward is that an understanding of the policy formation process is necessary for the design of effective policies. To this end, the thesis examines three different types of policy interventions. Whilst the economic environments considered differ, the focus throughout is on the relationship that citizen identity and political institutions bear to the choice and implications of policy interventions. This focus also guides the structure of the introduction.

1.1 The Economics of Public Policy

There exists a long tradition in public economics of considering the appropriate choice of public policy intervention as that which maximises some given social welfare function (Atkinson and Stiglitz 1980). According to this view, governments are best seen as social planners who implement this policy choice.

However, since Arrow's impossibility theorem, it is well known that it is difficult to reconcile this view of the policy formation process with equilibrium outcomes delivered by positive models of the political process. Arrow (1963) showed that, in general, it is not possible to write down an aggregation rule which is defined for all possible individual preferences, satisfies certain basic assumptions on the mapping from individual and social preferences and yields Pareto optimal policy choices. In other words it is not possible to write down models of the political process which are able to identify feasible policy interventions while respecting all citizens' policy preferences.

This suggests that a more promising avenue of research is to instead write down economic models of the political process which relate to observed political institutions. The efficiency and equity properties of observed policy choices can then be related to the assumptions on the primitives of the model. This is the approach adopted by most recent political economy models¹, and also in this thesis. In general, the key assumptions made in such political economy models are assumptions regarding the preferences of participants in the political process and the form that political institutions take.

This section provides a brief and selective overview of recent political economy research. In doing so, it seeks to provide the reader an introduction to the economic issues which are then taken up by the body of the thesis.

1.1.1 Government identity

In every country the government is responsible for defining and enforcing the basic rules which govern the functioning of the economy. However, the processes by which the individuals (policy-makers) who make up the government are selected, and the policy-making powers that they

¹For recent overviews of this literature see Persson and Tabellini 1999, and Besley and Coate 1998b.

enjoy vary greatly across countries.

Variations in the type of political process is particularly marked for the set of developing countries. This has given rise to a literature which has tried to link the presence of democratic systems of governance (or dictatorships) to a country's stage of development. However, attempts to obtain empirical evidence on this relationship have been extremely unsatisfactory—in the main because changes in political regime are usually endogenous (for a review of this literature, see Przeworski and Limongi 1993). Recognition of this fact has led economists to instead focus more attention on the theoretical and empirical relationship between the different political institutions that typify a given political regime and observed economic outcomes. This thesis (and the rest of the literature review) follows this approach and focus on representative democracies.

In representative democracies the norm is that citizens elect politicians who are then responsible for policy implementation. In so far as citizens care about policy outcomes they will condition their vote on the policies associated with alternative candidates. Therefore, in analysing the policy formation process a first issue of interest is - what determines the policies associated with competing electoral candidates?

An early economic analysis of this issue was provided by Downs² (1957). Downs analysed electoral competition between two candidates in a world in which citizens have one dimensional policy preferences. His key finding was that if candidates only care about winning and can commit to policy outcomes prior to election, then in the ensuing political equilibrium both candidates will offer the same set of policies. Further, the policy outcome selected will be the median voter's preferred policy.³ A number of authors (e.g. Grandmont 1978) have generalised this result to economic environments with multi-dimensional policy-making. With multi-dimensional policy-making the counterpart of the median voter's preferred policy is the policy vector which beats all others in pair wise competition (i.e. the policy which constitutes the Condorcet winner)⁴.

²Hotelling (1927) also discussed a similar model.

³This as the median voter's preferred policy beats all other policies in pairwise competition. Gans and Smart (1996) provide a general characterisation of the conditions necessary for this result to hold in a one-dimensional environment.

⁴Often such a policy vector (i.e. a Condorcet winner) may fail to exist. Such a situation arises whenever the losing candidate (party) can always affect the electoral outcome by changing her policy stance on some

The median voter approach to political economy has won many followers. In particular, the simplicity of the result makes it an attractive method of endogenising policy formation in different economic environments. However, the main problem with the median voter theorem is the lack of empirical support for its predictions. In particular, public finance and electoral data from most countries allow a conclusive rejection of the twin predictions of the median voter theorem. In reality candidates (parties) do not exhibit policy convergence, and the policies they choose tend to differ systematically from the median voter's preferences (Caillaud and Tirole 1998).

Instead, a large body of empirical papers testifies to the fact that variables such as candidate 'ideology' are a key determinant of observed policy outcomes (Kalt and Zupan 1985, Poole and Rosenthal 1997 and Levitt 1996). In general, these papers proceed by identifying empirical measures of ideology, and then regressing a legislator's voting decisions on her ideology. Even after controlling for the median voter's influence on legislator ideology, they find a strong influence of personal ideology on voting decisions. This literature has, however, remained basically atheoretical as to where the ideology comes from. For instance, for the US the usual ideology measure is the rating of legislators published by some ideological interest group such as Americans for Democratic Action. These ratings are just weighted sums of roll call voting decisions.

In trying to understand why the data does not support the median voter theorem, economists have paid much attention to two assumptions which underlie Downs' model of the economic process. First, that competing candidates only have electoral preferences and second, that candidates are able to fully commit to policies at the election campaign stage.

A number of authors (examples include Wittman 1977 and Roemer 1994) have considered models in which politicians have policy preferences, and can commit to policies at the campaign stage. However, even if candidates have differing policy preferences the ensuing political equilibrium may still be characterised by policy convergence. The reason is that as candidates care about implemented (rather than announced) policies, their policy choices will continue to reflect electoral concerns. This is due to the fact that each candidate experiences a discontinuous rise

dimension of policymaking. Recent game theoretic models of policymaking have made some progress in resolving such indeterminacy by considering the set of mixed strategy equilibria (Besley and Coate 1998c). In finite games mixed strategy equilibria always exist.

in her expected utility when she shifts from losing to winning (or equivalently, from tying for first position to winning). Therefore, policy convergence can persist even when candidates have policy preferences.

A different approach taken up in some recent political economy research (Alesina 1988; Besley and Coate 1997) is to also relax the assumption that candidates can fully commit to policies at the election stage. This thesis adopts this approach to policy analysis. That is, throughout it analyses situations in which candidates cannot credibly commit to policies different from their most preferred ones.

In most countries, citizens elect representatives for relatively long periods of time (the usual election cycle in most democracies is 4-5 years). It is, therefore, very unlikely that during election campaigns politicians and voters will be able to agree upon a full set of state contingent contracts which cover all possible economic situations (for a discussion of the incomplete contracting approach to political constitutions, see Persson, Roland and Tabellini 1997). Contractual incompleteness at the election stage implies that elected representatives enjoy considerable flexibility in making policy. Indirect evidence in support of this view is provided by Levitt (1996). Levitt shows that in the US the policy weight legislators attach to voter preferences exhibits sharp variation over the electoral cycle.

One reason for why politicians and citizens are, in general, unable to write down a full set of state contingent contracts is the lack of institutions capable of enforcing campaign promises. In this context it is worth noting that the legal enforcement of campaign promises is non-existent in most countries. For instance, US courts have tended to disfavour any restrictions on campaign speech as potential First Amendment violations (i.e. violating an individual's right to free speech)(Sencer 1991). While repeat elections may go some way towards reducing this problem of enforcement, Alesina (1988) showed that candidates' discount rate must be very low if full policy commitment is to be sustained as an equilibrium outcome in a dynamic setting (with repeat elections).

Other reasons for the observed lack of a full set of state contingent policy contracts include citizens' inability to foresee contingencies and the expense of full description. An interesting alternative explanation which hasn't yet been explored in the literature is that complete contracting over policies may be incompatible with satisfying a politician's incentive compatibility

constraints. Therefore, incomplete contracting may be ex ante efficient even though ex post it often leads to inefficient outcomes.⁵

In the absence of policy commitment, an elected representative will always have an incentive to implement her most preferred policy. If voters are rational then they will take account of this incentive in selecting amongst candidates. Hence, in general the only time consistent equilibrium is one in which candidates follow their most preferred policies and the voters rationally expect this outcome. In such situations policy convergence need not result. Such an approach raises the key modelling question of determines candidates' policy preferences.

In the existing literature one can distinguish two answers to this question. The first is to distinguish ex ante between the set of candidates (or parties) and citizens. Preferences for politicians and citizens are defined separately (Grossman and Helpman 1996; Dixit and Londregan 1995). In these models some reasons why candidate policy preferences differ from those of citizens may be that candidates receive pure rents from holding office, and/or that they have fixed (ideological) policy preferences regarding some dimensions of policy-making. This approach has proved useful in analysing political agency models and multidimensional models of policy analysis (postulating fixed policy preferences for candidates helps avoid the problem of the possible nonexistence of a policy vector which constitutes a Condorcet winner). However, such models provide an unsatisfactory depiction of the functioning of representative democracies where candidates are citizens who choose to stand for election.

This observation motivates the second approach - the 'citizen candidate' models of policy-making (Osborne and Slivinski 1996; Besley and Coate 1997). These models assume that candidates are drawn from the set of citizens. Hence, ex ante the preference distribution amongst candidates and citizens is identical.⁶

As this thesis is concerned with policy-making in representative democracies the citizen candidate approach to policy-making is used throughout. That is, it is assumed that the set of potential candidates and the set of citizens coincide. However, in most countries it is some subset of the general citizen population which chooses to stand for election. Therefore, regarding

⁵On a related note, Aghion and Bolton (1998) consider how incomplete information about the future may affect the optimal choice of voting rules at a constitution design stage. They show why ex ante efficiency considerations may lead to constitution designers optimally choosing majority rule (rather than unanimity) as the basis for future decisions.

⁶A drawback with this approach is that it usually leads to the existence of multiple political equilibria.

the entry of citizens as candidates the thesis considers two different cases - (i) the case where candidate entry is mediated by parties and (ii) the case where all citizens may enter, and face a common (small) entry cost.

1.1.2 Citizen Identity

A necessary condition for a non-trivial model of the policy formation process is heterogeneity in citizens policy preferences. One way of introducing such heterogeneity is to abstract from the details of the economic environment and simply postulate a spatial characterisation of citizens' preferences. That is, policies are points on a real line and citizens' differ with respect to their ideal policy outcome (see Osborne 1995 for a literature review of spatial models of policy-making). Whilst a useful way of analysing voting behaviour, this approach is unable to shed much light on the economic determinants of policy formation. Further, the lack of economic underpinnings for the individual preferences postulated implies that it is difficult to undertake any kind of efficiency analysis with such models.

Therefore, recent political economy models have instead focussed on economic environments in which citizen heterogeneity derives from differences in their economic characteristics. This approach brings the relationship between citizens' economic identity and policy preferences to the centre stage.

Seminal work on analysing this relationship was undertaken by Roberts (1977) (and subsequently, by Meltzer and Richards 1981). Roberts demonstrated that the median voter theorem can be derived as the equilibrium policy outcome of an economic model in which voters redistributive preferences were monotonically related to their productivity (and thereby, income), and policy making occurred on a single dimension (income). While Roberts considered the case where citizens directly vote over redistribution the same outcome can be sustained in a representative democracy in which politicians can commit to policies before the election.

Besley and Coate (1997) extended this result to a world without policy commitment. They showed that if certain conditions on the entry stage equilibrium were fulfilled then the median voter's preferred policy outcome would be chosen in the ensuing equilibrium. However, the mechanics by which this policy outcome is implemented differs from Roberts (1977). Specifically, as candidates cannot commit to policies the elected policy-maker will always implement her pre-

ferred policies. Therefore, citizens condition their vote on candidate identity. Hence it is via the election of the candidate who shares the median voter's identity (and thereby her preferences) that the median voter's preferred policies are implemented in the political equilibrium.

Much of the existing political economy research in this area has focussed on analyses of income based redistribution programmes. Therefore, both in modelling citizens' policy preferences and in characterising the political equilibrium these papers have tended to focus on the relationship between citizens' income identities and policy outcomes. Whilst such research has yielded important insights on the functioning of the policy formation process it is widely acknowledged that such a focus cannot provide a complete explanation of observed policy outcomes.

For example, an important stylised feature of many democracies has been the growth of government expenditure since the second world war (Meltzer and Richard 1981). However, empirical analysis shows that the cross-country correlation between increases in the size of the government and changes in the income distribution is low (Persson and Tabellini 1999). One reason for this low correlation is that the fastest growing transfers in most democratic countries are those which target citizens on the basis of their non-income identities. Examples of such transfers include pension schemes and medical schemes.

This suggests that for a full understanding of the policy formation process it is important to examine the relationship between both income and non-income aspects of citizen and candidate identity, and policy outcomes. The case for such research is particularly strong in situations where candidates cannot commit to policies during elections. In the absence of citizens and politicians being able to write down a full set of state contingent policy contracts, candidate identity can be approximated as a form of policy commitment.⁷

In so far as candidate identity is determined by citizens' voting decisions, this argument suggests that observed policy choices should be sensitive to changes in the distribution of population measured along both income and non-income dimensions. Evidence in support of the latter thesis (i.e. that citizens' non-income identities wield an important influence on policy-making) is

⁷One illustration of this was offered during the 1997 debate in the British parliament over the lowering of age of consent for homosexuals. During this period a number of gay activist groups followed an aggressive campaign of 'outing' gay politicians. The proffered reason was that if a parliamentarian's public identity was known to be gay, then he was unlikely to vote 'anti-gay'. Clearly, the underlying this campaign was a belief that a candidate's identity is informative of his policy preferences.

provided by some recent empirical papers. Easterly and Levine (1997) and Alesina, Baqir and Easterly (1997) examine the relationship between ethnic diversity, public good provision and economic growth.⁸ They provide evidence (cross country and for US states respectively) that even after controlling for an individual's income identity the ethnic composition of the population exerts a significant influence on policy outcomes. Easterly and Levine (1997) argue that this provides one explanation for Africa's growth tragedy. Microeconomic evidence suggesting that ethnic diversity has affected the levels of school funding in rural Kenyan schools is provided by Miguel (1999).

However, theoretical and empirical work in this area is still at an early stage. In particular, there is a paucity of good political economy models that identify the channels through which ethnic diversity influences the provision of public goods.⁹ For example, it is still not well understood whether ethnicity affects policy outcomes by directly influencing voters' policy preferences, by affecting their ability to agree upon the level of provision of a public good or by influencing the delivery of public goods to members of different ethnic groups.

Until now, the discussion of policy making has been institution free. However, it is clear that the form of political institutions adopted by a country will affect the way in which the political process aggregates multiple and often conflicting voter policy interests. This is the issue to which this chapter now turns.

1.1.3 Political Institutions

The political institutions of a representative democracy consist of the political positions (offices) that candidates vie for, the control rights associated with these offices and the procedures by which candidates may seek election to these offices. This literature review focuses on the set of political institutions which are usually provided for in a country's constitution. Other political

⁸In general, there is no single agreed upon definition of ethnicity in the economics literature. The usual presumption is that ethnicity is connected to birth and blood (kinship ties), but not absolutely so. As a result, in general the literature varies in defining ethnicity on tribal, racial, linguistic and religious grounds (Horowitz 1985).

⁹Alesina, Baqir and Easterly (1997) develop a model in which a citizen's ethnicity describes her public good preferences. Ethnic groups differ in their public good preference. They show that with sequential voting over amount and kind of public good provision - that is, citizens first vote over amount of redistribution and then kind of redistribution, the extent of redistribution and therefore public good provision is negatively related to extent of ethnic diversity.

institutions which influence the functioning of the political process include political parties and organised special interest groups (such as political lobbies).

Much of the early research on the form of political institutions and their influence on policy outcomes was undertaken by social choice theorists. This literature mainly focussed on normative analyses of the functioning of political institutions (see Myerson 1995 for an overview). In doing so, it provided important insights as to the relative worth of different political institutions in aggregating votes, and in providing various demographic groups political representation. However, it failed to shed much light on the relationship between the choice of political institutions and observed policy outcomes.

This latter issue has been the focus of some recent political economy research¹⁰. This subsection reviews this literature. As research by economists on political institutions is in early stages the literature review also draws upon the existing political science literature. The review proceeds as follows. First the economics of political institutions which govern the selection and election of candidates is reviewed. The review then discusses political institutions which influence the functioning of legislatures. Finally, it turns to the relationship between the control rights given to politicians and observed policy outcomes.

Entry stage

It is possible to identify at least two related sets of electoral laws which influence the selection and election of candidates in a representative democracy. The first is the (re)districting rules adopted by a country or region. These are the rules that govern the drawing of jurisdiction boundaries within a region or country. (Re)districting rules are crucial in mediating the extent of constituent diversity both across and within districts. This feature of districting rules has both been recognised, and exploited by policy-makers to serve specific purposes. For example, in the 1980s districting rules were used in US to create majority-minority districts (on this, see Cameron, Epstein and O'Halloran 1996). The explicit aim of these rules was to increase minority representation in legislatures.

An early literature on distributional politics in economics demonstrated that there are inherent fiscal inefficiencies associated with dividing up an economy into disjoint electoral districts

¹⁰Persson and Tabellini (1999) describe this area of research as *comparative politics*.

(Weingast, Shepsle and Johnson 1981). The reason for this is that policy benefits are often district specific while costs are shared by all districts. Therefore, citizens and politicians are prone to over-expenditure on district specific transfers. While these models predict that the extent of this fiscal inefficiency is likely to increase as the extent of (preference) heterogeneity across districts increases, the existing models of such distributional politics (often termed pork barrel politics) tend to take the size and demographic composition of jurisdictions as given. However, as is clear from the US experience with gerrymandering, electoral laws of (re)districting influence both the extent of inter and intra jurisdiction diversity. Therefore, we should expect policy outcomes to be sensitive to the districting rules adopted by a country or region.

Empirical work in this area is very limited. Some evidence from US states in support of this hypothesis is presented in Crain (1998). Using state legislature data Crain shows that changes in the demographic characteristics of jurisdictions due to redistricting have affected the provision of public goods across US states. However, this evidence is weakened by the fact the analysis fails to take account of the obvious endogeneity of districting rules in the US. It is clear from recent political science papers (Gelman and King 1994) that in the US (as in many other countries) political parties have tended to view redistricting as a means of increasing partisan advantage. Therefore, in order to correctly estimate the impact of changes in districting rules on observed policy outcomes we would want to use both data on (re)districting and public finance data to simultaneously examine the political motivations for redistricting and its policy effects.

The second set of electoral rules which influence candidate election are the laws which govern vote aggregation. These rules divide into two groups - those that determine the winning candidates identity, and those that determine the number of representatives elected from an electoral district.

Most democratic countries have adopted either a plurality (first past the post) rule or a proportional representation rule. Under plurality voting each voter can give one vote to only one candidate, and the candidate with the most votes wins. In contrast, in most proportional representation systems each voter gives one vote for one party with seats allocated to parties in proportion to their votes. Variations in this basic rule exist depending on what mapping between the vote distribution and the number of seats to be filled is adopted, and how the

identity of candidates in a party list relates to those chosen to be legislators (Myerson 1995).

Countries also vary in whether the electoral districts in the country are single or multi-member districts. Both types of electoral districts tend to be characterised by winner take all elections. The difference is that in single member elections the top vote receiver is declared as elected, while in multi member districts the top x vote receivers are (where $x > 1$).

There exists some empirical evidence suggesting that the extent of political representation afforded to members of different demographic groups is sensitive to a country's choice of electoral rules. For example, simple cross country correlations show that party list/proportional representation system results in higher female parliamentary representation than under plurality rule. Therefore, in 1987 the proportion of female representatives in Scandinavian countries such as Sweden, Norway and Finland was over 30 percent, while in the US and UK it was less than 7 percent. (Rule and Zimmerman 1992).

The evidence is less clear in the case of single versus multi member districts. In so far as multi-member districts tend to be geographically larger minority voting strength is often diluted. This would suggest that single member districts should do better in ensuring minority representation. However, electoral data shows that more women tend to be nominated and elected in district with more representatives per district. This effect is strengthened if multi-member districting is combined with citizens being able to cast multiple votes (Gerber, Morton and Reitz 1998).

Recent policy developments and academic research have underscored the need for further research in this area. Unhappy with the current representation afforded to women, a number of countries (these include Argentina and France) have passed legislation which seek to increase the political representation afforded to women. There is also a recent empirical political economy research which analyses the relationship between legislator's identity and policy outcomes (chapter 2 of this thesis; Besley and Case 1997). These papers find that legislators' ethnic and/or gender identities has a significant effect on policy outcomes. Such findings suggest that it is important to examine whether a country's choice of election rules influences policy outcomes by affecting the elected policy-maker's identity (for the reasons discussed above).¹¹

¹¹In this context its worth noting that there exists an empirical literature analysing credit (and other transfer) programmes. Papers in this literature find that the gender identity of transfer recipient affects subsequent

Legislature rules

In a multi-jurisdictional world observed policy outcomes also depend on the rules which govern the post election bargaining game amongst elected representatives in the legislature. One factor which influences the form of this bargaining game is whether a country has chosen to adopt a Parliamentary or a Presidential form of legislature. In a Parliamentary form of governance the chief executive is elected by the parliament. In contrast, in a Presidential system there is an independently elected chief executive.

Relative to Parliamentary systems of governance, Presidential forms of legislature are associated with greater separation of powers between members of the legislature (Persson, Roland and Tabellini 1997). In such systems legislative committees wield great policy influence. Therefore, individual legislators have relatively wide ranging policy influence in legislatures. In sharp contrast Parliamentary systems tend to be marked by greater legislative cohesion (Diermier and Feddersen 1998). This is as the chief executive needs the support of the majority. Therefore, policy-making in these environments tends to be characterised by majority party rule.

Empirical evidence suggests that these features of the legislature influence the form and extent of policy bargaining in the legislature. Persson and Tabellini (1999) exploit the existence of cross country variation in the choice of electoral and legislative rules to examine the relationship between a country's choice of political institutions and public finance outcomes. They find robust evidence that Presidential systems of governance are associated with a smaller government. They attribute it to the greater separation of powers observed in Presidential systems.

Their analysis while informative is a very reduced form estimation of the impact of a political institution on policy outcomes and leaves scope for further research. For instance, Chari, Jones and Marimon (1997) develop a model to show that Presidential forms of governance are associated with split ticket voting, wherein citizens elect fiscally liberal representatives and conservative Presidents. It would be interesting to empirically examine whether difference in voting patterns across Presidential and Parliamentary systems contribute to the observed difference in expenditure patterns.

Policy set

expenditure patterns.

An elected politician's ability to influence economic outcomes ultimately derives from the set of policy interventions available to her. In general, it is possible to distinguish between two broad categories of policy interventions that most governments undertake. First, policy interventions which seek to establish and enforce the institutions (and rules) that govern the functioning of economic markets. Examples include country-level policy decisions regarding the international trade (Bagwell and Staiger 1999), provisions for bankruptcy (White 1998), and policies defining property rights (Besley and Burgess 1998). The second set of policy interventions are those which directly influence economic activity within a given set of institutions. Clearly, all fiscal policy interventions fall in this category.

The use of both kinds of policies has the potential to affect individual well-being and aggregate economic outcomes. By now, there exists a large body of political economy literature examining this relationship. On the theoretical front, this literature has contributed to an understanding of how the form and influence of policy interventions varies across different economic environments. Empirically, the literature has made two main contributions. First, it has identified a set of reasons why policy outcomes are endogenous to the functioning of an economy. This has led to a general acceptance of the view that empirical analyses of policy incidence which simply include observed policy outcomes as left hand side variables will often give biased results. Second, it has provided important insights on how information about the functioning of political institutions may be used to find appropriate instrumental variables for policy outcomes.

However, the avenues of research in this area are far from exhausted. For example, a continuing puzzle in political economics remains the large cross section variation in observed political institutions combined with low time series variation. While it is clear that the status quo political institutions create vested interests we know little about how this affects their change over time (for some work on this issue, see Aghion and Bolton 1998).

1.2 Thesis Outline

This chapter has provided an introduction to some of the themes which are taken up by the subsequent chapters of this thesis. The remainder of this thesis provides an economic analysis

of three different policy interventions. Whilst the economic environments considered differ, the modelling of the political process remains constant. That is, throughout the citizen candidate approach to policy-making is adopted. The two key components of this approach are that candidates are selected from the set of citizens, and that ex ante policy commitment on the part of candidates is not possible.

The thesis contributes to two areas of ongoing research in political economy. The first is the relationship between a country's choice of political institutions and policy outcomes. This forms the focus of the research reported in chapter 2. The second is the relationship between the set of feasible policies available to a government and observed policy outcomes. Two different aspects of this relationship are analysed in chapters 3 and 4.

I conclude this introduction by providing a more detailed summary of these chapters.

Chapter 2 of the thesis examines the policy influence of an electoral law which guarantees minorities representation. The starting point of the chapter is the observation that in most democracies disadvantaged groups tend also to be politically under-represented. One consequence of this is that the policies implemented by electorally accountable governments often fail to reflect minority interests. A policy solution is to enhance the political power of minority groups. The chapter analyzes the success of an electoral law, which does this by reserving seats for minority groups in legislatures, in promoting minority interests. The chapter develops a theoretical model of the political process to analyze the policy impact of such a law. The key theoretical assumption, that candidates cannot commit to policies, implies that identity is relevant to policy choices. The chapter identifies economic reasons why this may lead parties to never field minority candidates. In such cases the model predicts that an electoral law of political reservation will influence policies. I then take advantage of the existence of such a law in India to test this prediction empirically. The principal finding is that minority representation has increased transfers to minorities. More generally, the results indicate that legislator identity influences policies, and provide some support for the contention that politicians cannot fully commit to policies.

Chapters 3 and 4 of the thesis turn to an analysis of the relationship between the control rights given to a government and policy outcomes.

One of basic tenets of public economics is that pure public goods should be provided by

governments. Provision of information of common interest to citizens, such as investment relevant information, seem like a clear cut application of this principle. Chapter 3 (which is joint research with Tim Besley) studies the possibility of credible information transmission by governments. To do so, it develops a model in which a group of heterogenous individuals have to make private investment and labour supply decisions while relying on the government for information about investment returns. The government consists of an elected citizen who chooses a redistributive strategy in addition to providing information. The chapter identifies reasons why such multi-tasking on part of the government may lead to inefficient outcomes. In particular, the chapter identifies conditions under which a government's redistributive motives may limit its ability to provide information. This, in turn, may lead to over- or under-investment in high return activities.

Chapter 4 of the thesis turns to an analysis of the economic and political determinants of industrialisation in underdeveloped agrarian economies. It is widely accepted that sustained growth in the output of an economy is generally accompanied by marked structural changes in the shares of agriculture and industry. Understanding the economic and political determinants of such structural transformations lies at the heart of development economics. These issues form the subject matter of this chapter. The chapter first provides a set of conditions under which industrialisation may be inhibited by an investment coordination failure amongst landowners in the agrarian sector. It then provides an analysis of the welfare economics and political economy of co ordination. Government led coordination of investment activity is shown to be associated with a Pareto superior outcome in equal societies. However, in unequal societies the success of coordination programmes depends crucially on the initial conditions in the economy and the policy intervention considered.

Chapter 2

Minority Representation and Policy Choices: The Significance of Legislator Identity

2.1 Introduction

Economists have identified important equity and efficiency reasons for targeting resources at historically disadvantaged groups. However, as these groups often constitute population minorities, there is no guarantee that electorally accountable governments will enact such transfers. A policy solution is to enhance the political power of disadvantaged groups as a vehicle for promoting their policy interests. Such considerations have led a number of countries to put in place electoral laws that aim to provide minorities political power through increased political representation. This chapter takes advantage of a unique experiment of this form in India to examine the role of an electoral law that influences legislator identity in promoting minority interests.

Whilst a substantial political science literature analyzes the role of political representation as a policy response¹, there is very little in the economics literature on this topic. Yet the issues

¹The political science literature distinguishes between *descriptive* representation which relates to how well the electoral system reflects the electorate's demographic characteristics and *substantive* representation which identifies how well it reflects their policy interests (Pitkin 1967, Guiner 1994). This chapter focuses on the role of

concerned are of central importance to economists interested in policy analysis. Recent research in political economy has identified significant reasons why political markets may fail to deliver desirable policy outcomes— one such reason being the form of political institutions (Besley and Coate 1999, and Persson and Tabellini 1998). Such research suggests that an understanding of the relationship between a country's choice of political institutions and observed policy outcomes is key to the design of effective public policies.

This is particularly true in the case of developing countries. Post colonialism, a majority of these countries adopted new constitutions. Often these constitutions marked a sharp change from the traditional forms of governance in these countries (Horowitz 1995). Since then, these countries have exhibited sharp variations in both policy choices and subsequent economic performance. A number of authors have attributed this to the varying success of the countries' political institutions in aggregating multiple, and often conflicting policy interests (Easterly and Levine 1997). However, no systematic economic analyses of this phenomenon exists.

This chapter undertakes such an analysis in the context of a prominent developing country— India, and a specific political institution— electoral laws for political representation. It examines how a country's choice of electoral laws, by affecting the extent of representation afforded to minorities, influences policy outcomes.

In general, electoral laws for political representation work either by altering voter composition (gerrymandering in the US), or by directly affecting legislator identity (political reservation in India). This chapter focuses on the latter set of laws. A large political science literature documents the fact that most electoral laws for minority representation have been successful in increasing minority presence in legislatures (Grofman and Lijphart 1994). However, much less is known about the relationship between increased minority representation and policy outcomes. Analyzing the policy influence of electoral laws that directly alter legislator identity provides a clear examination of this relationship. Further, the existence of such an electoral law in India makes it possible to examine the quantitative importance of this relationship.

One important reason why electoral laws that only influence legislator identity may not influence policies is the possibility of ex ante policy commitment by politicians. A number of

electoral laws in influencing policies i.e. in providing substantive representation. Related political science papers include Cameron, Epstein and O'Halloran (1996) and Gerber, Morton and Reitz (1998).

political economy papers argue that if politicians can commit to policies during the election campaign then electoral incentives will cause candidates to commit to policy vector preferred by a majority of voters² (a classic statement of this proposition is the median voter theorem³). As policy outcomes in these models are fully determined by the electorate's demographic composition these models predict that any electoral law which leaves the demographic composition of the electorate unaffected will not alter policy outcomes⁴.

However, in many situations full policy commitment on the part of politicians is not feasible. Reasons for this include politicians and voters inability to write down a full set of state contingent policy contracts prior to election, and/or the lack of institutions that can enforce campaign promises. A number of recent papers show that in such cases policy choices are sensitive to legislator policy preferences - on this, see Alesina (1988), Osborne and Slivinski (1996) and Besley and Coate (1997). In so far as a legislator's ethnic identity is informative of her policy preferences these models predict that an electoral law which increases minority representation in legislatures will affect policy outcomes

This chapter develops a theoretical model of the political process to precisely identify this channel of influence. The model assumes that citizens have both an income and an ethnic identity. Parties compete in the political process by fielding candidates. The elected legislators select the levels of income transfers which may target citizens on the basis of their income and (or) ethnic identity. The model is used to identify the relationship between a country's choice of political institutions and the extent of policy representation afforded to a minority.⁵ The model predicts that in situations of minority under-representation the introduction of an electoral law of political reservation will alter both legislator identity and policy outcomes. Further, this policy influence will mainly take the form of increased targeted transfers.

These theoretical predictions rely heavily on the assumption that politicians cannot commit

²Formally, the candidates will commit to the the policy vector that beats all others policies in pairwise competition, and therefore constitutes a Condorcet winner.

³The median voter theorem is attributed to Hotelling (1929) and Downs (1957). These authors considered a single dimensional environment and showed that the median voter's preferred policy constitutes a Condorcet winner. There also exist examples of multidimensional political economy models that assume policy commitment. These include most probabilistic voting models e.g. Lindbeck and Weibull (1987); Dixit and Londregan (1995).

⁴To be precise, such an electoral law will not affect the existence of the political equilibrium.

⁵In particular, we show that the combination of a lack of political institutions which may ensure policy commitment and the existence of plurality rule based majoritarian electoral systems imply that legislator ethnic identity affects policy outcomes. This, in turn, may lead to minority under-representation.

to policies. Therefore, to discriminate between the predictions of competing political economy models I devise an empirical test to examine whether legislator identity influences policy outcomes. The test is based on a state level panel data set for sixteen major Indian states from 1958-92. India is a relevant and interesting ground for testing the theory as it is amongst the most ethnically diverse societies in the world. Of equal, if not more importance, is the fact that it is also home to a unique experiment in electoral engineering. The Indian constitution provides for political representation of minorities via political reservation. That is, prior to every election a certain number of jurisdictions are declared as reserved. Only members of the minority group so targeted can stand for election in reserved jurisdictions. The composition of the electorate in these jurisdictions is, however, left unaltered (1950 Indian constitution).

The Indian constitution specifies that the extent of reservation in place for a minority should reflect its population share. Therefore, cross state and time variation in a minority's population share are associated with variations in the extent of political reservation it is afforded. Time lags in such population based readjustment implies that it is possible to empirically distinguish between the policy influence of demographic and minority representation variables. This forms the basis of the empirical identification strategy. Using variation in minority representation induced by population changes to measure changes in legislator identity also allows us to deal with endogeneity concerns. Specifically, since the extent of reservation afforded to a minority group is independent of the functioning of the political process, the extent of minority representation in an Indian state can be considered exogenous to the policy-making process.

The chapter's principal empirical finding is that improved minority representation has increased the levels of targeted transfers going to minorities. This finding provides substantial empirical credence to the idea that political representation is central to the design of policies that aim at promoting minority interests. More generally, the results indicate that legislator identity influences policies, and provide some support to the contention that politicians cannot fully commit to policies.

The remainder of the chapter is structured as follows. Section 2.2 discusses the related literature. Section 2.3 develops a theoretical model to analyze the causes of minority under-representation and the subsequent influence of an electoral law of political reservation on policy outcomes. Section 2.4 describes the institutional details of political reservation in India. Section

2.5 uses a panel data set for 16 Indian states to empirically test the relationship between legislator group identity and policy choices. Section 2.6 discusses the results and concludes. All proofs are in the appendix.

2.2 Related Literature

This section discusses some of the existing theoretical and empirical literature which is related to the work reported in this chapter.

The theoretical framework developed in this chapter is based on the citizen candidate model of political economy (Osborne and Slivinski 1996 and Besley and Coate 1997). The main assumptions underlying such a model of the political process are that candidates for elections are members of the polity, and that these candidates cannot commit to policies during the campaign stage. Together, these assumptions imply that candidate identity influences policy outcomes. This chapter extends the ambit of such research by analysing both how a country's choice of political institutions may affect the choice of citizen candidates, and the relative importance of income and ethnic based voter coalitions in determining political outcomes. The latter issue has also been the focus of some political economy papers which consider multi-dimensional policy-making –Besley and Coate 1998c; Dixit and Londegran 1995.

This chapter also undertakes an empirical analysis of the main theoretical predictions. The empirical analysis examines the role of an electoral law of political reservation in providing minorities with policy representation across Indian states. The identification strategy used seeks to exploit exogenous variation in an economically relevant variable (legislator identity) induced by the functioning of a political institution (the electoral law of political reservation). This econometric strategy is similar to that adopted in papers which exploit variation in the functioning of political institutions across US states to analyze questions of economic interest⁶. Besley and Case (1995) utilize variation in when gubernatorial term limits bind to identify the relative weight voter and state governors' preferences receive in policy-making, and Levitt (1997) uses electoral cycles in police hiring to estimate the effect of policing on crime.

⁶The approach may be contrasted with papers that instead utilize information on variations induced by changes in the political institution. For example Husted and Kenny (1997) use information on changes in the restrictions on the voting franchise to analyze the relationship between median voter's identity and the policy choices.

To date, empirical public economics research on the determinants of public policies has largely focused on the relationship between the demographic composition of political jurisdictions and the kind of transfers provided by governments. Examples include Alesina, Baqir and Easterly (1997), Cutler, Elmendorfer and Zeckhauser (1993) and Poterba (1997). This chapter extends such research by examining how changes in legislator identity influence the transfers chosen in situations where the demographic composition of jurisdictions is unchanged.

This analysis of the relationship between legislator identity and policy choices also relates to the large empirical literature that tests for the relevance of the median voter theorem in the US. A summary of this literature is provided in Poole and Rosenthal (1997). Most of these studies find very weak or no support for the median voter model. Instead papers such as Kalt and Zupan (1985) and Levitt (1996) show that legislator's own policy preferences (or ideology) are a primary determinant of roll call voting behavior in US legislatures.⁷ This chapter's main empirical finding is that a legislator's ethnic identity exerts a significant influence on policy outcomes. This finding supports the chapter's theoretical prediction that in the absence of political institutions which ensure policy commitment observed policy outcomes will vary with changes in legislators ethnic (or non income) identity.⁸

2.3 Theory

This section analyzes the determinants of minority under-representation in a representative democracy, and the role of an electoral law of political reservation in affecting such representation. To do so it develops a model in which candidates cannot commit to policy announcements. Hence parties and voters influence policies only by their choice of candidates and legislators respectively.

⁷My analysis can be interpreted as examining the relationship between a legislator's identity and the ideology she espouses. In a similar vein Besley and Case (1997) examine the relationship between increased female participation in U.S. state legislatures and state level policy making. They find robust evidence in support of the thesis that the gender identity of legislators influences policy outcomes.

⁸A similar argument has been put forward in papers which examine the relationship between the gender identity of transfer (cash/credit) recipients and economic outcomes (Pitt and Khandker 1998; Duflo 1999). These papers find that transfer recipients gender identity has a significant effect on subsequent expenditure patterns.

2.3.1 Economic Environment

Consider an economy populated by citizens who differ along two dimensions. First, citizens differ in the income they earn. A citizen is either rich or poor, with her income identity denoted as $i \in I = \{r, p\}$. For notational simplicity I assume that a citizen's income identity is perfectly informative of her total income (y_i). That is, rich citizens earn $y_r = r$ (and symmetrically $y_p = p$), where $y_r > y_p$ (i.e. $r > p$). Second, citizens differ in their social identity. A social norm assigns every citizen at birth to one of two social groups, which I term castes. Every citizen is born a *high* or a *low* caste, with her caste identity denoted $c \in C = \{h, l\}$. Membership of a social group does not have any direct economic significance⁹.

It follows that there are four citizen types in this economy. The total number of type (i, c) citizens' is denoted N_{ic} (with $\sum_{i \in I} \sum_{c \in C} N_{ic} \equiv N$); caste c citizens as N_c and income i citizens as N_i . Citizens are uniformly distributed across \mathcal{N} identical jurisdictions¹⁰. The number of type (i, c) citizens in any single jurisdiction is $\frac{N_{ic}}{\mathcal{N}}$.

A citizen's identity is informative of her policy preferences¹¹. The available policy instruments are the (triple) parameters of an income based redistribution scheme. These are (i) an anonymous tax rate $t \in [0, 1]$ and the levels of (ii) a non-targeted transfer $T \in \Re$ and (iii) a targeted transfer $\delta_l \in \Re$, which only benefits low caste citizens¹². The analysis restricts attention to feasible transfers. That is $(T, \delta_l) \in Z$, where Z is the set of transfers which, together with the associated tax rate t , satisfies the budget constraint:

$$t \sum_{i \in I} \sum_{c \in C} y_{ic} = NT + N_l \delta_l \quad (2.1)$$

⁹The analysis considers redistribution based on citizen's income and/or ethnic identity. Hence, the correlation between citizens ethnic and income identities affects policy choices (on this, also see Akerlof 1978). More generally, the analysis is robust to the introduction of some amount of ex ante correlation between these two identities.

¹⁰I discuss the implications of inter-jurisdiction heterogeneity later in the paper.

¹¹A citizen's caste identity affects her policy preferences because it is the basis for targeted transfers. An alternative approach would be to assume that citizen utility is directly enhanced by having a representative who shares her identity. Possible microfoundations for this assumption include group altruism, or (and) the observation that in situations of incomplete policy commitment candidate identity approximates a form of commitment (since the probability that someone who shares one's caste identity will share one's policy preferences is, in general, non zero).

¹²Increasing the set of policy instruments so as to allow for symmetric transfers which only target high castes leave the qualitative aspects of the analysis unaffected.

A type (i, c) citizen's utility given the policy vector (t, T, δ_t) is:

$$U_{ih} = (1 - t)y_{ih} + T, \quad i = r, p$$

$$U_{il} = (1 - t)y_{il} + T + \delta_t, \quad i = r, p$$

Therefore, her preferred choice of transfers will maximize her post redistribution income. The actual choice of policies are, however, determined via a political process characterized by electoral competition between two parties, labelled rich R and poor P .

This chapter models parties as institutions that mediate between citizens and candidates in the political process. They do so by fielding candidates for election in every jurisdiction¹³. Parties select candidates from the set of citizens. Importantly, candidates cannot commit to policies during election campaigns. Therefore, an elected candidate will always implement the policies which maximize her utility. A candidate's policy preferences are determined by her caste and income identity. Hence candidate identity will matter in the political process. Specifically, a party will anticipate the policies associated with every candidate and select that candidate set which maximizes the party's expected utility.

In most countries major political parties are associated with ideological differences on some, but not all, policy issues (Caillaud and Tirole 1998).¹⁴ Therefore, I allow for partial party ideological differences by postulating fixed income identities for parties.¹⁵ That is, party P represents the poor and party R the rich. Since parties affect policy via their selection of candidates this translates into an assumption on candidate selection. Specifically, party P only fields poor candidates, and party R rich.

In contrast, I take party caste preferences (and therefore party candidates caste identity) to be flexible. I assume that in choosing its candidates caste identity a party's primary concern is electoral. That is, it seeks to maximize the number of jurisdictions (n) in which it wins¹⁶. However, if the electoral outcome is invariant to the caste identity of a party's candidates

¹³A number of authors have argued for such a candidate centred view of (party) policy-making. For an overview see Aldrich (1995)

¹⁴In general, these ideological differences tend to differentiate parties along the left right axis.

¹⁵The assumption of fixed income preferences captures long term party ideological differences. For similar analyses, see Grossman and Helpman (1996) and Dixit and Londegran (1995).

¹⁶The analysis is unchanged if parties instead seek to maximize their probability of winning a majority in the legislature.

then it will field high caste candidates. This last assumption captures the often discussed fact that minority under-representation on party selection boards leads to an ex ante bias in party selection procedures against these groups. Overall, this characterization of party preferences implies that a party's choice variable is the proportion of jurisdictions in which it fields low caste citizens. This variable is denoted as $\pi_K \in \Pi \equiv \{0, \frac{1}{N}, \dots, 1\}$ where $K \in \{P, R\}$.

Finally, I describe the electoral and legislative institutions in this economy. My modelling of these institutions derives from the Indian experience. In India elections are characterised by single member plurality rule, and the legislature is Parliamentary. A number of recent political economy papers document the fact that Parliamentary systems of governance are usually associated with majority rule in the legislature and voting along party lines (Diermier and Feddersen 1998).¹⁷ These two features of a Parliamentary democracy are incorporated in the analysis. That is, I assume that legislators vote along party line, and that the transfers preferred by the majority party legislators are selected.

As a party's legislators share the same income identity, intra-party policy differences only arise from differences in legislators' caste identities. The final assumption regarding the functioning of political institutions concerns intra-party policy-making. The analysis assumes that party policies are a convex combination of the preferences of legislators belonging to the two caste groups. The weight attached to the preferences of legislators of each caste equal its share of the total.¹⁸

The analysis examines how the political equilibrium is affected by the introduction of an electoral law of political reservation. The implementation of such a law affects the functioning of the political process by restricting parties' feasible candidate set. Specifically, it forces parties to field low castes in (at least) the proportion $\hat{\pi}$ of jurisdictions that are declared reserved.

¹⁷For instance, in India this rule is enforced by party whips on most issues voted on in legislatures. Strict penalties exist for those who do not follow the whip.

¹⁸In a parliamentary democracy the majority party needs to maintain the support of its legislators. Hence this assumption can be justified as a solution to a bargaining game in which all legislators have some bargaining power.

2.3.2 Policy Choices

The sequence of events in the economy is as follows— the two parties select the proportion of jurisdictions in which to field low caste candidates. Then, citizens in every jurisdiction vote over the pair of candidates fielded by the parties. Finally, elected representatives select policies in the legislature.

As jurisdictions are identical I restrict attention to the case of identical electoral outcomes across jurisdictions. Therefore a party either enjoys (expected) electoral success in all jurisdictions, or in none. One implication of this is that the majority party's candidate and legislator sets coincide. This observation simplifies the analysis. It implies that the final policies associated with a party are completely characterized by two parameters: its (fixed) income identity and the proportion of jurisdictions in which it fields low caste candidates. The pair of transfers associated with a party may be denoted as $\delta^K(\pi_K; y_K)$ and $T^K(\pi_K; y_K)$ where $K \in \{R, P\}$.

In voting citizens seek to maximize their post redistribution incomes¹⁹. Majority rule implies that citizens will condition their voting strategy on the final policies associated with a party, rather than on those associated with any single candidate. A citizen's optimal strategy is to vote sincerely for that party's candidate whose final policies maximize her payoff.^{20,21} The proof is straightforward. If a voter doesn't affect the electoral outcome, then sincere voting can be maintained as an equilibrium outcome. If she does, then she will wish to vote so as to shift the final policy outcome towards her desired policy. In two candidate competition models (with weakly dominated voting strategies ruled out) this implies sincere voting.

I assume that indifferent voters abstain. If all citizens abstain, then the probability that either party is declared the majority party is a half.

¹⁹ A type (r, h) citizen favors no redistribution and a type (p, h) citizen non-targeted redistribution. A type (r, l) citizen favors targeted redistribution only if the group of poor low castes is small enough (on this, see proposition 1). Type (p, l) citizens always favor targeted redistribution.

²⁰Formally, let a type (i, c) citizen's voting decision be $\alpha_{ic} \in \{P, R\} \cup \{0\}$ with $\alpha(.) = \{\alpha_{il}, \alpha_{ih}\}_{i \in I}$ the associated type distribution of voting decisions. Citizens vote strategically (and no citizen uses weakly dominated strategies) s.t.

$$\alpha_{ic}^* = \arg \max_{\alpha_{ic}} \rho(\pi) U_{ic}^P(\pi_P) + (1 - \rho(\pi)) U_{ic}^R(\pi_R)$$

²¹In general sincere voting is not optimal if the elected legislature potentially consists of legislators from multiple parties (Austen-Smith 1989). However, with majority rule there exists a one to one mapping between the majority party's identity and policy outcomes such that sincere voting is optimal .

In this setup, party P 's optimal choice of the proportion of jurisdictions in which to field low caste candidates (π) solves:

$$\begin{aligned}\pi_P^* &= \arg \max_{\pi} n(\pi) \\ \text{if } n(0) &= n(\pi) \text{ for all } \pi \in [0, 1] \text{ then } \pi_P^* = 0\end{aligned}$$

where n is the number of jurisdictions. Party R 's optimization problem is similarly defined.

I focus on pure strategy equilibria of this entry game. With two-dimensional policy-making such equilibria may not exist, if the losing party can always affect the electoral outcome by changing π_k (i.e., no policy vector constitutes a Condorcet winner). However, as the strategy space is finite a mixed strategy equilibrium of the entry game will exist²².

A *political equilibrium* consists of a pair of party entry decisions $\pi (\equiv \{\pi_P, \pi_R\})$ and a vector of voting decisions, such that (π_P, π_R) is an equilibrium of the entry game supported by sincere voting by all citizen types. Let the probability that party P is the majority party be denoted as $\rho(\pi)$. Then, the probability that the policy outcome²³ is $\{T^P(\pi_P); \delta^P(\pi_P)\}$ is $\rho(\pi_P, \pi)$ and a type (i, c) citizen's expected utility is:

$$u_{ic}(\pi) = \rho(\pi) U_{ic}^P(\pi_P) + (1 - \rho(\pi)) U_{ic}^R(\pi_R)$$

where U_{ic}^K is her utility conditional on party K being the majority party.

The analysis examines how the introduction of an electoral law of political reservation affects the political equilibrium. Imposition of such a law restricts a party's feasible set of π . Each party must (at least) field low caste candidates in the reserved jurisdictions (that is $\pi_P^* = \arg \max_{\pi} u_P(\pi)$ s.t. $\pi \geq \hat{\pi}$). I define a political equilibrium as *non-neutral* if the policy outcomes differ before and after the introduction of an electoral law of political reservation. If policy outcomes

²²The set of possible mixed strategies is the probability distribution over Π . Let $\sigma_K(\pi_K, \pi)$ be party K 's strategy. An entry game equilibrium is a pair of mixed strategies (σ_P, σ_R) s.t. each party maximises its expected utility, given the other party's entry choice. A pure strategy political equilibrium exists if for some (π_P, π_R) , $\sigma_P(\pi_P, \pi) = \sigma_R(\pi_R, \pi) = 1$.

²³For mixed strategy equilibria, the probability that the final policy pair is $\{T^P(\pi_P), \delta^P(\pi_P)\}$ is $\sum_{\pi \in \Pi} \sigma_P(\pi_P) \sigma_R(\pi) \rho(\pi_P, \pi)$ and that it is $\{T^R(\pi_R), \delta^R(\pi_R)\}$ is $\sum_{\pi \in \Pi} \sigma_R(\pi_R) \sigma_P(\pi) (1 - \rho(\pi_P, \pi))$. Let the probability distribution over policies associated with some (σ_P, σ_R) be $\phi(\sigma_P, \sigma_R)$. Then a type (i, c) citizen's expected utility associated with an entry stage equilibrium $(\sigma_P(\pi), \sigma_R(\pi))$ is $u_{ic}(\phi(\sigma_P(\pi), \sigma_R(\pi)))$.

are invariant to the introduction of political reservation, then the equilibrium is *neutral*.

2.3.3 Analyzing Minority Representation

The analysis first identifies some reasons for why parties may not field low caste candidates. It, then, examines the policy effect of the introduction of an electoral law of political reservation in such situations. The analysis assumes that no single citizen type constitutes a population majority, but that the poor constitute a population majority ($N_p > \frac{1}{2}$). Throughout, the terms ‘low caste’ and ‘minority’ are used interchangeably.

Proposition 1 (*Budget Constraint effect*) *There exists a critical number of poor low caste citizens $\widehat{N}_{pl} \equiv \frac{N_{rh}r + N_{ph}p}{r-p}$, such that all legislators are high caste if $N_{pl} > \widehat{N}_{pl}$. In this case only non-targeted redistribution occurs.*

This proposition states that, if the number of poor low caste citizens is too large, then low castes fail to obtain political representation. The reasoning is as follows. The fact that the sum total of transfers must satisfy a budget constraint implies that increases in the poor low caste population share decreases the maximum feasible per-head level of targeted transfers. Whilst this does not affect poor low caste citizens preference for targeted redistribution, it adversely influences rich low castes preference for targeted redistribution. If $N_{pl} > \widehat{N}_{pl}$, then rich low castes favor no redistribution to targeted redistribution.

This, in turn, implies that the winning party will only field high castes. To see this consider a political equilibrium in which both parties only field high caste candidates. In this case no party is associated with targeted redistribution. However, parties’ fixed income identities implies their preferred levels of non targeted redistribution differs. Hence citizens vote along income lines, and party *P* wins. Now consider the losing party’s (party *R*) ability to affect this equilibrium. As long as $N_{pl} > \widehat{N}_{pl}$ rich citizens, irrespective of their caste, favor zero redistribution. Consequently all potential party *R* candidates are associated with no redistribution. Hence the losing party - party *R* cannot affect the level of redistribution it is associated with, and therefore citizens’ optimal voting decisions by it’s choice of π . The equilibrium in which all legislators are poor high caste citizens is stable. As it maximizes party *P*’s payoff, it is also the unique equilibrium.

The main insight afforded by this proposition is that increases in the group size of (some)

beneficiaries of targeted transfers which leave them less than a majority can adversely affect their policy influence. In this model, this also implies that minorities (poor low castes) will fail to obtain political representation.

Corollary to Proposition 1: *The equilibrium is non-neutral. There exists a critical value of political reservation $\tilde{\pi} \equiv \frac{N_r(r-p)}{N_p p + N_r r}$. If $\hat{\pi} < \tilde{\pi}$, then political reservation increases targeted transfers. If $\hat{\pi} > \tilde{\pi}$ then political reservation alters the winning party's identity such that a no redistribution outcome obtains.*

With political reservation parties must (at least) field low caste candidates in reserved jurisdictions. This does not affect the policies associated with party R (since all rich citizens favour no redistribution). Party P , however, is now also associated with targeted redistribution. The extent of targeted redistribution it chooses is increasing in the proportion of low caste candidates it fields (i.e. in π).

Therefore, rich citizens will continue to vote for party R . Interestingly, poor high caste citizens may switch to voting for party R if the proportion of jurisdictions reserved (and therefore the targeted redistribution associated with party P) is too high. That is, political reservation affects the political equilibrium by making citizens' caste based redistributive preferences relevant to their optimal voting decision.²⁴ This, in turn, may alter both the electoral outcome and the policies chosen. If $\hat{\pi} > \tilde{\pi}$ then the ensuing equilibrium the policies favored by the rich will be undertaken²⁵ (i.e. there will be no redistribution).

If, however, the proportion of jurisdictions reserved remains below $\tilde{\pi}$ then citizens' continue to vote along class lines and Party P wins. The policy outcomes, however, differ in that both targeted and non-targeted redistribution is undertaken. In both cases the winning party only fields low caste candidates in those jurisdictions which are declared reserved.

I now examine whether minority under-representation may persist even when all low castes favor targeted redistribution. Therefore assumption 1 holds for the rest of the analysis.

Assumption 1:

$$N_{pl} < \frac{N_{rh}r + N_{ph}p}{r - p}$$

²⁴There exists some qualitative evidence suggesting that legislation which targets a specific social group is often associated with the emergence of a politics of identity (Bardhan 1996).

²⁵It is possible to interpret this as a situation in which policy is captured by the 'minority elite'.

Proposition 2 (Demographic Effect) *All legislators are high caste if (i) high caste citizens form a population majority and (ii) caste preferences are politically decisive (that is , $N_{ph} < N_{rl}$). In this case only non-targeted redistribution occurs.*

If both parties only field high caste candidates, then party P wins (by the same logic as in proposition 1). However, the difference from proposition 1 is that assumption 1 holds. Therefore, the losing party (party R) can affect citizens' voting decisions by appealing to their caste based redistributive preferences. However, proposition 2 tells us that if $N_{ph} < N_{rl}$ and $N_h > \frac{1}{2}$ then party R cannot so affect the electoral outcome. The reason is that if $N_{ph} < N_{rl}$ then citizens' caste based preferences are *politically decisive*. That is, it is not possible for party R to choose a portfolio of candidates such that low, but not high, caste citizens vote along caste lines. Therefore, in situations where party R fields a non zero proportion of low caste candidates and gains the low caste vote it will lose the rich high caste vote. In the ensuing equilibrium all citizen types will vote along caste lines. High caste citizens will vote for party P which is associated with no targeted redistribution. As $N_h > \frac{1}{2}$ party P will win. Therefore, while party R can affect the basis of citizens' voting decisions it cannot affect the electoral outcome. Here it is the demographic composition of the population combined with the fact that citizens caste based preferences are politically decisive which militates against low caste political representation.

Corollary to Proposition 2 *The equilibrium is non-neutral. Political reservation increases targeted redistribution, but leaves the winning party's identity unaffected.*

The proof shows that with political reservation parties field low caste candidates in the reserved jurisdictions. Party P continues to enjoy electoral success. Party R cannot influence the electoral outcome by further increasing the proportion of low caste candidates it fields. The reason is the same as in proposition 2. Namely, that any such increase leads to citizens' voting on the basis of their caste preferences. High caste citizens vote for the party fielding fewer low castes - party P . As they form a population majority party P continues to win. Once again, it is the demographic composition of the polity which limits the extent of minority representation. The difference, of course, is that with political reservation the final policy vector includes both

targeted and non-targeted redistribution.^{26, 27}

A key assumption in this model is that candidates cannot commit to policies. This leads to parties conditioning candidate selection on candidate identity. In particular, the analysis shows that the winning party selects the candidates who share the policy preferences of a majority of voters. In situations in which the majority prefers zero targeted transfers are situations in which low castes fail to obtain political representation. The reason is straightforward. Since (poor) low castes favor targeted redistribution a party cannot both field low caste citizens and be associated with zero targeted redistribution.

The analysis identified two such situations.²⁸ In both cases the demographic composition of the political jurisdictions played a crucial role. Situations in which low castes formed a population minority and caste based preferences are politically decisive are characterized by minority under-representation. Importantly, situations in which the population share of poor low caste citizens was relatively large (but less than half) are also characterized by minority under-representation. In this case all other citizens (including rich low castes) unite in their opposition to targeted transfers.²⁹ The subsequent introduction of an electoral law of political reservation by forcing parties to alter their candidate set affects policy outcomes.

I now examine the real world relevance of this thesis. To do so, I exploit the existence of an electoral law of political reservation across Indian states. In particular, I use Indian state level data on the functioning of political reservation to examine the relationship between the presence of minority legislators and state level policy outcomes. Before doing so, I briefly discuss some empirically relevant generalisations of the theory.

²⁶If $N_h > \frac{1}{2}$ but $N_{ph} > N_{rl}$ then in many cases only mixed strategy equilibria exist. Conditional on party P fielding high castes party R can attract a majority of votes by fielding some proportion of low caste candidates. This leads to cycles where for each candidate mix a party puts forward there is another candidate set that the losing party can use to defeat it.

²⁷This analysis focuses on the relationship between the demographic composition of political jurisdictions and the extent of minority under-representation. Another reason why minority under-representation may arise is extreme party prejudice. Such a case would arise if a party prefers electoral defeat to winning but having to undertake targeted redistribution. Such situations may arise when the main national parties are ethnic parties. In these cases political reservation is, again, a powerful tool by which low castes may achieve policy representation.

²⁸In the cases analyzed parties' equilibrium choice of π coincided. This feature of the model can be related to papers such as Lindbeck and Weibull (1987) and Dixit and Londegran (1995). These papers show that if party policy potentially differs along a 'fixed' and a 'pliable' dimension then in equilibrium party policies on the pliable dimension will coincide, with party differences on the fixed policy dimension determining the winning candidates party identity.

²⁹Papers such as Cutler, Elmendorf and Zeckhauser (1993), Poterba (1997) and Gelbach and Pritchett (1997) make the same point

2.3.4 Generalizing the Results

This subsection discusses the robustness of the model to changes in some of its underlying assumptions. The focus is on assumptions which are relevant to the subsequent empirical analysis.

Choice of electoral law

The analysis modelled the introduction of political reservation as an exogenous change in the existing set of political institutions. In reality, such changes are also determined by the political process. This would suggest that the determination and policy consequences of such laws should be jointly modelled.

One way would be to consider a two period variant of our model— in period one elections are held and the elected legislators choose whether to change the electoral institution; in period two elections are held under the new electoral arrangements and the elected legislators select the levels of redistribution. Clearly, in stage 1 rational voters will anticipate the choice of political institutions associated with a policy-maker and will vote accordingly. In the situations identified in this model the electoral law of political reservation would not be implemented. For in period one a majority of citizens will vote for high caste legislators, whose policy preferences are for no political reservation.³⁰

A second way of modelling the choice of electoral institutions- which fits the Indian reality - is to postulate a constitution design stage prior to the game analysed in this section. In many countries members of constituent assemblies are nominated not elected. If these include a sufficient number of minority members (who would push for the introduction of such a law) then an electoral law of political reservation may be implemented. In India the fact that the head of the Constituent assembly was a low caste played a crucial role in the implementation of the policy of political reservation.

The empirical analysis deals with the potential endogeneity of the electoral law of political reservation by only analysing data for the post Independence period in India. The electoral law of political reservation was in existence for the entire period. However, the population basis

³⁰In general, this is a reason often cited for the observed persistence of the status quo political institutions in most countries.

of reservation induced exogenous cross state and time variation in the *extent of reservation*. The empirical analysis exploits this data variation. From the theoretical analysis we know that in situations of initial minority under-representation the introduction of a law of political reservation will lead to the winning party fielding low caste candidates (only) in the reserved jurisdictions. This suggests that subsequent population induced variations in the extent of political reservation will be associated with variations in both the number of minority legislators and policy outcomes.

Multiple minority groups

This analysis examines the case of a single minority group— low caste citizens. In most countries (India being no exception) multiple minority groups exist. Extending our analysis to cover such a case alters the quantitative results as the size and number of feasible voter coalitions changes. However, as long as (i) the minority groups are reasonably symmetric and (ii) the groups, taken together, do not constitute a population majority the qualitative aspects of the results generalize.

Inter jurisdiction heterogeneity

The analysis assumed that the demographic composition of jurisdictions is identical. However, in reality jurisdictions within a state differ in their demographic composition. In such a case, as long as policy-making occurs at the state level and policy outcomes are common across jurisdictions, citizens will continue to condition their vote on a party's entire vector of candidates. However, the identity of the winning candidates (and therefore a party's candidate set) is potentially affected by inter-jurisdictional heterogeneity. In general, introducing inter-jurisdiction heterogeneity in models of policy-making concentrates electoral competition in some 'swing' jurisdictions (for an example of this, see Persson and Tabellini 1998). That is, parties select the set of candidates favored by a majority of citizens in these jurisdictions.

It is clear that Indian states are likely to be characterised by substantial inter-jurisdiction heterogeneity. Therefore, for the theoretical analysis to be relevant for a state level analysis of policy-making I need two identifying assumptions. First, that the demographic characteristics of swing jurisdictions be such that minority under-representation results. The second identifying

assumption related to the fact that I capture the effect of demographic features on policy outcomes via state-level demographic data. For this to be appropriate it must be true that a state's demographic composition is correlated with the demographic composition of the swing jurisdictions.

2.3.5 Empirical Predictions

To conclude, I outline the main empirically testable predictions of the theory.

Prediction 1: *In situations where low castes constitute a population minority, they will fail to obtain political representation if :*

(i) (budget constraint effect) Poor low castes population share is large

(ii) (demographic effect) Poor low castes population share is relatively low, but caste preferences are politically decisive.

Prediction 2: *In situations of minority under-representation both the introduction of and variations in the extent of political reservation affect policy outcomes. This policy influence takes the form of increased targeted transfers and a reduction in the share of non targeted transfers.*

Corollary: *If, however, the extent of reservation is too high then the electoral outcomes may be affected by political reservation. In this case political reservation reduces both targeted and non targeted transfers.*

Finally, I note that a significant effect of legislator identity on the policies chosen may also be taken as evidence for, but not proof of, the lack of policy commitment on the part of legislators³¹.

2.4 The Context: Political Reservation in India

In this section I use a state level panel data set from India to empirically examine the relationship between minority representation and policy outcomes. To do so, I exploit the cross state and

³¹As with any such empirical test I cannot rule out other competing hypotheses. For in so far as I cannot isolate a single policy dimension in my empirical analysis I cannot directly test for the extent to which policy commitment is absent.

time variation in legislator identity induced by the functioning of the electoral law of political reservation across Indian states.

The main principles which guide elections in India were laid down in the Indian constitution in 1950. The constitution states that India is a federal democracy in which citizens elect representatives in single-member jurisdiction elections. The elections are winner-take-all elections with the top vote receiver being elected. Importantly, the 1950 constitution also provided for political reservation. Article 330 and 332 of the constitution state that prior to every state and national election a certain number of jurisdictions will be reserved. Only candidates belonging to a specified population group may stand for election in these jurisdictions. The entire electorate, however, participates in choosing amongst candidates so qualified.

The constitution provides such political reservation for two population groups: scheduled castes and scheduled tribes. For expositional ease, these groups are referred to as minority 1 (scheduled castes) and minority 2 (scheduled tribes). Together, the groups make up roughly 25 percent of the Indian population, of which minority 1 accounts for roughly two thirds (1991 census). The existence of the 'minority 1' population group relates to the Hindu caste system³² which assigns every individual at birth to a caste. Every caste occupies a (largely) determinate position in a hierarchical scale of ranks. Between two to three thousand castes exist, of which 779 of the most socially disadvantaged castes are identified³³ as members of minority 1. The population category 'minority 2' covers members of India's indigenous tribal population. Whilst the legal basis for group identification is social and common across states (Table 2.1), members of these groups tend also to be economically disadvantaged (Table 2.2).³⁴

The electoral law of political reservation (as set out in the Indian constitution) states that prior to every state level election a certain number of jurisdictions will be reserved (separately) for each of the two minorities. Two criteria for the selection of reserved jurisdictions. These are (i) the population concentration of the minority group in that jurisdiction and (ii) sufficient

³²Hindus make up approximately 85 percent of the Indian population (1991 Census). The genesis of the caste system is usually traced to the Aryan invasion of India in 1500 B.C. Caste groupings are endogamous with hereditary membership.

³³This group was first identified in a Government of India Act of 1935.

³⁴In case of minority 1 the cause is caste based restrictions on their social interaction and employment opportunities (Akerlof 1976). In contrast, the economic backwardness of minority 2 members is mainly due to their ecological and social isolation from the mainstream.

dispersal of reserved jurisdictions within the state. In case of minority 1 criteria (ii) has been the main determinant of reservation. Minority 1 citizens form a population minority in almost every state assembly level jurisdiction reserved for them³⁵. In case of minority 2 both criteria have been used. Minority 2 citizens constitute a population minority in approximately half of the jurisdictions reserved for them.

Regarding the extent of reservation, the Indian constitution states that the proportion of jurisdictions reserved for a minority should reflect its population share— as defined in the decennial census (Article 322, 1950 Indian constitution). The constitution also provides for population based readjustment of the proportion of jurisdictions reserved for a group.

The extent of political reservation for a minority in an Indian state is determined by the group's population share. However, changes in a group's population share and the extent of reservation it is afforded have not been contemporaneous. There are two reasons for this. The Indian constitution states that the basis for such readjustments must be the decennial census. Adjustment on the basis of anticipated population figures is disallowed. Hence, during a single census period the proportion of seats reserved for a group is usually adjusted twice - once on the basis of provisional census figures, and once on the basis of final census figures. The second reason for time lags in the population based readjustment of the number of seats reserved is that such adjustments can only occur at the point of election.

It is widely agreed that the presence of minority legislators in Indian state legislatures is mainly due to political reservation (Galanter 1978; Dushkin 1972). Table 2.3 shows that during the 1960s and 1970s almost all minority legislators³⁶ were elected from reserved jurisdictions. The second part of the table analyses minority representation in the upper houses of state legislatures (where no reservation exists). Due to the limited nature of the data I cannot conclude what the actual representation of minorities would have been in the absence of political reservation. Table 2.3 shows that while minority 2 representation in the upper houses of state legislatures remained relatively constant, minority 1 representation increased significantly. Therefore, based on this table I would conclude that while it is possible that minorities would

³⁵The minority 1 population share in reserved jurisdictions tends to be at best five to six percentage points higher than in unreserved jurisdictions.(Galanter 1984)

³⁶We were unable to get data for the 1980s and 1990s. However, the literature suggests that there have not been any dramatic changes in this trend (Mendelsohn and Vicziany 1998).

have attained significant political representation even in the absence of political reservation, the precise extent of representation would have differed.

There exists very little formal literature which analyses the influence that minority representation has had on state level policy-making across Indian states. Qualitative evidence on whether minority legislators have altered state level policy-making is mixed. Some authors, such as Baxi (1984), argue that increased minority representation has not affected state level policy-making in India. Instead, minority legislators' policy behavior has been largely determined by their need to appeal both to upper caste constituents in reserved jurisdictions and to the primarily upper caste membership of party plenary committees.³⁷ In contrast, authors such as Dushkin (1972), Joshi (1982) and Galanter (1984) claim that minority representation has influenced policy-making. Their main thesis is that minority legislators have tended to act *en bloc* and concentrate effort on increasing transfers to their own group: more cabinet positions for themselves, more scholarships and reservations in higher educational institutions and, above all, more government jobs³⁸.

Both theory and the existing qualitative literature provide important reasons for why increased minority representation in state legislatures may not have influenced state level policy-making. I, therefore, turn to an econometric analysis to formally assess the success of political reservation in influencing state level policy-making in India.

2.5 Testing for the Determinants of Policy Choices

The unit of observation in the econometric analysis is an Indian state. The federal nature of the Indian constitution implies that Indian state governments have important independent policy-making powers. Further, many of the subjects on which states enjoy sole jurisdiction relate to minority welfare. This suggests that it is appropriate to use an Indian state level panel data set

³⁷The relative poverty of minority group members has meant that attempts at forming minority political parties or interest groups have been largely unsuccessful.

³⁸Dushkin (1972) quotes instances of such activism during the 1967-72 national parliamentary session. The main national party Congress was defeated on the amendment, 'the opinion of the House (that) safeguards provided in the Constitution for the scheduled castes and tribes are not being fully implemented'. The defeat was primarily due to bloc voting by minority legislators. She also attributes the liberalisation of job reservation policy (July 1968, 1970), increased flexibility in targeted educational subsidies (1969), and a stiffening of the untouchability offences act (1970) to their influence.

to analyze the relationship between minority representation and policy outcomes. Whilst the electoral law of political reservation has been in force during the entire data period, the extent of political reservation has exhibited cross state and time series variation. The analysis exploits this exogenous variation in legislator identity, induced by the functioning of the electoral law, to examine the relationship between minority representation and state level policy choices.

To do so, I use a data set which covers 16 major Indian states and spans the years 1957-1992. These states account for over 95 percent of the Indian population. The data set contains state level data on policy outcomes, the proportion of seats reserved for minority 1 and minority 2 in state legislatures and other variables characterizing state demographic composition and income distribution. Due to data availability reasons the precise time coverage varies across regressions.

Table 2.4 describes some salient economic and demographic features of these states. Minority population shares exhibit considerable inter state variation. Whilst all states have some minority 1 population, three states do not have any minority 2 population³⁹. The economic characteristics of Indian states— measured by per capita state income, Gini coefficient and levels of state expenditure and revenue, also exhibit significant cross state differences.

Table 2.5 provides means and deviations for the variables entering the analysis. I control for minority presence in a state's legislature by including data on the proportion of seats reserved for each of the two minorities in the state legislature. As discussed earlier this is a very good proxy for total minority presence in the legislature. I use data on minority population shares to control for voter identity. Time-lags in the population based readjustment of the extent of reservation afforded to a group implies that the correlation between contemporaneous changes in the population and reservation series is weak (on this also see the further results section). Hence the population and reservation series are not observationally equivalent.

To control for other time varying state specific controls I include public finance data on state income per capita and federal grants per capita. These provide a measure of the state budget constraint. I also include information on state level income inequality. However, this data is only used for robustness checks. This is both due to restricted data availability for

³⁹Three states contain nearly half of the minority 2 population: Madhya Pradesh, Orissa, and Bihar. In contrast Punjab, Haryana, J&K and UP until 1974 have no jurisdictions reserved for minority 2.

these series, and the more general worry that these variables are partially determined by the dependent policy variable.

In taking theory to the data, the first question that arises is whether the demographic features of Indian states are such that minority under-representation is likely (for the reasons discussed in the theory section). From table 2.4 shows that the first requirement of our theory— that, the two minority groups constitute a population minority is satisfied in every state. Unfortunately, due to the lack of caste wise income data we cannot further test the theoretical predictions regarding the causes of minority under-representation. However, the summary statistics in Table 2.2 show that the incidence of poverty is much higher amongst minorities (the poverty rates amongst minority 1 and minority 2 groups were one and a half times that of the general population in 1987). Also, if we regress state-level income inequality measure (Gini) on minority population shares we find that increases in minority 1's population share are associated with greater inequality. The same is true of minority 2, though the effect is less significant.⁴⁰ These results are suggestive of the thesis that, absent political reservation, these two minorities would have been politically under-represented for two reasons. First, because they constitute a population minority. Second, because of the relatively high poverty rates in these groups (the budget constraint effect).

The data analysis focusses on analysing the influence of minority representation on an array of state level public policy. This provides a direct test of the relationship between legislator identity and policy outcomes (after controlling for voter effects).⁴¹ The analysis, I distinguishes between policies on the basis of who the intended beneficiaries are. Policies that do not use group identity to discriminate between recipients are termed general policies. Policies that aim to transfer resources only to minority members are termed targeted⁴². This characterization applies both to the public finance and asset redistribution variables considered.

The general public finance variables considered are *total state expenditure per capita* and the share going to *education*. Roughly 21 percent of an average Indian state's budgetary expenditure is allocated to education. The determinants of these general policies are contrasted with those of

⁴⁰The point estimates are 0.42 for minority 1 (with a t-statistic of 5.2) and 0.16 for minority 2 (with a t-statistic of 1.76).

⁴¹This can be seen as a weak test of the policy commitment model. If there is full policy commitment then policy variation should be related to variation in demographic composition.

⁴²The Indian constitution explicitly provides for 'group' identification for purposes of public policy making.

two targeted policies: the share of state expenditure going to '*minority 1 welfare*' and '*minority 2 welfare*'. On average, between three to four percent of an average Indian state's expenditure is allocated to these two categories. Due to data non-availability, the public finance regressions are for the shorter time period 1974-1992. In case of minority 1 welfare, the available data series is for an even shorter period (1980-92).⁴³

Two asset redistribution policies are also examined. The general policy analyzed is a cumulative land reform index⁴⁴. The targeted policy analyzed is total state level job quotas for minority 1 and 2. The variable considered in the analysis is the determinants of total reserved jobs (i.e. minority 1 jobs + minority 2 jobs).⁴⁵ The Indian constitution provides for job quotas for the two minority groups in government services. The precise extent of job quotas in any state government service is under the state government's jurisdiction ⁴⁶. The regressions that consider asset redistribution policies span the time period 1957-1992. Further details of variables that enter the analysis are in the data appendix.

2.5.1 Empirical Model

Empirically, I wish to estimate the impact of variations in the extent of minority representation on state level policy outcomes, while controlling for the state's demographic composition. Such an estimation procedure serves two purposes. First, it allows us to examine whether legislator identity matters. Second, including additional data on state demographic composition allows a (weak) test of the competing models of political economy. Specifically, with full policy commitment (and controlling for the demographic composition) we should not expect variations in minority representation to affect policy outcomes. However, with incomplete policy commitment, we expect variations in the extent of political representation to affect policy outcomes. In particular, our theory predicts that increased minority representation should be associated with increased targeted redistribution. In contrast, non-targeted redistribution should fall.

⁴³Since, the data period covered by regressions vary, I always check that the results are not sensitive to the time-period considered.

⁴⁴This variable was constructed by Besley and Burgess. It is a count data series that cumulates the land reform acts passed by a state. For details, see Besley and Burgess (1998).

⁴⁵The reason for this is that some states have legislated on job quotas for these two groups jointly

⁴⁶A number of authors have discussed the high levels of political activism associated with the determination of job quotas. See for example, Narayana (1980) as well as various reports of the Commissioner for Scheduled Castes and Scheduled Tribes.

Therefore, in the reported regressions I include minority population shares in a state (P_{jt}) and the proportion of seats reserved for the minority in the state legislature (R_{jt}) as explanatory variables. I start by using the Indian state level panel data set to estimate linear equations of the form:

$$O_{jt} = \alpha_j + \beta_t + \gamma_1 R_{jt} + \gamma_2 P_{jt} + \gamma_3 D_{jt} + \varepsilon_{jt} \quad (2.2)$$

where O_{jt} is some state level public policy outcome in state j at time t , R_{jt} is a vector whose two elements characterize the proportion of seats reserved for the two minority groups. The vector P_{jt} denotes minority state population shares. D_{jt} is an electoral dummy which takes a value of one in the election year, and zero otherwise.

The constitutionally specified basis for state level reservation is population. Therefore, this estimation strategy is appropriate if changes in a group's population share are uncorrelated with contemporaneous changes in policy outcomes (an issue to which I return later). As changes in the extent of reservation can only occur at the point of election, it is important to ensure that policy variation attributed to changes in the extent of reservation is not simply proxying the electoral cycle. Hence, I include an electoral dummy variable D_{jt} . α_j is a state specific fixed effect and β_t is a year dummy variable. State fixed effects⁴⁷ control for time invariant differences across states which may influence policies. These include, among others, permanent differences in state economic structures. Year effects take account of any impact of time related macro shocks to the economy as a whole on policy outcomes. Examples include political shocks (e.g. declaration of the nationwide 'emergency' in 1977), climatic shocks (e.g. droughts) and wars.

The main coefficients of interest are γ_1 and γ_2 . If γ_1 is insignificant then variations in extent of minority representation have no independent policy effect. The coefficient γ_2 captures the voter group size effects. Theory suggests that this variable's significance should differ across general and targeted policies. In the former case, γ_2 captures minority groups direct 'voter influence'. In the latter case, it has an additional indirect effect. As increases in a minority's population share make provision of the same level of per head targeted transfers a

⁴⁷The inclusion of state level fixed effects implies that the impact of political reservation and demographic and economic variables on policy outcomes is identified from deviations from state means over this period.

more expensive proposition, this would tend to negatively affect non-minority citizens' preferred levels of targeted transfers.

The rest of this section proceeds as follows. I first report the basic results where policy outcomes are conditioned on the proportion of seats reserved for the two minority groups and their population shares. I, then, provide a series of robustness checks and extensions. These include a discussion of exogeneity and identification concerns, an analysis of the relative importance of legislator party and group identity in influencing policy and an examination of how regional (North-South) differences influence the relationship that legislator identity bears to policy outcomes.

2.5.2 Basic Results

Table 2.6 reports the regression results for the basic specification. Columns (1)-(3) analyze general policies, while columns (4)-(6) consider targeted policies. All regressions are estimated by OLS, except the land reform index. As land reform data is count data, Poisson regressions are reported for this case.

Variations in the proportion of minority legislators (as measured by the proportion of seats reserved for them) do not significantly affect total per capita expenditure. However, the share of expenditure going to education is negatively influenced by increases in the share of minority 1 legislators. This is suggestive of the thesis that increased minority representation adversely affects non targeted transfers— in this case education. However, variations in the share of minority 2 legislators don't affect general policies. In marked contrast, targeted policies respond significantly to changes in the extent of minority representation. Minority 2 legislators have a positive and significant effect on both the percentage of total state expenditure going to minority 2 welfare (column (5)), and on job quotas. Similarly, job quotas responds positively to the extent of political reservation afforded to minority 1. The only targeted policy unaffected by political reservation is minority 1's welfare expenditure.⁴⁸

The results support the thesis that increased minority representation has affected state level policy making in India. Data suggests that such increases in representation have raised

⁴⁸It is worth noting that the data available for this series is much more restricted. Results reported later in the paper also suggest that this insignificance is partly driven by the netting out of opposing party and regional effects.

the levels of targeted transfers. There is no evidence that this has been accompanied by an increase in total expenditure. Instead the levels of the non targeted transfer— education were reduced by increases in minority 1 representation. An analysis of the point estimates suggests that the effect is non-trivial. For instance, a one percentage point increase in the proportion of seats reserved for minority 2 raises the minority 2's welfare expenditure share by 0.9 percentage points. Back of the envelope calculations suggest that the implied elasticity is over one.

Turning to the relationship between a minority group's population share and policy outcomes, the evidence is mixed. General policies such as education expenditure share and land reforms enacted are positively influenced by minority 1's population share. A one percentage point increase in minority 1's population share raises education spending by 0.8 percentage points. One interpretation is that the demand for education and land reform is high among members of this group. This is a reasonable interpretation as both illiteracy and landlessness are prevalent amongst members of minority 1. In contrast, minority 2's population share has a significant negative influence on both policies. This finding, while surprising at first, is consistent with the very low levels of political activism amongst minority 2 members (Galanter 1984).

A similar pattern exists for targeted transfers. In general, increases in minority 1's population share raises job quotas and reduces expenditure on minority 2 welfare spending. Minority 2's population share exerts a negative but insignificant influence on policy outcomes.

To address the concern that political reservation variables may simply be proxying for omitted time varying state specific variables table 2.7 reports results that include additional controls. Two measures of the state budget constraint are included— per capita state income and per capita federal grants. Changes in the budget constraint may be expected to influence the shares of expenditure going to different categories. I also include an additional control for voter preference— the Gini coefficient. These controls are lagged as unobserved shocks to such variables may be correlated with contemporaneous shocks to policy outcomes. As data availability for some of these series is restricted, the number of observations per regression differ from table 2.6.

The difference is that the influence of minority 2 legislators on job quotas is not robust to the inclusion of additional variables. Data analysis shows that this is mainly driven by the

state income variable. Also the negative relationship between minority 1 representation and education is much less significant. All other results are robust to this specification. Minority legislators continue to positively influence the levels of own group targeted transfers. Per capita state income, while positively correlated with total per capita expenditure, has no significant effect on the sectoral distribution of general expenditure shares, and a negative effect on targeted expenditures.⁴⁹ The same is true of the state level income inequality variable.

2.5.3 Further Results

Exogeneity and Identification

The Indian constitution states that the proportion of jurisdictions reserved for a minority group should reflect its population share. Further, the extent of reservation should be readjusted after every decennial census. Time lags in the population based readjustment of reservation implies that the population-reservation relationship can be captured by an equation of the form:

$$R_{jt} = \phi P_{jt-n} + \nu_{jt}$$

If changes in group population shares are not correlated with changes in the policy-making process then the extent of reservation may be considered exogenous to the policy-making process.

Linguistic and cultural differences across Indian states have meant that interstate migration rates are very low (they constituted roughly 5% of an average state's total migration in 1991 – see Cashin and Sahay 1995). Net interstate migration rates, on average, account for less than 1% of the population growth rate. Further, census data suggest that no significant cross group migration differences exist, and that the main cause for changes in group population shares is differentials in birth and death rates. Therefore, as long as these fertility changes are not driven by contemporaneous changes in state level policy variables state level population changes in

⁴⁹This finding squares with the conventional wisdom that the growth in public expenditure across Indian states is primarily due to increased expenditure on non-developmental items, such as wages and interest payments (Rao and Sen 1993). One may also conjecture that these findings are consistent with the thesis that state level policy-making in India has not had a primarily developmental basis - for in that case we would have expected a state's level of development (as measured by state income or more generally by the gini coefficient) and the sectoral distribution of government expenditure to be inversely related.

India are relatively exogenous to the policy-making process.

I, now, turn to the issue of identification. My identification strategy is based on the fact that while minority population shares vary annually, adjustments in the proportion of seats reserved for a group occur with a time lag. This is for two reasons. The proportion of seats reserved for a group can only be adjusted at the point of election. Further, the Indian constitution states that the basis for such readjustments must be the decennial census.^{50,51} Both these facts imply low correlation between contemporaneous changes in the population and reservation series (as we are running panel regressions the relevant correlations are correlations of deviations from the mean for the two series). These correlations are 0.22 and 0.18 for minority 1 and minority 2 respectively (table 2.8a).

Table 2.8b provides a regression analysis of the same. Columns (1) and (3) examine the raw correlation between a minority group's population share and the proportion of jurisdictions reserved for it. The correlation is positive and high, confirming that population shares are the primary basis for reservation. Columns (2) and (4) examine the role of the election dummy and time and state effects in mediating this relation. The difference is dramatic. The relationship between population and reservation series remains positive and significant, but both the point estimate and the t-statistic fall. Whilst this suggests that movements in these two series is not identical, multicollinearity remains a potential worry - especially in case of minority 2. Therefore, I re-ran the reported regressions with either only the population series or the reservation series entering the regression⁵². There were no major swings in parameter values or sign changes in coefficient values across regressions.

As a further check, I considered two variants of the basic regression. These regressions used alternative measures of voter strength. The first utilized information about the electoral cycle. I entered a weighted population share of a group as the population variable, where the weight took a value of one in an election year and values less than one in non-election years⁵³. The identifying assumption underlying this specification is that as citizens mainly influence policy-

⁵⁰ Often within a single census (ten year) period the extent of reservation is changed twice. Once on the basis of the provisional census figures and once on the basis of final population figures.

⁵¹ The constitutional requirements imply that the election commission never uses projected population as the basis of reservation.

⁵² These results are available from the author

⁵³ Minority population share were weighted in non election years by a weight x where $x = \frac{1}{\text{no. of years to election}}$.

making by voting⁵⁴. Therefore their influence is strongest in election years. The regression results were robust to this specification. The second case used census age distribution data to measure voter strength. Specifically, only population shares of citizens over the age of 18 were included. Again, the results were robust to this specification.

A final concern is that the true relationship between policy outcomes and population shares is non-linear, and that it is this effect which is being picked up by the reservation series. I, therefore, ran a number of regressions in which the population variable entered non-linearly. The results were not affected.

Party Identity versus Group Identity

The theoretical analysis assumed long term income based ideological differences between political parties. The analysis suggested that these differences should be reflected in party candidate choice. If this is correct, then changes in both a legislator's group and party identity should be correlated with changes in policy outcomes. The model also predicted that variations in the extent of political reservation may affect electoral outcomes. This section examines the empirical validity of these theoretical predictions regarding the role of political parties in mediating the relationship between legislator identity and policy outcomes.

The empirical analysis restricts attention to two Indian political party groupings - the Congress party and a Left party grouping⁵⁵. The latter includes major national left wing parties and Janta parties. In general such a grouping may obscure important inter-party differences. However, in this case further subdivision of each party grouping into its constituent parties leaves results unaffected.

The empirical analysis is in two parts. Table 2.9 examines the relationship between a party's electoral performance, minority population shares and the extent of political reservation. Party ideological differences, if present, should affect the electoral support that parties command from different population groups. I find that minority 1's population share is positively correlated

⁵⁴There could be the alternative thesis that voters lobby. In that case the identification strategy would be invalid. However qualitative evidence suggests that there have been very few successful minority political lobby groups.

⁵⁵The parties contained in the the political groupings are: (i) Congress party (Indian National Congress + Indian Congress Socialist + Indian National Congress Urs + Indian National Congress Organization) (ii) Non Congress Parties: (a) Hard Left parties (Communist Party of India+ Communist Party of India Marxist) , (b) Soft Left parties (Praja Socialist Party + Socialist Party) and (c)Janta Parties (Janta Party + Janta Dal Party + Lok Dal Party)

with the left party's share of seats. This is consistent with the idea that the party associated with greater redistribution commands support from members of the group with relatively high poverty rates. In contrast, minority 2's population share does not significantly influence either parties electoral performance. This is probably due to the group's relatively small size, and their relative isolation from the mainstream.

I also find that the left party's seat share increases with the extent of political reservation. This finding is consistent with either of two hypotheses. First, that parties are also (partially) segregated on caste lines with the left party representing low castes. Second, that increases in the extent of reservation alters the policy mix associated with either party such that citizens switch their votes to the left party.

Table 2.10 report the results of regressions where we estimate the relationship between legislator party and group identity and policy outcomes. These regressions include as explanatory variables both the total proportion of seats reserved for a minority and the proportion of reserved seats won by each of the two party groupings. The latter is defined as the ratio of reserved seats won by a party to total seats. The relationship between the total proportion of seats reserved for a group and policy outcomes is as in the previous section. In addition, the results show that in the case of targetted transfers minority legislators party identity has additional explanatory power. The presence of left party minority legislators positively increase the transfers targeted towards that group. The evidence in case of Congress legislators is similar but weaker. The only exception is the impact of minority 2 legislators on job quotas. Further, for every targeted policy I am able to reject the hypothesis that legislators' belonging to the same party but different groups exhibit similar policy behavior.

North-South Differences

Our model of legislator behavior assumed that the marginal policy influence of an additional minority legislator is constant. This section examines the validity of this assumption.

The first hypothesis examined is whether the level of societal prejudice affects minority legislators' policy influence. If a minority legislator's absolute policy influence is greater in states where minorities face less oppression, then we should expect minority 1 legislators policy influence to be higher in South Indian states. The caste structure in Southern states is both less hierarchical and less oppressive. In addition, these states have been witness to long-lived

successful anti-caste movements. The second hypothesis examined is whether minority legislators policy influence is increasing in their numerical strength. If yes, then minority 2 legislators in Northern states should exhibit higher policy activism. The population share of minority 2 is below 5% in all Southern states.

To examine these hypotheses I run regressions of the form:

$$P_{jt} = \alpha_j + \beta_t + \gamma_{1s}R_{jt} + \gamma'_1R_{jt}D'_{jt} + \gamma_2C_{jt} + \gamma_3D_{jt} + \varepsilon_{jt} \quad (2.3)$$

where D'_{jt} is a dummy which takes the value of one for North Indian states. The coefficient γ_{1s} is a measure of the impact of political reservation in Southern states while the coefficient of $R_{jt}D'_{jt}$ is informative of North South differences ($H_0 : \gamma'_1 \equiv \gamma_{1n} - \gamma_{1s} = 0$).

Table 2.11 presents estimates of equation (2.3). Political reservation continues to have a largely insignificant effect on total expenditure, and there is some (weak) evidence that increases in share of minority 1 legislators reduce education spending. Turning to targeted outcomes there is evidence of regional differences. Minority 1's welfare expenditure is largely unaffected by variations in the extent of political reservation, though there is weak evidence of opposing North-South effects. In case of minority 2 welfare expenditure, we find that the positive influence of minority 2 legislators is driven by minority 2 legislators in North Indian states. This finding supports the thesis that the numerical strength of legislators matters.

In case of job quotas, the evidence on North South differences is mixed. For both groups there is evidence of significant North South differentials. Further, the positive relationship between the political reservation and job quotas appears to be driven by political activism by minority legislators in Northern states.

Overall, the empirical results support two thesis. First, that minority representation affects (some) policy outcomes. Second, the extent to which minority representation affects policy outcomes depends on factors such as the party identity of legislators, the overall level of societal discrimination and the total numerical strength of minorities in the legislature.

2.6 Concluding Remarks

This chapter makes two main contributions. First it provides a theoretical framework for thinking about the policy influence of electoral laws that increase minority representation. Second, it uses an Indian state level panel data set to examine the relationship between minority representation in state legislatures and policy outcomes. The empirical results demonstrate that increased minority representation in Indian state legislatures have raised the level of transfers going to these groups. The findings have significant implications for policies that try to change outcomes by increasing political power of disadvantaged groups.⁵⁶

The theory developed in this chapter has three key features. First, both a citizen's income and ethnic identities may form the basis for redistribution. Second, electoral candidates cannot commit to policy announcements. Third, the political process is characterised by Plurality rule in elections and a Parliamentary form of legislature. The analysis identifies reasons for why these features of the model imply that a legislator's identity influences final policy outcomes. Further, the analysis identifies circumstances under which this leads to parties not fielding minority candidates. In such situations of minority under-representation, introduction of an electoral law of political reservation will alter policy outcomes, primarily by increasing the level of targeted transfers.

This prediction is in sharp contrast to that afforded by political economy models which assume that politicians can commit to policies during elections⁵⁷. In such models, parties directly commit to policies that maximize their expected utility. Party candidates are rendered mere vehicles of party policy and candidate identity is irrelevant to the choice of final policies. Instead, the winning party⁵⁸ directly commits to policies favored by a majority of voters⁵⁹. Therefore, the extent of minority 'policy' under-representation only depends on the composition of the electorate. Whilst the introduction of an electoral law of political reservation may increase the number of minority legislators, it will not influence policy outcomes.

To discriminate between the predictions of these two competing models of political economy

⁵⁶Clearly, further research is needed to analyze fully the welfare implications of such increased targeted transfers.

⁵⁷A similar reasoning applies if we instead assume that candidates only care about electoral success.

⁵⁸This is conditional on there existing a pure strategy political equilibrium.

⁵⁹That is, the policy that constitutes a (strict) Condorcet winner. In many economic environments, this is the median voter's preferred policy.

I develop an empirical test using Indian data. My principal empirical finding is that legislator identity has influenced policy choices across Indian states. This influence has primarily taken the form of increased targeted transfers. These results provide some credence to the idea that politicians are unable to commit to policy announcements.⁶⁰ More generally, the empirical analysis stresses the importance of taking political economy models to data. Only in this way are we able to discriminate between the predictions of competing models as regards factors such as the policy significance of legislator identity, and whether politicians can commit to policy announcements.

This chapter's findings are encouraging to the idea that electoral data is an important resource in analyzing the determinants of policies undertaken by governments of developing countries. This is significant as, unlike much other data from these countries, electoral data is usually easily available and easily verifiable. In addition, electoral data exhibits sufficient time series and cross section variation to be of use in analyzing issues of economic interest. Political economy concerns strongly constrain which types of policies are implementable in developing countries. Therefore, gaining a better understanding of the determinants of the policy formation process is critical to the formation of effective policy. This type of analysis, which relies on a blend of theory and empirical testing, is well suited to such purpose. Finally, it is worth noting that analyses such as this also provide important insights regarding the optimal design of political constitutions - an issue of particular significance for those countries or regions which are ethnically, culturally or religiously diverse.

⁶⁰The results echo the findings of papers that test for the median voter theorem in the US (Levitt 1996). These papers conclusively reject the median voter theorem for the US and find evidence that senators' simply vote according to their ideology without regard for the interests of the electorate or party ideology. We conjecture that this paper sheds some light on senator ideology. Specifically, it appears that one economically relevant component of 'ideology' is a legislator's ethnic identity.

2.7 Appendix

2.7.1 Mathematical Appendix

The proofs use the notation $U_{ic}^K(\pi_K)$ to denote a type (i, c) citizen's utility when party K fields π_K proportion of low caste candidates and is the majority party. The voting decision of a type (i, c) citizen is denoted as $\alpha_{ic} \in \{P, R\} \cup \{0\}$

Proof of Proposition 1

Let $\widehat{N}_{pl} \equiv \frac{N_{rh}r + N_{ph}p}{r-p}$. I demonstrate that if $N_{pl} > \widehat{N}_{pl}$ then in the ensuing political equilibrium parties choose $\{\pi_K = 0\}_{K \in \{R, P\}}$; citizens vote sincerely and party P 's candidate wins in every jurisdiction s.t. $\rho(0, 0) = 1$. The proof proceeds as follows. I first characterize the political equilibrium when $\{\pi_K = 0\}_{K \in \{R, P\}}$. I then verify that $\{\pi_K = 0\}_{K \in \{R, P\}}$ form a pair of best responses.

With $\{\pi_K = 0\}_{K \in \{R, P\}}$ party R is associated with the following policies:

$$\delta_i^R(0) = 0; T^R(0) = 0 \quad \forall \pi_R \in \Pi \quad (2.4)$$

and party P with

$$\delta_i^P(0) = 0; T^P(0) = \frac{N_{pp} + N_{rr}}{N} \quad (2.5)$$

In voting, citizens anticipate these policies and vote sincerely. A type (i, c) citizen votes for the party who's final policies maximize her utility U_{ic} . In identifying citizens optimal voting behavior I can restrict attention to a single jurisdiction. This is because both the demographic composition of jurisdictions and the level of transfers provided across jurisdictions are identical. Therefore identical electoral outcomes can be sustained in every jurisdiction.

In any single jurisdiction citizens compare policies of the two parties such that the optimal (sincere) voting strategies (α_{ic}) are:

- (i) For type (r, h) citizens $U_{rh}^R(0) > U_{rh}^P(0)$ as $r > \frac{N_{pp} + N_{rr}}{N}$. Therefore $\alpha_{rh}^* = R$
- (ii) For type (p, h) citizens: $U_{ph}^R(0) < U_{ph}^P(0)$ as $p < \frac{N_{pp} + N_{rr}}{N}$. Therefore $\alpha_{ph}^* = P$
- (iii) For type (r, l) citizens: $U_{rl}^R(0) > U_{rl}^P(0)$ as $r > \frac{N_{pp} + N_{rr}}{N}$. Therefore $\alpha_{rl}^* = R$
- (iv) For type (p, l) citizens: $U_{pl}^R(0) < U_{pl}^P(0)$ as $p < \frac{N_{pp} + N_{rr}}{N}$. Therefore $\alpha_{pl}^* = P$

These voting strategies are easily understood. With $\{\pi_K\}_{K \in \{R, P\}}$ no party undertakes

targeted redistribution. Hence, citizens vote along income lines. Types (r, h) and (r, l) citizens vote for party R and types (p, h) and (p, l) for party P . Further, as $N_p > \frac{1}{2}$ party P 's candidate wins. By symmetry, party P 's candidate wins in every jurisdiction. The final policies are given by (2.5).

This constitutes an equilibrium if and only if $\{\pi_K = 0\}_{K \in \{R, P\}}$ constitute a pair of best responses. Before I prove this, note that rich low caste citizens do not desire targeted redistribution if $r > \frac{N_p p + N_r r}{N_l}$. By rearranging terms, this condition can be rewritten as $N_{pl} > \widehat{N}_{pl}$. That is, if $N_{pl} > \widehat{N}_{pl}$ then irrespective of the value π_R takes party R is associated with no redistribution (as given in (2.4)). This is as (2.4) is the preferred policy outcome of all rich citizens.

This, in turn, implies that conditional on $\pi_P = 0$ any deviation by party R to $\pi_R > 0$ will leave party R 's policies unaffected. Hence the voting decisions will remain unaltered such that $\rho(0, 0) = \rho(0, \pi_R) = 1$. Consequently $u_R(0, 0) = u_R(0, \pi'_R) \forall \pi'_R \in \Pi \setminus \{0\}$. Therefore party R cannot alter its final payoff by its choice of π_R and $\pi_R = 0$ is a best response for party R . For party P it is easily shown that $u_P(\pi'_P, 0) < u_P(0, 0) \forall \pi'_P \in \Pi \setminus \{0\}$. Clearly, as party P 's expected utility is maximised with $\pi_P = 0$, it constitutes a best response ■

Corollary to Proposition 1

Introduction of an electoral law of political reservation restricts parties feasible set of entry choices, such that $\pi_K \in \Pi' = \{\widehat{\pi}, \dots, 1\} \forall K \in \{R, P\}$. The proof demonstrates that conditional on $N_{pl} < \widehat{N}_{pl}$ the ensuing political equilibrium is characterized by party entry choices $\{\pi_K = \widehat{\pi}\}_{K \in \{R, P\}}$; sincere voting by citizens and $\rho(\widehat{\pi}_P, \widehat{\pi}_R) = 1$ if $\widehat{\pi} < \frac{N_r(r-p)}{N_p p + N_r r}$; and $\rho(\widehat{\pi}_P, \widehat{\pi}_R) = 0$ if $\widehat{\pi} < \frac{N_r(r-p)}{N_p p + N_r r}$. For simplicity, I assume $\widehat{\pi} \neq \frac{N_r(r-p)}{N_p p + N_r r}$. The proof proceeds as in proposition 1.

With $\{\pi_K = \widehat{\pi}\}_{K \in \{R, P\}}$ then party R 's policies are

$$T^R(\widehat{\pi}) = 0; \delta_l^R(\widehat{\pi}) = 0 \quad (2.6)$$

while those associated with party P are

$$T^P(\widehat{\pi}) = (1 - \widehat{\pi}) \left(\frac{N_p p + N_r r}{N} \right); \delta_l^P(\widehat{\pi}) = \widehat{\pi} \left(\frac{N_p p + N_r r}{N_l} \right) \quad (2.7)$$

The associated voting behaviour in a jurisdiction are:

(i) For type (r, h) citizens: $U_{rh}^R(\hat{\pi}) > U_{rh}^P(\hat{\pi})$ as $r > (1 - \hat{\pi}) \left(\frac{N_p p + N_r r}{N} \right)$. Therefore $\alpha_{rh}^* = R$.

(ii) For type (p, h) citizens: $U_{ph}^R(\hat{\pi}) > U_{ph}^P(\hat{\pi})$ if $p > (1 - \hat{\pi}) \frac{N_p p + N_r r}{N}$

$$\Rightarrow \hat{\pi} > \frac{N_r(r - p)}{N_p p + N_r r} \quad (2.8)$$

Therefore $\alpha_{ph}^* = R$ if (2.8) holds, else $\alpha_{ph} = P$.

(iii) For type (r, l) citizens: $U_{rl}^R(\hat{\pi}) > U_{rl}^P(\hat{\pi})$ if $r > (1 - \hat{\pi}) \left(\frac{N_p p + N_r r}{N} \right) + \hat{\pi} \left(\frac{N_p p + N_r r}{N_l} \right)$. This is true as long as $N_{pl} > \hat{N}_{pl}$. Therefore $\alpha_{rl}^* = R$.

(iv) For type (p, l) citizens: $U_{pl}^R(\hat{\pi}) < U_{pl}^P(\hat{\pi})$ as $p < (1 - \hat{\pi}) \left(\frac{N_p p + N_r r}{N} \right) + \hat{\pi} \left(\frac{N_p p + N_r r}{N_c + N_d} \right)$.

Therefore $\alpha_{pl}^* = P$.

To characterize the electoral outcome I distinguish between two cases, depending on whether (2.8) holds.

I. If (2.8) holds then types (r, h) , (p, h) and (r, l) citizens vote for party R 's candidate. By assumption, $N_{pl} < \frac{1}{2}$. Therefore, party R 's candidate wins in every jurisdiction. In this case $\rho(\hat{\pi}, \hat{\pi}) = 0$ and the final policies are given by (2.6).

To prove that this constitutes a political equilibrium, I need to show that $\{\pi_K = \hat{\pi}\}_{K \in \{R, P\}}$ constitute a pair of best responses. Note that the existence of an electoral law of political reservation implies that neither party can deviate to $\pi < \hat{\pi}$. It follows from my characterization of citizens' voting strategies that a deviation by party P to $\pi' > \hat{\pi}$ leaves voting decisions unaffected. Hence $\rho(\pi', \hat{\pi}) = \rho(\hat{\pi}, \hat{\pi}) \forall \pi' \in \Pi' \setminus \{\hat{\pi}\}$ and $u_P(\hat{\pi}, \hat{\pi}) = u_P(\pi', \hat{\pi})$. Therefore, $\pi_P = \hat{\pi}$ constitutes a best response for party P . For party R , as $u_R(\hat{\pi}, \pi') < u_R(\hat{\pi}, \hat{\pi}) \forall \pi' \in \Pi' \setminus \{\hat{\pi}\}$, $\pi_R = \hat{\pi}$ constitutes a best response.

II. I now consider the case when (2.8) does not hold. In this case, citizens continue to vote along income lines: type (r, h) and (r, l) citizens vote for party R and types (p, h) and (p, l) citizens for party P . As $N_p > \frac{1}{2}$ party P 's candidate s.t. $\rho(\hat{\pi}, \hat{\pi}) = 1$. The final policies are given by (2.7).

To check that $\{\pi_K = \hat{\pi}\}_{K \in \{R, P\}}$ constitute a pair of best responses note that with $\pi_P = \hat{\pi}$ a deviation by party R to $\pi' > \hat{\pi}$ leaves the policies it is associated with and voting decisions unaffected. Hence $\rho(\pi', \hat{\pi}) = \rho(\hat{\pi}, \hat{\pi}) \forall \pi' \in \Pi' \setminus \{\hat{\pi}\}$. Therefore $u_R(\hat{\pi}, \hat{\pi}) = u_R(\hat{\pi}, \pi')$ s.t. $\pi_R = \hat{\pi}$

is a best response for party R . For party P , as $u_P(\pi', \hat{\pi}) < u_P(\hat{\pi}, \hat{\pi}) \forall \pi' \in \Pi' \setminus \{\hat{\pi}\}$, $\pi_P = \hat{\pi}$ constitutes a best response ■

Proof of Proposition 2

The proof demonstrates that if (i) assumption 1 holds, (ii) $N_{rl} > N_{ph}$ and (iii) $N_h > \frac{1}{2}$ then $\{\pi_K = 0\}_{K \in \{R, P\}}$ constitutes an entry game equilibrium. Citizens vote sincerely and in the ensuing equilibrium $\rho(0, 0) = 1$.

I first characterize the political equilibrium with $\{\pi_K = 0\}_{K \in \{R, P\}}$ and then check that $\{\pi_K = 0\}_{K \in \{R, P\}}$ constitute a pair of best responses. With $\{\pi_K = 0\}_{K \in \{R, P\}}$ party R and party P 's policies are given by (2.4) and (2.5) respectively. Therefore the voting decisions are exactly the same as those identified in the proof of Proposition 1. That is, types (r, h) and (r, l) vote for party R and types (p, h) and (p, l) for party P . As $N_p > \frac{1}{2}$ party P 's candidate wins in every jurisdiction and final policies are given by (2.5).

I now check that $\{\pi_K = 0\}_{K \in \{R, P\}}$ constitute a pair of best responses. Given $\pi_P = 0$ if party R deviates to some $\pi_R > 0$ then the policies associated with it alter to:

$$\delta_l^R = \pi_R \left(\frac{N_p p + N_r r}{N_l} \right) \text{ and } T^R = 0$$

Given assumption 1, the voting decisions induced are:

(i) For type (r, h) voters $U_{rh}^R(\pi_R) > U_{rh}^P(0)$ if $(1 - \pi_R)r > \frac{N_p p + N_r r}{N}$. Therefore $\alpha_{rh}^* = R$ if and only if $\pi_R < \bar{\pi}$ where

$$\bar{\pi} \equiv \frac{N_p(r - p)}{N_r} \quad (2.9)$$

(ii) For type (p, h) voters $U_{ph}^R(\pi_R) < U_{ph}^P(0)$ as $(1 - \pi_R)p < \frac{N_p p + N_r r}{N}$. Therefore $\alpha_{ph}^* = P$.

(iii) For type (r, l) voters $U_{rl}^R(\pi_R) > U_{rl}^P(0)$ if $(1 - \pi_R)r + \pi_R \left(\frac{N_p p + N_r r}{N_l} \right) < \frac{N_p p + N_r r}{N}$. Assumption 1 implies this holds, such that $\alpha_{rl}^* = R$.

(iv) For type (p, l) voters: $U_{pl}^R(\pi_R) > U_{pl}^P(0)$ if $(1 - \pi_R)p + \pi_R \left(\frac{N_p p + N_r r}{N_l} \right) > \frac{N_p p + N_r r}{N}$. Therefore $\alpha_{pl}^* = R$ if $\pi_R \geq \underline{\pi}$ where:

$$\underline{\pi} \equiv \frac{N_l N_r (r - p)}{N((N_p - N_l)p + N_r r)} \quad (2.10)$$

Note that if $\bar{\pi} < \underline{\pi}$ then $\nexists \pi \in \Pi$ such that (2.9) and (2.10) are simultaneously satisfied.

Solving (2.9) and (2.10), I find that a necessary and sufficient condition for $\bar{\pi} < \underline{\pi}$ is

$$N_{rl} > N_{ph} \quad (2.11)$$

Given that (2.11) holds, this implies that $\rho(0, 0) = 1$ and the final policies are given by (2.5).

To ensure that $\{\pi_K = 0\}_{K \in \{R, P\}}$ constitutes an equilibrium I need to consider potentially three possible deviations by party R , given $\pi_P = 0$.

(i) If party R deviates to $\pi_R \in]0, \bar{\pi}[$ then citizen voting decisions remain unaffected. Therefore, $\rho(0, \pi) = \rho(\pi_R, \pi) = 0$ such that $u_R(0, 0) = u_R(0, \pi_R)$.

(ii) If party R deviates to $\pi_R \in]\bar{\pi}, \underline{\pi}[$ then citizens' optimal voting decision are affected. Specifically, it follows from citizens' optimal voting decisions that types (r, h) , (p, h) and (p, l) will vote for party P . Further, $\rho(0, \pi) = \rho(\pi_R, \pi)$ such that $u_R(0, 0) = u_R(0, \pi_R)$

(iii) If party R deviates to $\pi_R \in]\underline{\pi}, 1]$ then types (r, l) and (p, l) will vote for party R and types (r, h) and (p, h) for party P . As $N_h > \frac{1}{2}$, $\rho(0, 0) = \rho(0, \pi_R) = 0$. Therefore $u_R(0, 0) = u_R(0, \pi_R)$.

Taken together, (i) - (iii) imply that party R cannot affect the electoral outcome by its choice of π_R . Hence $\rho(0, 0) = \rho(0, \pi_R) = 0 \forall \pi_R \in \Pi \setminus \{0\}$. Therefore, I can conclude that $\pi_R = 0$ constitutes a best response for party R . Further as $u_P(0, 0) > u_P(\pi', 0) \forall \pi' \in \Pi \setminus \{0\}$ $\pi_P = 0$ constitutes a best response for party P ■

Corollary to Proposition 2

The proof demonstrates that with the law of political reservation in place $\{\pi_K = \hat{\pi}\}_{K \in \{R, P\}}$ constitutes an entry game equilibrium, supported by a vector of sincere voting decisions such that $\rho(\hat{\pi}, \hat{\pi}) = 1$.

With $\{\pi_K = \hat{\pi}\}_{K \in \{R, P\}}$ party R and party P 's are given by (2.6) and (2.7) respectively. The voting decisions are as in the corollary to proposition 1 and $\rho(\hat{\pi}, \hat{\pi}) = 1$.

I demonstrate that $\{\pi_K = \hat{\pi}\}_{K \in \{R, P\}}$ constitute a pair of best responses. To do so, I consider a possible deviation by the losing party R to $\pi_R = \pi' (\in \Pi' \setminus \{\hat{\pi}\})$ when $\pi_P = \hat{\pi}$. In this case party R 's policies change to: $T^R = 0$ and $\delta_i^R = \pi' \left(\frac{N_P p + N_R r}{N_i} \right)$. The associated voting decisions are:

(i) For type (r, h) citizens: $U_{rh}^R(\pi') > U_{rh}^P(\hat{\pi})$ if

$$(1 - \pi')r > (1 - \hat{\pi}) \left(\frac{N_p p + N_r r}{N} \right) \quad (2.12)$$

Therefore $\alpha_{rh}^* = R$ if (2.12) holds.

(ii) For type (p, h) citizens: for $\pi' > \hat{\pi}$ $U_{ph}^R(\pi') < U_{ph}^P(\hat{\pi})$ as $(1 - \pi')p < (1 - \hat{\pi}) \left(\frac{N_p p + N_r r}{N} \right)$.

Therefore $\alpha_{ph}^* = P$

(iii) For type (r, l) citizens: $U_{rl}^R(\pi') > U_{rl}^P(\hat{\pi})$ as $(1 - \pi')r + \pi' \left(\frac{N_p p + N_r r}{N_l} \right) > (1 - \hat{\pi}) \left(\frac{N_p p + N_r r}{N} \right) + \hat{\pi} \left(\frac{N_p p + N_r r}{N_l} \right)$. Therefore $\alpha_{rl}^* = R$.

(iv) For type (p, l) citizens: $U_{pl}^R(\pi') > U_{pl}^P(\hat{\pi})$ if

$$(1 - \pi')p + \pi' \left(\frac{N_p p + N_r r}{N_l} \right) > (1 - \hat{\pi}) \left(\frac{N_p p + N_r r}{N} \right) + \hat{\pi} \left(\frac{N_p p + N_r r}{N_l} \right) \quad (2.13)$$

Therefore $\alpha_{pl}^* = R$ if (2.13) holds.

However, it is easily shown that if $N_{rl} > N_{ph}$ then any $\pi' \in \Pi'$ which satisfies (2.13) violates (2.12). Therefore by the same logic as in proposition 2, it follows party R cannot influence its probability of winning by changing π_R to some $\pi' > \hat{\pi}$. Hence $\rho(\hat{\pi}, \hat{\pi}) = \rho(\hat{\pi}, \pi') = 1 \forall \pi' \in \Pi' \setminus \{\hat{\pi}\}$. Therefore party R 's expected utility is invariant to its choice of π_R and $\pi_R = \hat{\pi}$ is a best response. For party P as $u_P(\hat{\pi}, \pi) > u_P(\pi', \pi) \forall \pi' \in \Pi' \setminus \{\hat{\pi}\}$, $\pi_P = \hat{\pi}$ constitutes a best response ■

2.7.2 Data Appendix

Relevant Provisions in the Constitution of India (1950)

Identification of minority 1 and minority 2:

Article 341 and 342 of the Indian constitution define the mechanism for declaring communities as belonging to minority 1 and minority 2 respectively. The Article(s) state: ‘the President after consultation with the Governor of the state by public notifications specifies the castes, races or tribes or parts of or groups within castes, races or tribes which for the purposes of this Constitution shall be deemed to be minority 1 (scheduled castes) or specify the tribes or tribal communities or parts of it as minority 2 (scheduled tribes) respectively in that state.’

In keeping with this article a scheduled caste order and a scheduled tribe order was promulgated by the President in 1950. These were based on the 1931 census criteria and 1950 tribal identification criteria, respectively (see Table 1). In 1956 this list were revised to remove anomalies. The lists remained stable until 1976 when a Parliamentary bill eliminated intra-state area restrictions on identification of these groups (our population measure takes account of this change). The criteria for identification of these groups has, however, remained unaltered since 1950.

Composition of State Legislature and provisions for political reservation⁶¹

Article 170 of the Constitution states that a uniform ratio of population be maintained in the division of a State into territorial assembly constituencies. Section 3 of Article 170 states that upon the completion of each census the total number of seats be adjusted.

Article 330 provides for the reservation of seats for minority 1 and minority 2 in the National Parliament. *Article 332* provides for political reservation for minorities 1 and 2 in State Legislative Assemblies.

Section 3 of *Article 332* identifies the basis for political reservation. It states that, ‘the number of seats reserved shall bear as nearly as may be, the same proportion to the total number of seats in the Assembly as the population of minority 1 in the state or the minority

⁶¹The constitutional provision of reserved seats is complemented by statutory provisions to enhance political participation by these groups- Smaller election deposits are required from them and they enjoy more permissive residence requirements.

2 in the state, as the case maybe, in respect of which seats are so reserved, bears to the total population in the state’.

Administration of Elections and Delimitation of Constituencies

The Indian Constitution provides for the establishment of an Election Commission fully independent of the Union and State Governments. The Constitution vests in the Election Commission the power of superintendence, direction and control of elections.

After Independence, the Parliament passed a law entrusting the work of delimitation to a three member commission called the Delimitation Commission. This commission consists of a retired Supreme Court judge, a sitting High Court Judge and the Chief Election Commissioner.(for further details, see Galanter 1984). The delimitation commission and election commission are together responsible for division of a state into constituencies. The orders of the delimitation commission and election commission have the force of law and cannot be called into question in any court.

Delimitation Commissions were constituted in 1953 (the same commission continued reallocation of seats in 1956) and after the census in 1961 and 1971. The election commission was entrusted with the duty of readjusting the proportion of seats reserved after the 1976 area delimitation act.

Finally, we should note that in 1976 the total number of constituencies in the Legislative assembly of a state were frozen by a National act of Parliament. Therefore post 1976 there has been an increased discrepancy between the proportion of minority 1 and 2 in a state and proportion of seats reserved.

Details of data-set

The data-set used in this paper has been put together from a number of sources. It builds on a Indian state level panel data-set collated by Ozler, Datt and Ravallion (1996) and Tim Besley and Robin Burgess (1998). The main variables used from the Ozler, Datt and Ravallion (1996) data-set are the price indices and output data. The main variables used from the Besley and Burgess data-set are the basic public expenditure and electoral data. To this, I have added data on targeted expenditure across Indian states and electoral data pertaining to reserved seats.

The data covers the sixteen main Indian states (see table 4). Until 1965 there were 15 states. In 1965 Haryana split from Punjab and is entered as a separate variable thereafter.

Public finance data: The primary source for the public finance data regarding non targeted expenditure is the Reserve Bank of India annual publication Report on Currency and Finance.

The first measure of targeted expenditure '**minority 1 welfare**' is the state outlays on the 'special component plan'. The Special component plan was begun in 1980. The state outlays under the SCP are designed to channelise the flow of outlays and benefits from the general sectors in the plans of States for development of minority 1 members.

'**Minority 2 welfare**' includes expenditure under the state plan on 'tribal sub plan'. This scheme began in 1974. The purported aim is that under these schemes every state department must allocate a certain amount of its budgetary resources for minority 2 welfare.

Data on these categories was obtained directly from ministry of welfare documents.

Asset redistribution data: The cumulative land reform index was created by Besley and Burgess (1998). The variable is a cumulative measure the total number of land reform legislations passed by a state.⁶² For further details on construction of this variable, see Besley and Burgess 1998.

Articles 16(4), 320(4) and 335 provide for job reservations for members of minority 1 and 2 in state government services. In a few states both groups share a common reservation. Jobs in the state government services are divided into four classes. The job quota variable measures the average reservation for the four classes.⁶³ For consistency we consider the total job quotas in a state. The variable has been constructed using information given in the annual reports of the Scheduled Caste and Scheduled Tribe Commissioner.

Inequality data: The measure of state level inequality used is the Gini coefficient. It is taken from the Ozler, Datt and Ravallion (1996) data-set. The measure is based on consumption data from the 22 rounds of consumption expenditure survey conducted by the Indian National Sample Survey.

Population data: Population estimates are derived from the five censuses for 1951, 1961, 1971, 1981 and 1991. We derive yearly population estimates by assuming that between any two

⁶²These reforms can broadly be divided into tenancy reform, abolition of intermediaries, ceilings on land holdings and consolidation of land plots.

⁶³In most cases the job quota is constant across the four classes.

censuses population grew at a constant (exponential) growth rate, derived from the respective population totals. The census provides information on the general, minority 1 and minority 2 populations separately. In 1976, change in the legal classification of minority 1 and minority 2 led to an increase in their population. We treat this in the following way- we calculate annual population for the period 1961-1976 using the estimates for 1961 and 1971. For 1977-1981 we use 1971 census estimates recalculated using new population figures and the 1981 figure. There is therefore a break in the population series in 1977.

Political reservation data

Data on the proportion of seats reserved in every state legislature for minority 1 and minority 2 has been collated from the Election Commission document relating to election in a state. The data on the party distribution of these seats also derives from the same source.⁶⁴

⁶⁴I am grateful to Dr. Prannoy Roy for providing me with access to constituency level electoral data in computerised form.

TABLE 2.1: LEGAL IDENTIFICATION OF MINORITY GROUPS IN INDIA¹

Selection Criteria for minority 1 (1931 Census)

- Can be served by clean Brahmans or not
- Can be served by the barbers, water-carriers, tailors etc. who serve the caste Hindus
- Pollutes a high-caste Hindu by contact or by proximity
- Is one from whose hands a caste Hindu can take water
- Is debarred from using public amenities, such as roads, ferries, wells or schools
- Will be treated as an equal by high caste men of the same educational qualification in ordinary social intercourse
- Is depressed on account of the occupation followed and whether, but for that, occupation would be subject to no social disability

Selection Criteria for minority 2 (1950 Presidential List)

- Tribal origin
 - Primitive ways of life and habitation in remote and less accessible areas
 - General backwardness in all respects
-

¹ The constitution of India (article 341 and 342) states that the designation of castes and tribes as belonging to minority 1 and 2 groups respectively will be undertaken by Presidential orders. The criteria in this table have formed the basis for such Presidential orders.

TABLE 2.2: ECONOMIC CHARACTERISTICS OF MINORITY GROUPS IN INDIA²

	total population	non minority population	minority 1 population	minority 2 population
% population share	100	75.4	16.4	7.9
% urban population	25.7	29.2	18.7	7.3
literacy rate	52.2	57.8	37.4	29.6
% main work force		32.8	36	42
% workers employed in the Primary sector ³	67.5	62.1	77.1	90
% population below poverty line ⁴	36.9	31.15	53.1	58.4

TABLE 2.3: REPRESENTATION OF MINORITY GROUPS IN UNRESERVED SEATS OF INDIAN STATE LEGISLATURES⁵

Lower house of state legislatures			
year	number of unreserved seats	of which: minority 1 legislators	of which: minority 2 legislators
1967	2723	4	8
1975	2958	4	-
Upper house of state legislatures			
	Number of seats	of which: minority 1 legislators	of which: minority 2 legislators
1964 ⁶	750	12	7
1974 ⁷	294	23	3

² Source: *Census of India 1991*

³ This sector primarily includes those employed in the agricultural sector

⁴ Source: Centre for Monitoring Indian Economy for 1983-84

⁵ Source: *Scheduled Caste and Scheduled Tribe Commissioner's reports*- various years

⁶ This data is for 10 Indian states

⁷ This data is for 7 Indian states

TABLE 2.4: MAIN STATE ECONOMIC AND DEMOGRAPHIC VARIABLES

state	minority 1 popn. (%)	minority 2 popn. (%)	minority 1 Seats (%)	minority 2 Seats (%)	state income (rs. p.c)	minority1 expenditure (% of total)	minority2 expenditure (% of total)	education expenditure (% of total)	Job quota (%)	Cum total landrefo legisln.
Andhra Pradesh	14 (0.96)	4 (1)	13.6 (0.52)	4.3 (0.67)	1004 (260)	3.7 (1.39)	1.33 (0.33)	20.05 (1.67)	18.11 (1.56)	1.52 (0.50)
Assam	6 (0.3)	13 (3)	6.1 (0.9)	16.34 (4.93)	903 (196)	1.41 (0.74)	3.89 (0.47)	25.2 (1.99)	17.41 (1.29)	2.00 (1.06)
Bihar	14 (0.3)	7 (1)	13.9 (0.91)	9.16 (0.59)	633 (110)	3.97 (0.72)	8.86 (2.99)	24.74 (2.55)	36.9 (9.6)	4.30 (1.92)
Gujarat	7 (0.3)	14 (0.5)	6.9 (0.35)	13.65 (0.55)	1176 (272)	1.38 (0.54)	4.29 (1.87)	21.84 (2.94)	17.93 (3.2)	3.05 (1.26)
Haryana	19.17 (0.28)	0 (0)	18.7 (0.18)	0 (0)	1444 (357.4)	4.24 (1.62)	0 (0)	17.7 (0.81)	20.1 (0.89)	0 (0)
Jammu Kashmir	8 (0.5)	0 (0)	7.5 (0.98)	0 (0)	1021 (228)	1.96 (0.9)	0 (0)	15.67 (1.51)	4 (4.05)	1.33 (0.71)
Karnataka	14 (1.2)	2 (1.7)	13.9 (0.64)	0.78 (0.19)	1037 (216)	3.87 (1.29)	0.27 (0.16)	20.25 (1.33)	19.75 (3.07)	2.83 (1.38)
Kerala	9 (0.7)	1 (0.1)	8.76 (0.43)	1.05 (0.37)	864 (182)	2.35 (0.45)	0.36 (0.19)	31.2 (3.7)	10 (0.1)	5.44 (3.37)
Madhya Pradesh	13 (0.5)	21 (1.4)	13.7 (0.81)	21.06 (1.94)	843 (190)	3.48 (0.60)	8.55 (4.02)	19.12 (1.98)	31.09 (7.23)	2.80 (0.71)
Maharashtra	7 (1.6)	7 (1.6)	7.7 (2.9)	6.46 (1.02)	1288 (331)	1.35 (0.38)	2.26 (0.63)	19.47 (1.01)	18.10 (2.9)	1.86 (0.42)
Mizoram	15 (0.5)	22 (0.5)	15.82 (1.34)	22.68 (1.31)	873 (186)	4.76 (2.17)	11.72 (4.8)	20.38 (1.09)	39.8 (1.25)	5.05 (3.11)
Punjab	28 (4)	0	23.1 (1.54)	0 (0)	1732 (384)	2.85 (1.16)	0 (0)	21.96 (2.88)	22.6 (2.72)	0.58 (0.50)
Rajasthan	16 (0.6)	12 (0.3)	16.17 (0.42)	11.51 (0.37)	785 (136)	4.22 (0.77)	3.45 (1.41)	21.59 (1.32)	23.86 (6.75)	0.94 (0.23)
Tamil Nadu	18 (0.4)	0.8 (0.1)	17.96 (0.03)	0.9 (0.32)	1015 (272)	4.65 (1.05)	0.24 (0.07)	21.41 (1.91)	16.69 (1.09)	4.91 (2.54)
Uttar Pradesh	21 (0.16)	0.7 (0.9)	21.03 (0.38)	0.12 (0.11)	874 (140)	4.6 (1.01)	0.03 (0.01)	21.13 (1.79)	32.58 (6.67)	3.75 (1.25)
West Bengal	20 (3.2)	5 (0.13)	19.3 (0.94)	5.8 (0.09)	1173 (191)	2.78 (0.48)	1.2 (0.37)	23.45 (1.65)	27.08 (7.59)	6.13 (5.58)
TOTAL	14.5 (6.16)	7.29 (7.49)	14.01 (5.28)	7.30 (7.70)	1030.52 (346.12)	3.24 (1.57)	2.95 (4.07)	21.33 (4.56)	22.29 (10.3)	2.91 (2.74)

Standard deviations are in parenthesis. The data appendix provides further details.

TABLE 2.5: DESCRIPTIVE STATISTICS FOR ALL VARIABLES

	units	mean	standard deviation	years
Policy choices				
1. state expenditure p.c. of which:	rs. per person	197.88	86.2	1974-92 ⁸
2. minority 1 welfare share ⁹	%	3.24	1.57	1980-92
3. minority 2 welfare share ¹⁰	%	2.96	4.08	1974-92
4. education share	%	21.59	3.95	1974-92
5. cumulative land reform index	absolute nos.	2.9	2.74	1957-92
6. minority job quota	%	22.29	10.62	1957-92
Political reservation¹¹				
Seats reserved for				
1. minority 1 in state legislatures	%	14.01	5.28	1957-92
2. minority 2 in state legislatures	%	7.30	7.7	1957-92
Budget constraint variables				
1. state income p.c. ¹²	rs. per person	1030.5	346	1960-92
2. federal grants p.c. ¹³	rs. per person	29.31	35.31	1958-92
Income distribution and demographic variables				
1. gini coefficient ¹⁴	%	29.7	3.8	1958-92
2. minority 1 population	%	14.19	5.62	1957-92
3. minority 2 population.	%	7.40	7.49	1957-92
Political variables¹⁵				
1. seats won by congress party of which	%	49.1	25.1	1957-92
(a) minority 1 seats		7.09	4.53	
(b) minority 2 seats		4.1	5.19	
2. seats won by left parties of which:	%	23.3	22.5	1957-92
(a) minority 1 seats		2.93	4.16	
(b) minority 2 seats		.93	2.42	

⁸ missing for J&K for 1992

⁹ missing for 1984 for all states except andhrapradesh & assam, missing for 1980 and 1981 for J&K

¹⁰ for andhra we lack 1986 data, for maharashtra & tamilnadu 1974 data and 1974, 1975 & 1986 for UP

¹¹ For J&K the series starts in 1962, and for Punjab and Haryana in 1966

¹² 1992 data is missing for Haryana, Punjab and J&K

¹³ 1992 data is missing for J&K

¹⁴ we lack 1958 data for Gujarat, 1960 and 1992 data for J&K, 1958 data for maharashtra

¹⁵ for haryana the data begins in 1966, for J&K we lack data for 1957-61

TABLE 2.6: MINORITY REPRESENTATION AND POLICY CHOICES

model	general policies			targeted policies		
	total state expenditure p.c. (rs./person)	education spending (%)	cum. land reform legislation (no.)	minority 1 welfare spending (%)	minority 2 welfare spending (%)	total job quotas (%)
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	Poisson	OLS	OLS	OLS
% seats reserved for minority 1	0.588 (0.164)	-0.746 (2.854)	0.057 (1.524)	-0.468 (0.991)	-0.310 (1.116)	0.611 (4.443)
% seats reserved for minority 2	-2.305 (1.168)	0.209 (1.028)	-0.0003 (0.011)	-0.644 (1.318)	0.949 (3.388)	0.376 (2.191)
% minority 1 population	-4.305 (1.280)	0.786 (3.352)	0.140 (3.384)	0.076 (0.529)	-0.461 (2.413)	0.683 (4.338)
% minority 2 population	5.211 (2.639)	-0.616 (3.185)	-0.106 (2.531)	0.269 (0.759)	-0.460 (1.943)	-0.210 (0.860)
F-test : reservation & population variables	F(4, 264)=2.21 (0.06)	F(4, 264)=7.4 (0)	Chi2(4)=17.9 (0.001)	F(4,158)=1.6 (0.17)	F(4,258)=6.3 (0.0001)	F(4,490)=13.6 (0)
election dummy	2.809 (0.644)	0.079 (0.294)	0.006 (0.093)	0.120 (0.464)	-0.346 (1.481)	-0.282 (0.602)
cumulative land reform (t-4)			0.085 (4.124)			
state indicators?	yes	yes	yes	yes	yes	yes
year indicators?	yes	yes	yes	yes	yes	yes
R ²	0.98	0.99	(pseudo):0.41	0.93	0.90	0.97
sample size	303	304	501	192	298	553

All OLS regressions are reported with robust standard errors. For OLS regressions t-statistics are in parenthesis, and for Poisson regression z-statistic. The data is for sixteen states. For all public finance regressions, except minority 1, expenditure regressions we use 1974-1992 data. Lack of 1992 state income data for Jammu and Kashmir reduces the sample size in the column (1) regression. Lack of minority 2 expenditure data for 6 observations (for details, see descriptive statistics) reduces sample size in the column (5) regression. The minority 1 expenditure regression uses data for 1980-92. 16 observations on minority 1 expenditure are missing (for details, see descriptive statistics). The land reform regression uses data from 1961-1992. The job quota regression uses data from 1957-1992. In both cases the sample size is reduced by the fact that the data on political reservation begins in 1966 for Punjab and Haryana, and in 1962 for Jammu and Kashmir.

TABLE 2.7: MINORITY REPRESENTATION AND POLICY CHOICES:
CONTROLLING FOR OMITTED VARIABLES

model	general policies			Targeted policies		
	total state expenditure p.c. (rs./person)	education spending (%)	cum. land reform legislation (no.)	minority 1 welfare spending (%)	minority 2 welfare spending (%)	total job quotas (%)
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	Poisson	OLS	OLS	OLS
% seats reserved for minority 1 in legislature	-0.587 (0.198)	-0.509 (1.858)	0.041 (0.838)	-0.474 (1.004)	-0.255 (0.916)	0.538 (1.976)
% seats reserved for minority 2 in legislature	-1.169 (0.631)	0.227 (1.059)	-0.028 (0.556)	-0.574 (1.054)	0.946 (3.374)	-0.011 (0.035)
% minority 1 population	-4.898 (1.784)	1.072 (4.520)	0.154 (3.181)	-0.015 (0.108)	-0.407 (2.03)	1.120 (6.322)
% minority 2 population	2.592 (1.387)	-0.649 (3.303)	-0.109 (2.234)	0.291 (0.705)	-0.445 (1.814)	-0.499 (1.895)
electoral dummy	2.390 (0.584)	0.173 (0.655)	0.003 (0.045)	0.110 (0.411)	-0.325 (1.370)	-0.333 (0.802)
state income p.c. (t-4)	0.110 (4.827)	-0.002 (1.670)	-0.0003 (0.602)	0.001 (0.758)	-0.001 (0.910)	-0.004 (2.781)
federal grants to state p.c. (t-4)	0.471 (1.811)	0.046 (3.551)	0.002 (0.780)	-0.001 (0.092)	0.008 (0.909)	0.026 (2.039)
gini coefficient (t-4)	0.728 (0.877)	-0.013 (0.243)	0.003 (0.227)	-0.033 (0.723)	-0.02 (0.408)	-0.065 (0.638)
cumulative land reform (t-4)			0.06 (2.747)			
state indicators?	yes	yes	yes	yes	yes	yes
year indicators?	yes	yes	yes	yes	yes	yes
R ²	0.99	0.99	(pseudo): 0.40	0.93	0.91	0.98
sample size	303	304	443	192	298	443

All OLS regressions are reported with robust standard errors. For OLS regressions t-statistics are in parenthesis, and for Poisson regression z-statistic. The data are for the sixteen major states. For the public finance regressions the time period covered is as in table 2.6. For the asset redistribution regressions (columns 3 and 6) we have data from 1964-92 for 12 states. For Haryana (which was formed from Punjab in 1965) we have data from 1970-92. For Punjab we have data from 1969-92. For Jammu and Kashmir we have data from 1968-92 and for Assam we have data for 1964, 1969 and 1972-92.

TABLE 2.8a: THE POPULATION AND RESERVATION CORRELATION COEFFICIENTS

Population group	Correlation coefficient (variables considered: deviations from mean of the population and reservation series respectively)
minority 1	0.22
minority 2	0.18

TABLE 2.8b: POPULATION AND RESERVATION REGRESSION

model	% seats reserved for minority 1		% seats reserved for minority 2	
	(1)	(2)	(3)	(4)
	OLS	OLS	OLS	OLS
% minority 1 population	0.965 (190.756)	0.099 (1.431)	1.000 (135.585)	
% minority 2 population				0.870 (11.811)
Election dummy		-0.008 (0.083)		-0.032 (0.248)
state effects	no	yes	no	yes
year effects	no	yes	no	yes
R squared	0.98	0.99	0.98	0.99
sample size	553	553	553	553

All regressions are reported with robust standard errors. The t-statistics are in parenthesis. The regressions uses data from 1957-1992 for the sixteen major states. The sample size is reduced by the fact that the data on political reservation begins in 1966 for Punjab and Haryana, and in 1962 for Jammu and Kashmir.

TABLE 2.9: POLITICAL RESERVATION AND PARTY PERFORMANCE

model	% seats won by congress	% seats won by left party grouping
	(1)	(2)
% seats reserved for minority 1	-1.139 (1.270)	1.047 (2.194)
% seats reserved for minority 2	0.347 (0.488)	0.599 (0.892)
% minority 1 population	-2.287 (3.372)	2.472 (4.198)
% minority 2 population	0.442 (0.552)	-0.886 (0.971)
state indicators?	yes	yes
year indicators?	yes	yes
R ²	0.90	0.79
sample size	553	553

All regressions are reported with robust standard errors. The t-statistics are in parenthesis. The regressions uses data from 1957-1992 for the sixteen major states. The sample size is reduced by the fact that the data on political reservation begins in 1966 for Punjab and Haryana, and in 1962 for Jammu and Kashmir.

TABLE 2.10 : PARTY IDENTITY AND CASTE IDENTITY

model	general policies			targeted policies		
	total state expenditure p.c. rs./person	education spending (%)	cum. land reform legislation (no.)	minority 1 welfare spending (%)	minority 2 welfare spending (%)	total job quotas (%)
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	Poisson	OLS	OLS	OLS
Proportion seats reserved for minority 1	0.997 (0.294)	-0.735 (2.783)	0.066 (1.580)	-0.871 (1.907)	-0.303 (1.107)	0.401 (2.806)
Proportion seats reserved for minority 2	-5.089 (1.816)	0.257 (1.158)	-0.004 (0.122)	-0.332 (0.593)	0.866 (2.913)	0.524 (2.723)
% seats reserved for minority 1 won by: congress party	-1.591 (1.643)	-0.018 (0.318)	-0.005 (0.388)	-0.001 (0.003)	.0003 (0.013)	0.09 (1.321)
left party grouping	-2.865 (2.403)	0.013 (0.187)	-0.001 (0.113)	0.107 (1.778)	-0.048 (1.263)	0.271 (3.431)
% seats reserved for minority 2 won by congress party	2.638 (2.403)	-0.065 (1.045)	0.008 (0.536)	-0.105 (2.442)	0.218 (2.355)	-0.257 (2.666)
left party grouping	3.707 (3.180)	-0.066 (0.981)	0.007 (0.427)	-0.050 (0.562)	0.267 (2.483)	-0.213 (2.091)
% minority 1 population	-5.141 (1.519)	0.780 (3.331)	0.143 (3.283)	0.128 (0.910)	-0.508 (2.698)	0.502 (3.121)
% minority 2 population	5.718 (2.960)	-0.641 (3.259)	-0.108 (2.568)	0.314 (0.874)	-0.390 (1.692)	-0.268 (1.102)
election dummy	3.231 (0.747)	0.036 (0.136)	0.004 (0.066)	0.080 (0.322)	-0.256 (1.174)	-0.317 (0.664)
cum. land reform(t-4)			0.080 (3.594)			
state indicators?	yes	yes	yes	yes	yes	yes
year indicators?	yes	yes	yes	yes	yes	yes
R ²	0.98	0.99	(pseudo)0.41	0.94	0.91	0.99

TABLE 2.10(continued)

F-tests for legislators						
elected from minority 1 seats (p value)	2.44 (0.089)	3.63 (0.027)	2.30 (0.31)	3.81 (0.024)	2.31 (0.101)	4.21 (0.015)
elected from minority 2 seats (p value)	4.82 (0)	1.03 (0.358)	0.09 (0.95)	0.30 (0.739)	2.29 (0.103)	4.85 (0.008)
congress ¹⁶ legislators (p value)	4.80 (0.029)	0.19 (0.663)	0.09 (0.76)	1.52 (0.219)	4.33 (0.038)	5.82 (0.016)
left legislators (p value)	8.95 (0.003)	0.40 (0.527)	0 (.11)	1.52 (0.219)	6.71 (0.010)	10.26 (0.001)
sample size	303	304	501	192	298	553

All OLS regressions are reported with robust standard errors. For OLS regressions t-statistics are in parenthesis, and for Poisson regression z-statistic. The data is for sixteen states. The years covered in each regression and resulting sample size is as in Table 2.6 (see endnote of table 2.6 for details).

¹⁶ This F-test is a joint test of the equality of the coefficients for any party: (proportion SC legislators)=(proportion ST legislators)=(proportion gen. Legislators)

TABLE 2.11: NORTH-SOUTH DIFFERENCES

model	general policies			targeted policies		
	total state expenditure p.c. rs./person	education spending (%)	cum. land reform legislation (no.)	minority 1 welfare spending (%)	minority 2 welfare spending (%)	total job quotas (%)
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	Poisson	OLS	OLS	OLS
% seats reserved for minority 1 in south ¹⁷	-2.416 (0.353)	-1.463 (1.785)	0.039 (0.239)	-2.972 (1.251)	-0.647 (1.017)	-2.892 (3.650)
north south differences	9.718 (1.296)	1.011 (1.215)	0.219 (0.133)	2.606 (1.076)	0.029 (0.043)	3.554 (4.354)
% seats reserved for minority 2 in south	15.939 (1.690)	0.284 (0.281)	0.067 (0.363)	3.905 (0.603)	-0.492 (0.707)	-5.306 (6.246)
north south differences	-22.448 (2.508)	-0.292 (0.297)	-0.070 (0.395)	-4.698 (0.735)	1.612 (2.169)	5.525 (7.008)
% minority 1 population	-5.341 (1.613)	0.761 (3.256)	0.139 (3.356)	0.073 (0.503)	-0.393 (2.139)	0.726 (4.744)
% minority 2 population	5.594 (2.571)	-0.531 (2.360)	-0.105 (2.263)	0.248 (0.697)	-0.416 (1.486)	0.221 (0.801)
election dummy	2.447 (0.572)	0.086 (0.313)	0.006 (0.095)	0.093 (0.346)	-0.312 (1.331)	-0.142 (0.311)
cumulative land reform (t-4)			0.087 (4.128)			
state indicators?	yes	yes	yes	yes	yes	yes
year indicators?	yes	yes	yes	yes	yes	yes
R ²	0.98	0.99	(pseudo):0.41	0.93	0.91	0.98
sample size	303	304	501	192	298	553

All OLS regressions are reported with robust standard errors. For OLS regressions t-statistics are in parenthesis, and for Poisson regression z-statistic. The data is for sixteen states. The years covered in each regression and resulting sample size is as in Table 2.6 (see endnote of table 2.6 for details).

¹⁷ The regressions included the variable % seats reserved for minority1 and the same interacted with a North India dummy. The dummy took the value of one for north Indian states and zero for South Indian states.

Chapter 3

Read My Lips: The Political Economy of Information Transmission¹

3.1 Introduction

One of basic tenets of public economics is that pure public goods should be provided by governments. Information of common interest to citizens, such as public safety announcements, seem like a clear cut application of this principle. In some countries, this aspect of government intervention is taken much further. For example, the direction of investment strategies of private firms is often associated with the economic success of East Asia. Indeed Japan's Ministry of International Trade and Industry is often held up as a paragon of indicative planning where firms were encouraged to invest in leading sectors.² Unquestioning adherence to the view that governments should act as knowledge banks for their citizens does, however, require that they face no agency problems in deciding what to reveal. This chapter analyzes how the power to

¹This chapter is joint with Tim Besley.

²MITI has been responsible for Japan's industrial policy post World War II . Conventional wisdom is that industrial policy as determined by MITI played an important role in Japan's subsequent growth performance (See for instance, World Bank (1993)).One of MITI's primary functions was to provide information to the private sector via *deliberation* councils which had members from the Japanese government and the Private sector. Firms could choose to not heed MITI's advice, the creation of the Mitsubishi Automobile company in 1965 against MITI's advice is a case in point.

redistribute can interfere with incentives for credible information transmission and can lead to political failure in the transmission of information. We consider a model where private sector investment decisions could be informed by information available to the government. However, citizens must rely on politicians elected to carry out redistributive strategies to make announcements. In some cases identified here, this leads to under-exploitation of profitable investment opportunities and Pareto inefficiency.

The analysis is related to the growing literature that incorporates imperfect information into political economy models, some of which consider the role of cheap talk. We suppose that the policy maker is privately informed. This is a common informational assumption in the extensive literature on political agency models — see, for example, Rogoff (1990) who demonstrates how costly signalling on the part of governments to affect re-election probabilities can result in political business cycles. In contrast, we focus on costless signaling. Stein's (1989) analysis of cheap talk by a central bank is related to this chapter. He suggests that limits on credible information transmission explain why organizations like the Federal Reserve may make only imprecise policy announcements.

Recent electoral models have focused on situations where some citizens are better informed than others prior to an election. This approach includes the recent work by Feddersen and Pesendorfer (1996) on how well voting aggregates information. Grossman and Helpman (1999) allow for the possibility of imperfectly informed voters being swayed by special interest group endorsements which take the form of cheap talk. Banerjee and Somanathan (1997) consider the role of cheap talk in a world in which citizens enjoy an informational advantage. However, rather than modeling elections, they consider the possibility of direct reports of the state of the world to an uninformed policy maker. They demonstrate why only certain kinds of citizens get the ear of policy makers and hence are influential in the policy process.

Other papers have focused on how legislative processes may be affected by communication. Gilligan and Krehbiel (1989) and Austen-Smith (1990) focus on how strategic pronouncements by committees can influence legislation passed on the floor of a legislature. In similar spirit, Matthews (1989) considers how rhetoric (modeled as cheap talk) can affect policy outcome in an environment where a president with veto power faces a legislature which is imperfectly informed about the president's type.

Many of these contributions build on Crawford and Sobel's (1982) seminal work on strategic information transmission. They showed how diversity in preferences between a sender and receiver limits the amount of information that can be credibly conveyed. In comparison, in this chapter, the extent of preference diversity is endogenous. The policy maker and hence message sender is elected. Our model embeds the cheap talk game in an explicit economic environment where individuals make private investment and labor supply decisions and governments redistribute. This allows for a clear distinction between the issues of how much information is revealed in equilibrium and whether investment outcomes are inefficient in a conventional Paretian sense. We show that (lack of) revelation of information is a distinct issue from whether the outcome can be Pareto dominated.

We embed our game of information transmission in a model where citizens are uncertain about the value of particular investment strategies and rely on the government to advise them on this. After receiving government advice the investment decisions are made. Finally, the government can choose to redistribute income across groups. We demonstrate how the possibility of redistribution is responsible for how credibly governments transmit information — a government that cannot redistribute or has no desire to do so faces no credibility problem in our model. The choice of the citizen who transmits information and makes redistributive decisions is determined in an election. This provides a simple way of making the policy choice and information transmission decision endogenous. We use the model to identify when it is possible to have a Pareto dominated policy choice selected in political equilibrium.

The remainder of the chapter is organized as follows. The next section lays out the model. Section 3.3 considers the complete information case, while section 3.4 extends this to incomplete information. Section 3.5 discusses political economy and welfare issues in the model. Section 3.6 discusses some possible extensions and implications of the results. Section 3.7 concludes.

3.2 The Model

The economy consists of N citizens indexed by $i \in \{1, \dots, N\}$ and lasts one period. There are two productive sectors in the economy, indexed by $\ell \in \{A, B\}$. Citizens either belong to sector A or B. The total number of citizens belonging to sector ℓ is denoted N_ℓ . Each citizen

is endowed with one unit of capital and one unit of labor. We assume that an individual can only supply his labor in his own sector³ at a wage rate $w_\ell \in \{w_A, w_B\}$ and that $w_B > w_A$. On the other hand, capital can be invested indivisibly in either sector, where $k_i = 1$ denotes that individual i invests in sector A and $k_i = 0$ denotes investment in sector B . The return to capital in sector ℓ is denoted $r_{\ell j}$, where j denotes the state of the world.

There are four possible states of the world, two of which favor sector A and two of which favor sector B . A base return \bar{r} is guaranteed in every state. However, an additional incremental return may also be available. These increments are denoted $\{\Delta_H, \Delta_L\}$ with $\Delta_H > \Delta_L$ and

$$\begin{aligned}
 r_{A1} &= \bar{r} + \Delta_H > r_{B1} = \bar{r} \\
 r_{A2} &= \bar{r} + \Delta_L > r_{B2} = \bar{r} \\
 r_{B3} &= \bar{r} + \Delta_L > r_{A3} = \bar{r} \\
 r_{B4} &= \bar{r} + \Delta_H > r_{A4} = \bar{r}
 \end{aligned} \tag{3.1}$$

Hence, in states 1 and 2 sector A is favored and in states 3 and 4 sector B is favored. While a citizen can invest in either sector, we suppose that it is cheaper to invest in one's own sector. We suppose that this is due to unmodelled monitoring costs denoted by δ . A key assumption that we maintain throughout the analysis is

Assumption 1: $\Delta_H > \delta > \Delta_L > 0$.

This implies that the returns are sufficient to cover the transaction cost of investing out of sector only if the return is Δ_H . Thus it is not enough to know which sector is favored — it is necessary to know by how much.

We allow the government to intervene in the economy by redistributing income. We suppose that it does so by levying an income tax and redistributing the proceeds back to the citizens in lump sum form. The parameters of the tax system are therefore an income tax rate $t \in [0, 1]$ and an income guarantee level $T \in \mathfrak{R}$. While this is a simplistic picture of real world redistributive strategies, it suffices to make the main points of this chapter. We assume that the tax base does

³We do not explicitly model the causes of this sectoral labour immobility. Possible causes include non-transferable human capital investments on the part of citizens and spatial differences in location of the two sectors.

not allow investors to deduct their cross sectoral investment monitoring costs from their taxable income. This seems reasonable given many of these are likely to be non-pecuniary costs.

The preferences of a citizen i located in sector A in state j are

$$(1-t)[w_A l + r_{A_j} k_i + r_{B_j}(1-k_i)] - \phi(l) - \delta(1-k_i) + T$$

where $\phi(\cdot)$ is a common disutility of labor function which we suppose to be smooth, increasing and convex. For citizen i located in sector B preferences are

$$(1-t)[w_B l + r_{A_j} k_i + r_{B_j}(1-k_i)] - \phi(l) - \delta k_i + T$$

It is clear that the optimal labor supply in either sector is

$$l_i^* = \arg \max \{(1-t)w_\ell l - \phi(l) : l \in [0, 1]\}.$$

Let $v((1-t)w_\ell) = (1-t)w_\ell l_i^* - \phi(l_i^*)$ and define

$$V_j^A(w_A, k_i, t, T) = v((1-t)w_A) + (1-t)[r_{A_j} k_i + r_{B_j}(1-k_i)] - \delta(1-k_i) + T, \text{ and}$$

$$V_j^B(w_B, k_i, t, T) = v((1-t)w_B) + (1-t)[r_{A_j} k_i + r_{B_j}(1-k_i)] - \delta k_i + T$$

as the indirect utility function of a representative individual in each sector. Individuals may be imperfectly informed about the true state of the world. In this case let q_j be the (commonly held) probability that the state is j and let

$$W^\ell(q, k_i, w_\ell, t, T) = \sum_{j=1}^4 q_j V_j^\ell(w_\ell, k_i, t, T)$$

denote their ex ante expected utility.

Given a particular state of the world and a particular vector of investment decisions is

realized, we can define the vector of ex post feasible tax and transfer policies in state j . These will satisfy the following government budget constraint.

$$NT = t \left[\left(\sum_{i=1}^N k_i \right) r_{Aj} + \left[N - \sum_{i=1}^N k_i \right] r_{Bj} + w_A N_A l_A^* ((1-t)w_A) + w_B N_B l_B^* ((1-t)w_B) \right]$$

Defining $k = (k_1, \dots, k_N)$, let $Z_j(k)$ denote the set of (t, T) pairs that satisfy this equation.

3.3 Full Information

We begin by studying equilibrium investment and policy decisions under full information about the state. This provides a useful benchmark to compare with the case where investors are ill informed about the state of the world. The timing considered in this section is as follows. First, nature selects the state which is observable to all. Second, individuals make investment decisions. Finally, government chooses a redistributive policy after which each individual chooses his/her labor supply. We are interested in the case where individuals cannot influence government policy through their private sector actions. This is true if the government budget constraint is independent of i 's decision. Hence, we consider a large N where the fractions N_A/N ($\equiv \pi_A$) and N_B/N ($\equiv (1 - \pi_A)$) are fixed, and $\pi_A \in [0, 1]$. We focus on the case where everyone within a sector behaves symmetrically. In that case we can think of an investment strategy for a representative member of sector ℓ denoted K_ℓ , with $K_\ell = 1$ denoting the case where members of sector ℓ invest in sector A and $K_\ell = 0$ denoting the case where sector ℓ members invest in sector B . Let $K = (K_A, K_B)$ represent the aggregate sector investment decisions.

To solve the model, we work backwards. Consider the preferences

$$G_j(\gamma, K, t, T) = \gamma V_j^A(w_A, K_A, t, T) + (1 - \gamma) V_j^B(w_B, K_B, t, T).$$

These represent a weighted sum of the two sector's utilities. In a political economy model, we will argue that we expect either $\gamma = 1$ or $\gamma = 0$ to determine the redistributive decision. However, for the moment it is useful to keep γ as a parameter. As γ varies, we map the entire

set of ex post Pareto optimal tax and transfer policies. Define

$$\begin{aligned} (t_{\gamma j}^*(K), T_{\gamma j}^*(K)) &= \arg \max_{(t, T)} G_j(\gamma, K, t, T) \\ \text{subject to } (t, T) &\in Z_j(K) \end{aligned} \quad (3.2)$$

as the optimal choice of redistributive policy for a particular state, investment profile and social preference. Since, in our large economy, K depends only on the fractions of individuals who invest, individuals will treat the redistributive policy as independent of their own investment decision.

It is now straightforward to characterize the equilibrium investment decisions for this economy. Under full information, it is clear that the optimal investment decision of an individual in sector $\ell \in \{A, B\}$ solves

$$K_{\ell j}^*(t_j, T_j) = \arg \max_{K_{\ell} \in \{0, 1\}} \left\{ V_j^{\ell}(w_{\ell}, K_{\ell}, t_j, T_j) \right\}. \quad (3.3)$$

In this formulation, individuals take the tax policy as given. Note, however, that for high enough levels of redistributive taxation, individuals can be prevented from seeking to invest anywhere outside their own sector. An *equilibrium investment profile* solves

$$\widehat{K}_{\ell j} = K_{\ell j}^*(t_{\gamma j}^*(\widehat{K}_j), T_{\gamma j}^*(\widehat{K}_j)) \quad \ell \in \{A, B\}.$$

where $\widehat{K}_j = (\widehat{K}_{A_j}(\gamma), \widehat{K}_{B_j}(\gamma))$. We assume that this exists and is unique.

We can now state our notion of equilibrium. The outcome of the model is a particular tax, redistribution and investment profile in each state. Formally, denote this as an investment and redistribution sequence (IRS) $\{t_j, T_j, K_j\}_{j=1}^4$. Then, for a given $\gamma \in [0, 1]$ a $\{t_j, T_j, K_j\}_{j=1}^4$ can be generated as an equilibrium IRS if and only if (i) (t_j, T_j) can be generated from (3.2) given K_j and (ii) K_j can be generated as an equilibrium investment profile.

From assumption 1 it follows that if such an IRS sequence has no redistribution then the optimal investment strategies will be

$$K_{A_j}^*(0, 0) = 1 \text{ for } j = 1, 2, 3 \text{ and } K_{A_4}^*(0, 0) = 0$$

(3.4)

$$K_{B1}^*(0,0) = 1 \text{ and } K_{Bj}^*(0,0) = 0 \text{ for } j = 2, 3, 4.$$

Without redistribution, it is trivial that these form an equilibrium investment profile. The monitoring costs make investment decision conservative — individuals favor their own sector unless there is an outstanding opportunity in the other sector.

For this investment profile to be part of an IRS that can be generated as an equilibrium of the model, we need to show that this can be generated by actual government and investor behaviour. Therefore, we now examine the different IRS' which can be generated as equilibrium outcomes as we vary the preferences of the policy maker (and therefore the extent of redistribution). This provides a useful benchmark against which we can compare the results of our subsequent analysis.

Recall that citizens in sector B have higher wages than those in sector A . This means that sector A individuals will, on the whole, desire to redistribute via the income tax. The only possible exception is if sufficient inequality is generated by the different investment strategies pursued in each sector. Specifically, in state 2 where sector B individuals do not desire to invest in sector A , while sector A individuals earn an extra return of Δ_L by investing in their own sector, this will tend to reduce ex post inequality and may even generate an incentive for sector B individuals to redistribute income. For ease of exposition, we rule this out by assumption. Specifically, we assume that

Assumption 2:

$$v((1-t)w_B) + ty(t) + t\pi_A\Delta_L \text{ is decreasing in } t.$$

where $y(t) \equiv \pi_A w_A l_A^* ((1-t)w_A) + (1-\pi_A) w_B l_B^* ((1-t)w_B)$ is the total wage income

As Sector B individuals earn a higher wage, then as long as the disutility of labour is not too high the first two terms are always decreasing in t . Assumption 2 ensures that any redistributive gains accruing to sector B in s_2 due to sector A individuals higher investment returns does not offset their loss from redistribution as represented by the first two terms. This will be true provided that the wage difference between the sectors is sufficiently large and/or Δ_L is sufficiently small. For the rest of the analysis we assume that Assumption 2 holds. Assumption 2 provides a simple characterization of the equilibrium IRS when $\gamma = 0$.

Benchmark 1 *With $\gamma = 0$, there is a unique IRS $\{t_j, T_j, K_j\}_{j=1}^4$ that can be generated as the equilibrium of the model where (i) there is no redistribution in any state and (ii) the investment decisions are as given by (3.4).*

With $\gamma = 0$ the equilibrium tax policies are those favored by sector B investors. It follows from assumption 2 that a policy maker who maximizes the payoff of sector B citizens will never choose to redistribute. In this case zero redistributive taxation is delivered as the Pareto optimal choice and investment will be as in the full information, no redistribution situation.

We now study the case where $\gamma = 1$, so that the tax policy reflects the preferences of citizens in sector A . It is useful to define

$$\bar{t}(\mu) = \arg \max_{t \in [0,1]} v((1-t)w_A) + t(y(t) + \mu) \quad (3.5)$$

as the tax rate desired by an individual in sector A . Let

$$\bar{T}(\mu) = \bar{t}(\mu) [y(\bar{t}(\mu)) + \mu]$$

be the associated transfer at this tax rate. In the case where $\mu = 0$, we just have the standard model where wage inequality drives the desire to redistribute. The parameter μ represents the possibility that incentives to redistribute are affected by disparities in income due to asymmetric investment strategies across sectors. For example, in state 3 there is an extra redistributive incentive because sector B individuals earn an additional Δ_L by investing in their own sector, compared to the sector A individuals who invest in their own sector. A very useful assumption which we maintained throughout is

Assumption 3: $(1 - \bar{t}(0)) \Delta_H > \delta$.

While it would be straightforward to relax this, its value comes from the benchmark that it allows us to establish. The assumption says that, at the level of redistributive taxation at which both sectors make the same investment decisions, it is worthwhile to invest in the other sector when the return there is Δ_H . This assumption will hold provided that inequality is not too great and/or there is a sufficiently steep labor schedule to hold redistributive sentiments by sector A individuals in check. Assumption 3 allows a simple characterization of the equilibrium IRS when $\gamma = 1$.

Benchmark 2 With $\gamma = 1$, there is a unique IRS $\{t_j, T_j, K_j\}_{j=1}^4$ that can be generated as the equilibrium of the model where

(i) the redistributive strategies are

$$\begin{aligned} (t_j, T_j) &= (\bar{t}(0), \bar{T}(0)) \text{ for } j = 1, 4, \\ (t_2, T_2) &= (\bar{t}(-(1 - \pi_A) \Delta_L), \bar{T}(-(1 - \pi_A) \Delta_L)) \\ (t_3, T_3) &= (\bar{t}((1 - \pi_A) \Delta_L), \bar{T}((1 - \pi_A) \Delta_L)) , \text{ and} \end{aligned}$$

(ii) the investment decisions are identical to those found without redistribution.

The first part details the redistribution decisions in each state of the world. This mirrors the underlying wage inequality plus any changes in income distribution due to asymmetric investment strategies in the two sectors. The second part gives the investment equilibrium. The main observation is that this is identical to that under zero redistribution. Assumption 3 is critical to this finding and allows us to have a simple full information investment benchmark against which to contrast incomplete information.

In this model the policymaker's desire for redistribution is increasing in γ . Therefore a corollary of the two benchmark results is that, under assumptions 2 and 3, every ex post Pareto optimal redistribution schedule has the same investment profile. This is true in spite of the fact that we have not allowed the policy maker to commit to redistribution in advance. Therefore with full information equilibrium redistribution affects labor supply decisions, but not investment. The remainder of the chapter examines how these benchmark results are altered when investors have incomplete information regarding the state of the world.

3.4 Incomplete Information

We now consider a world in which only the policy maker knows the true state of the world. As we argued above, this fits a number of relevant contexts. We assume that the government can transmit information costlessly to the citizens, i.e. it is *cheap talk*. The citizens will listen to these messages and update their beliefs taking into account the credibility of the statements that they hear.

The timing of the model is now as follows. First, nature determines the state which is

observed only by the policy maker. The policy maker can then transmit a message to the other citizens. On the basis of this, citizens choose simultaneously how to invest. After investment, the state of nature is revealed to all citizens. The policymaker then chooses a redistributive strategy. Finally, payoffs are realized.

The policy choice will satisfy (3.2). The investment profile depends upon investors' beliefs about which state of the world has obtained. We assume investors in all sectors have identical priors and denote these by $\{p_j\}_{j=1}^4$. After receiving a message about which state of the world has occurred, investors' posterior probabilities are $\{q_j\}_{j=1}^4$. We focus on symmetric investment strategies, where investors take the redistributive policy associated with each state of the world as given. Let

$$\tilde{K}_\ell \left(q; \{t_j, T_j\}_{j=1}^4 \right) = \arg \max_{k \in \{0,1\}} \sum_{j=1}^4 q_j V_j^\ell (w_\ell, k_i, t_j, T_j) \quad (3.6)$$

be the optimal investment decision for an investor in sector ℓ . An *equilibrium investment profile* $(\hat{K}_A(\gamma, q), \hat{K}_B(\gamma, q))$ solves

$$\hat{K}_\ell = \tilde{K}_\ell \left(q, \{t_{\gamma j}^*(\hat{K}), T_{\gamma j}^*(\hat{K})\}_{j=1}^4 \right) \quad \ell \in \{A, B\}.$$

Let

$$\hat{K}(\gamma, q) = \left(\hat{K}_A(\gamma, q), \hat{K}_B(\gamma, q) \right)$$

be the equilibrium investment profile for some beliefs q about the state of the world. Once again, we assume that this is unique.

We assume that absent further information (beyond an individual's priors) about which state has occurred, the equilibrium investment profile has each individual investing in their own sector. Formally, we make

Assumption 4: $\hat{K}_A(0, p) = 1$ and $\hat{K}_B(0, p) = 0$ for all $\gamma \in [0, 1]$.

This is a joint assumption on the prior beliefs and the tax rates in different states. There is no simple way of stating the condition in terms of the primitives.⁴

⁴Essentially, it requires that

$$\begin{aligned} & |((1-t_1)p_1 - (1-t_2)p_4)\Delta_H \\ & + ((1-t_2)p_2 - (1-t_3)p_3)\Delta_L| < \delta, \end{aligned}$$

Beliefs about which state has occurred can depend upon messages sent by the policy maker before investment decisions are taken. A message, denoted m , is restricted to belong to a finite set \mathcal{M} containing all possible subsets of the states. These messages require interpretation by the investors. Given state j , let $\phi_j(m)$ be the probability that the government sends message m . Therefore, having received message m the likelihood function is given by $\phi_j(m), j = 1, \dots, 4$. Renormalise by defining

$$\sigma_j(m) = \frac{\phi_j(m)}{\sum_j \phi_{j'}(m)}$$

These beliefs are admissible if $\sum_{j=1}^4 \sigma_j(m) = 1$ for all messages $m \in \mathcal{M}$. We suppose that the investors update using Bayes rule given the beliefs about the meaning of messages, i.e.

$$q_j(m, p, \sigma) = \frac{p_j \sigma_j(m)}{\sum_{j=1}^4 p_j \sigma_j(m)}. \quad (3.7)$$

where $q(m, p; \sigma)$ denotes the vector of posterior beliefs and let

$$\widehat{G}_j(\gamma, q) = G_j\left(\gamma, \widehat{K}(\gamma, q), t_{\gamma j}^*(\widehat{K}(\gamma, q)), T_{\gamma j}^*(\widehat{K}(\gamma, q))\right) \quad (3.8)$$

denote the ‘‘policy makers’’ payoff at a particular investment equilibrium. The policy-maker optimizes in his choice of messages, given σ , that is

$$m_j^*(\sigma) \in \arg \max_{m \in \mathcal{M}} \left\{ \widehat{G}_j(\gamma, q(m, p; \sigma)) \right\}, \quad (3.9)$$

The outcome of the model is a particular tax, redistribution, investment and message profile in each state. We call this an *investment, redistribution and message* sequence (IRMS) and denote it by $\{t_j, T_j, K_j, m_j\}_{j=1}^4$. Then, for a given γ , an IRMS $\{t_j, T_j, K_j, m_j\}_{j=1}^4$ can be generated as an equilibrium of the model if and only if, there is a set of admissible beliefs σ such that (i) (t_j, T_j) satisfies (3.2) given K_j , (ii) K_j is an investment equilibrium when q is derived from p using Bayes rule, the beliefs σ and the messages m , (iii) messages solve (3.9) in each state such that $m_j = m_j^*(\sigma)$, and beliefs are such that $\phi_j(m_j^*(\sigma)) = 1$.

where the vector of tax rates satisfies (3.2) at the investment equilibrium, for all $\gamma \in [0, 1]$.

As is usual in such models, the fact that many different beliefs are possible about the meaning of messages implies that the signalling equilibrium will not be unique. There is always a trivial equilibrium where no information is transmitted⁵ and citizens invest entirely on their priors. We will focus on cases where beliefs allow us to get as close as possible to a full information investment equilibrium.

We now consider the IRMS's generated by the most informative equilibria under different assumptions about the redistributive preferences of the policy maker. We begin with the most straightforward case where $\gamma = 0$. In this case, we have:

Proposition 1 *With $\gamma = 0$, there exists a set of admissible beliefs σ for which an IRMS $\{t_j, T_j, K_j, m_j\}_{j=1}^4$ can be generated as an equilibrium of the model with no redistribution, full information revelation and investment decisions given by (3.4)*

Thus a policy maker without redistributive intentions can credibly reveal the information to his citizens. It is easy to see why. A policy maker who cares about sector B individuals care that they invest the right way and has no reason not to reveal the truth to sector A individuals when their investment can benefit from it. The policy maker's incentives do not diverge from those of the citizens.

The more interesting case arises where $\gamma = 1$ and the policy maker favors sector A individuals. The following preliminary observation says that full information is not a possibility in this instance.

Lemma 1: *Suppose that $\gamma = 1$ and let (q, q') be such that $\widehat{K}_B(1, q) > \widehat{K}_B(1, q')$, then, for any beliefs σ , there is no $\{m_j\}_{j=1}^4$ which satisfies (3.9) such that $q(m_1^*, p, \sigma) = q$ and $q(m_2^*, p, \sigma) = q'$.*

This lemma tells us that there cannot be an equilibrium of the message game that leads sector B individuals to invest in sector A in state 1 and not in state 2. However, full information strategies require sector B individuals to invest in sector A in state 1, but not in state 2. This is explained by the policy maker's desire to redistribute. In state 2, the policy maker who favors sector A always has an incentive to dishonestly announce that state 1 has occurred in order to benefit from the increased transfers that he will receive if a sector B individual invests in

⁵If $\sigma_j(m) = \frac{1}{4}$ for all j and all $m \in M$, then we have a babbling equilibrium.

sector A . Thus having a policy maker who favors sector A cannot result in full information being revealed to investors.

To explore this further, we distinguish between two cases, referred to as the over-investment and under-investment cases. In the over-investment case, sector B individuals invest in sector A even though they sometimes make a loss by doing so, while in the under-investment case, they are conservative and always choose to invest in their own sector. Proposition 2 identifies the critical condition that differentiates these two. This condition is a function of investors priors regarding the likelihood of states 1 and 2 and the associated investment returns. Specifically, for the over investment case we have the following result⁶

Proposition 2 *Suppose that $(1 - \bar{t}(0)) [p_1 \Delta_H + p_2 \Delta_L] > (p_1 + p_2) \delta$, then with $\gamma = 1$ there exists a set of admissible beliefs σ for which an IRMS $\{t_j, T_j, K_j, m_j\}_{j=1}^4$ can be generated as an equilibrium where*

(i) *redistribution policies are given by:*

$$\begin{aligned} (t_j, T_j) &= (\bar{t}(0), \bar{T}(0)) \text{ for } j = 1, 2, 4 \\ (t_3, T_3) &= (\bar{t}((1 - \pi_A) \Delta_L), \bar{T}((1 - \pi_A) \Delta_L)) \end{aligned}$$

(ii) *the policy maker announces the true state when the state is 3 or 4, but does not differentiate between states 1 and 2, i.e., $m_j^* = j$ for $j = 3, 4$ and $m_1^* = m_2^* = \{1 \cup 2\}$, and*

(iii) *the investment equilibrium has sector A individuals using their full information investment strategies and sector B individuals investing in sector A in states 1 and 2 and in sector B otherwise.*

There are three parts to the Proposition. The first gives the redistributive strategies employed by the policy maker. The second gives the equilibrium messages which are the same in either state 1 or 2. Thus the true state of the world is not revealed in this case. This is because a policy maker who maximizes the payoff of sector A individuals cannot credibly distinguish between states 1 and 2. The argument is exactly that developed to prove Lemma 1. Part (iii) of the Proposition gives the investment strategies which lead to over-investment in sector A .

⁶Propositions 1, 2 and 3 describe weak equilibria in the sense that, in the equilibrium that we describe, in some states the policy is indifferent between the posited equilibrium message and some other message.

We now consider what happens when the tendency is towards to under-investment in sector A. Underinvestment arises when investors' priors about the likelihood of state 1 and 2 and the associated investment returns are such that a sector B investor's expected cost from investing in sector A in states 1 and 2 exceed her expected benefits. This outcome is described in

Proposition 3 *Suppose that $(1 - \bar{t}(0)) [p_1 \Delta_H + p_2 \Delta_L] < (p_1 + p_2) \delta$, then with $\gamma = 1$ there exists a set of admissible beliefs σ such that an IRMS $\{t_j, T_j, K_j, m_j\}_{j=1}^4$ can be generated as an equilibrium of the model where*

(i) redistributive policies are given by

$$\begin{aligned}
(t_1, T_1) &= (\bar{t}(-(1 - \pi_A) \Delta_H), \bar{T}(-(1 - \pi_A) \Delta_H)) \\
(t_2, T_2) &= (\bar{t}(-(1 - \pi_A) \Delta_L), \bar{T}(-(1 - \pi_A) \Delta_L)) \\
(t_3, T_3) &= (\bar{t}((1 - \pi_A) \Delta_L), \bar{T}((1 - \pi_A) \Delta_L)) \\
(t_4, T_4) &= (\bar{t}(0), \bar{T}(0))
\end{aligned} \tag{3.10}$$

(ii) the policy maker announces the true state when the state is 3 or 4, but does not differentiate between states 1 and 2, i.e., $m_j^ = j$ for $j = 3, 4$ and $m_1^* = m_2^* = \{1 \cup 2\}$, and*

(iii) an investment equilibrium in which sector A individuals use their full information investment strategies and sector B individuals invest in sector B.

Again, there are three parts. The first gives the redistributive strategies. The second the equilibrium messages. These are identical to those described in Proposition 4. The third part give the investment strategies. The key difference with Proposition 2 is that individuals in sector B now never choose to invest in sector A, even in state 1.

A comparison of Proposition 1, 2 and 3 shows how a policy maker's ability to credibly transmit information is affected by his redistributive preferences. A policy maker with no desire to redistribute has no credibility problem and generates an IRMS which is the same as the full information outcome. The desire for redistribution creates a kind of externality since individuals benefit from others' decisions to invest directly. If costs of investment are not fully internalized, then this results in a credibility problem. The Propositions identify a key condition determining whether the most informative equilibrium under incomplete information has too

much or too little investment in sector A compared to the case of full information. We will see below that this has important implications for the welfare analysis.⁷

3.5 Political Economy and Welfare Analysis

So far, we have taken policy maker preferences as exogenous. We now consider what would happen if we allow the identity of the policy maker to be determined in an election. From our previous analysis we know that a policymaker's sectoral identity influences her redistributive preferences. This, in turn, affects her ability to provide full information. Endogenising the policymaker's identity allows an examination of how citizens optimally trade-off the informational and redistributive rents associated with the different candidates in electing the policy-maker. It also allows us to identify reasons for why multi-tasking by elected governments may or may not lead to a Pareto dominated outcome for the economy.

The political economy model that we use to examine these issues is the citizen candidate approach developed in Osborne and Slivinski (1996) and Besley and Coate (1997). This is a natural model to consider here where we think of the policy maker as one among the citizens located in sector A or B .

The citizen candidate model has three main stages of political competition. At stage one, any citizen can declare him or herself a candidate for office at a small cost c . At stage two, voters vote over the declared candidates and at stage three policy is chosen. We suppose that the default policy if nobody enters is $t = 0, T = 0$ in all states and no messages are sent to the citizens. We also assume that voting and entry decisions are strategic. A political equilibrium is a set of voting decisions at stage two (where no citizen uses a weakly dominated strategy) and a set of entry decisions at stage one which form a Nash equilibrium. For details see Besley and Coate (1997).

The last two sections give us a description of what happens in the event that a citizen

⁷The equilibria in Propositions 2 and 3 do not permit the policy maker to differentiate between states 1 and 2 in the messages that they send. Thus, as in Lemma 1, they do not invoke different investment strategies in these two states. Hence, from an ex post point of view, the outcome generated in these equilibria will be at least as good as any that satisfies Lemma 1. However, from an ex ante view point, it is possible that more informative announcements are possible as long as they lead to the same investment strategy ex post. Since our interest below is in ex post welfare, we do not pursue this possibility further.

with a particular type of preference is elected conditional on whether the state of the world is observable to the whole polity. A sector A citizen being elected corresponds to the case where $\gamma = 1$ and a sector B citizen being elected to the case where $\gamma = 0$. The assumption that there are only two types of citizens permits a fairly routine application of Proposition 2 in Besley and Coate (1997). Since (generically) either sector A or sector B citizens are in a majority, we would expect (for small enough c) a one candidate equilibrium with the candidate representing the preference of the majority sector. If a single candidate of the majority type is standing, no other citizen of the same type would wish to enter — the policy would be unchanged and they would have to pay c . No citizen of the non-majority type would wish to enter as in two candidate races where voters do not use weakly dominated voting strategies, the candidate with a majority of sincere preferences will win. In what follows, we assume that c is small enough so that this constitutes the equilibrium.

In a world of complete information, each citizen will prefer to have their own type in office to promote their preferred redistributive policy. The results derived in section 3.3 imply, that under assumptions 2 and 3, the investment strategies are invariant to which citizen is in office. The only thing decided by political competition is the level of the redistributive taxation. This is like the standard Meltzer and Richards (1981) model of redistribution.

Turning to incomplete information, we observed in Section 3.4 that the preference of the policy maker affects how much information is revealed and hence equilibrium investment strategies. Our desire to embed the analysis in a model where the policy maker is a citizen generates a further complication since he will also be an investor. Moreover, his investment will always be an informed one, regardless of whether other citizens are also informed by messages that he chooses to send. In a simultaneous move investment game, it would be necessary to separate out the policy maker's informed investment decision from that of his fellow citizens. We do not regard the complications involved in specifying the investment equilibrium for this "asymmetric" case to be worthwhile, in that it does not add anything essential to the analysis of the chapter. Hence, we assume that, once elected, a policy maker must place his assets "in trust" which are automatically invested in line with other members of his sector and he earns a return accordingly. Apart from simplifying the analysis, this parallels the kind of institutional arrangement that is commonly observed in representative democracies precisely to limit the

gains that policy makers can receive by trading on inside information about the future of the economy.⁸ With this assumption, we can use the analysis of the previous section to describe what happens when a type A or B citizen is elected under incomplete information. Specifically, we make the following assumption on the IRMS associated with the political equilibrium.

Assumption 5: If a type B policy maker is elected then the IRMS described in Proposition 1 will result. If a type A policy maker is elected then the IRMS will be as in either in Propositions 2 or 3.

It is easy to check that each citizen will still prefer to vote a citizen of their own type in this case. Hence, once again we expect a one candidate equilibrium where the candidate is from the majority sector. If sector B citizens are a majority, then the outcome is that described in Proposition 1 with information fully revealed and no redistribution. If sector A citizens are in the majority, then depending upon whether $(1 - \bar{t}(0)) [p_1 \Delta_H + p_2 \Delta_L] - (p_1 + p_2) \delta$ is positive or negative, either Proposition 2 or 3 will apply.

We know that information is not necessarily revealed in political equilibrium — if a type A citizen is elected to choose policy, then we know that information revelation is only partial while a type B citizen would reveal all information. Less clear is whether full information is ex post Pareto dominant over the political equilibrium. This will be true if there is a feasible tax change such that with the full information investment strategies one of the types of individual can be made strictly better off in some state of the world and no worse off in every other. Since, it generates full information, it is obvious that the outcome when a sector B policy maker chooses policy cannot be Pareto dominated. Hence, we consider whether the equilibrium with a type A policy maker can be dominated by full information revelation coupled with an appropriate variation in tax policy. For the rest of the chapter we assume

Assumption 6: Sector A individuals constitute a majority in the population.

Our first result in this section relates to the IRMS identified in Proposition 3. Specifically, Proposition 4 tells us that a political equilibrium in which this IRMS is generated is Pareto inefficient.

⁸In the U.S. the general rule is that top officials must either divest their holdings, or put them in a blind trust. If a top official has not put assets into a blind account, then he or she must definitely be recused from handling matters that affect the value of those assets. It is worth noting that many of these restrictions come from Executive Orders and ‘ethics codes’ rather than laws.

Proposition 4 *Suppose that $(1 - \bar{t}(0)) [p_1 \Delta_H + p_2 \Delta_L] < (p_1 + p_2) \delta$ and the political equilibrium generates the IRMS described in Proposition 3. Then this outcome can be Pareto dominated by an IRMS in which there is full information revelation.*

Thus the under-investment case results in a Pareto inefficient outcome. Sector B individuals choose to invest in their own sector regardless of the message that they receive and sector A individuals behave as in a complete information world. The only difference in investment strategies arises in state 1, where with full information the sector B individual would wish to invest in sector A . This will be the equilibrium investment strategy under full information for any Pareto efficient tax on income. Clearly, with full information the sector B individuals are better off in state 1 if we keep the tax rate at $\bar{t}(-(1 - \pi_A) \Delta_H)$. If $\bar{t}(-(1 - \pi_A) \Delta_H) > 0$ then Sector A individuals are also better off in state 1 since they get a larger income transfer from the government, for a given tax rate. If $\bar{t}(-(1 - \pi_A) \Delta_H) = 0$ then Sector A individuals are indifferent between the two outcomes. Proposition 4 demonstrates a potential inefficiency associated with giving an elected policy-maker the right to both provide information and redistribute income. As the policy-maker cannot commit to a redistribution schedule prior to citizens' investing she will always have an incentive to misreport in some states of the world. In the case identified above this leads to a Pareto dominated outcome.

We now examine the welfare properties of the over-investment case identified in Proposition 2. Proposition 5 tells us that the outcome cannot be Pareto dominated by a situation in which the information about the state of the world is revealed.

Proposition 5 *Suppose that $(1 - \bar{t}(0)) [p_1 \Delta_H + p_2 \Delta_L] > (p_1 + p_2) \delta$ and that the political equilibrium generates the IRMS described in Proposition 2. Then this outcome cannot be Pareto dominated by the IRMS with full information revelation.*

In this case, full information leads to sector B citizens investing less often in sector A . This improves sector B individuals' welfare. However, holding tax rates constant, this implies a loss to sector A individuals. Moreover, there is no variation in taxes that can undo that welfare loss.

Thus, the welfare properties of the political equilibrium associated with the election of a sector A citizen depends critically on whether we are in the under- or over- investment case.

Loosely speaking, overinvestment is more likely when investors are relatively more optimistic about the likelihood of state 1 occurring (p_1 is high) and/or the additional investment return from investing in sector A in state 1 is large. The fact that the outcome cannot be Pareto dominated in the case of over-investment shows that the absence of full information revelation does not necessarily imply inefficiency. Put another way, not revealing information which determines investment decisions could form part of an optimal redistributive strategy for the government.⁹

3.6 Discussion

While we have focused on economy wide redistribution strategies, the point of the paper that credibility of information is affected by redistribution possibilities is a general one. One could, for example, derive similar results in a case where special interests can make transfers to politicians in exchange for limiting information transmission. The recent crisis over the safety of beef in the UK precipitated by a party in government which was traditionally supported by farmers could be thought of along these lines. The key ingredient that drives this model is the possibility of an agency problem among politicians who no longer equate the social cost and benefit of information.

The latter interpretation of our result makes clear that we can also get results similar to those developed here from an externality in the production process. Consider a world without redistribution where the wage rate in each sector depended upon the amount of investment in that sector. Then it would be in the interest of the policy maker, to claim that his/her sector had the highest return to capital in order to benefit from wage externality engendered by increased investment. This would again reduce the scope for credible information transmission. As in the model developed above, rents to earning wage income within a sector are also important. If individuals could move to the sector with the highest wage rate, this would not be a problem.

The desire for income redistribution in our model is borne out of an initial wage inequality across sectors, where the wage inequality reflects ownership of different levels or types of human

⁹The result can be viewed as failure of the conditions for production efficiency to hold in the Diamond-Mirrlees (1971) sense. This result requires that the government have a full array of (linear) tax instruments. Here, the fact that δ cannot be taxed is key. If the government were able to adopt a tax system in which δ were deducted from income before tax was levied, there would be no possibility of inefficiency in the policy choice.

capital. More generally, we could allow for wealth inequalities across sectors by assuming that individuals in different sectors differ in their ownership of capital. Most of the results could be extended to cover this case. However, additional complications could arise if investment disparities across the sectors made the desire to redistribute in different states of the world sensitive to investment decisions. This seems most likely when sector *A* individuals are capital rich relative to those in sector *B* even though the latter enjoy a higher wage rate.

We have cast the problem of this paper as one that arises when the policy maker is elected. However, it should be apparent from section three that even with a social planner incomplete information is a possibility if the planner's preferences favor sector *A*. The main issue is whether it is reasonable to think of a truly benevolent planner suffering from credibility problems.¹⁰ In the spirit of the literature on time-inconsistent capital taxation, we could interpret our results as saying that a planner may face credibility problems in the transmission of information if he favors a particular group and has redistributive power. For instance, in this model a planner with maximin preferences might yield an IRMS that can be Pareto dominated. However, in the final analysis, planners with credibility problems are probably best thought of as citizens who are elected to choose policy, making the political economy interpretation more palatable.

Assumption 3 in the paper guarantees that some transmission of information can be welfare improving from an ex ante point of view. If this assumption fails, then it is possible that investors in one sector prefer the uninformative "babbling" equilibrium to the more informative equilibria. This is because more information leads sector *B* citizens to reduce their investment in sector *A* in certain states of the world.¹¹ In such cases, ex ante it is possible that full information does not dominate the uninformative equilibrium for sector *A* individuals. Since the political equilibrium can always deliver an uninformative outcome, we would not expect to find that political equilibrium is Pareto dominated in such cases.

We have focused here on cheap talk. The existing literature on political agency models focuses on costly signalling on part of the policy maker primarily in order to affect re-election incentives. Coate and Morris (1995) have shown how this may lead to inefficient outcomes when

¹⁰A fully credible planner could always avoid the inefficiency described in Proposition 6 and could commit to a tax rate with full information that made everyone better off.

¹¹The failure of assumption 3 is akin to a failure of monotonicity in the sense discussed in Crawford and Sobel (1982).

two sources of uncertainty exist. We might expect costly signalling to re-emerge in situations where information transmission is important but governments lack credibility. This may be particularly desirable in situations where the cheap talk equilibrium is Pareto dominated. The British Prime Minister's efforts to eat British beef publicly during the recent public safety scare illustrates this kind of behavior. However, as is well known from such models, the very factors that prevent credible cheap talk may engender distortions in the use of costly signalling. In addition, use of these instruments generates a welfare cost that cheap talk may not suffer from.

The model could be thought of as an argument for trying to write constitutions that uncouple policymakers' private interests from the social interest. A policy maker who received a fixed wage regardless of the state of the economy and was immune to considerations about the level of redistribution would always reveal information faithfully. However, the virtues of such a policy could be, in turn, undermined by possible problems of lobbying and promises of future favors to politicians.

3.7 Concluding Comments

Situations where governments enjoy an informational advantage that is important to private decisions are common. Here, we have developed a simple model of why governments might not be able to transmit credibly all of the information that they possess. We have highlighted how the possibility of redistribution can be key to understanding this, although it is not always true that outcomes with limited information are Pareto inefficient. Our analysis can give a broad hint of when development strategies based on some kind of indicative planning can succeed. Societies where underlying redistributive conflicts are slight seem more likely to be successful when they cast governments in this role. This can be squared with the frequently made observation that the East Asian economies benefitted from their relatively low levels of inequality when embarking on their development strategies.

The analysis suggests possibilities for further research. The possibility that information is withheld in equilibrium somewhat undermines the case for governments to monopolize information collection. In most democracies, we see this task also being undertaken by the press, by independent think-tanks, academics etc. Understanding when private provision of information

may dominate government provision would be an interesting extension. Of course, similar issues about credibility arise if the information sources were considered to be partisan. However, this kind of approach is well placed to explain circumstances under which private provision of this public good would then not be a perfect substitute for government provision and when private agencies would arise endogenously.

The analysis also suggests why functions of government might optimally be horizontally differentiated, with agencies providing information being separated from those that engage in redistribution. Of course, functional separation does not guarantee that political influence could not be exacted upon those charged with information transmission. Nonetheless, to the extent that an ethos of independent impartial transmission of information could be inculcated into certain parts of government, the problems described here could be circumvented. The optimal assignment of powers to different divisions of governments and the missions that they are given merits further consideration.

3.8 Appendix

Proof of Benchmark 1 Result: With $\gamma = 0$, the policy maker chooses $(t_j^*, T_j^*)_{j=1}^4$ to maximize $V_j^B(W_B, K_B, t, T)$. Since $W_B > W_A$ the policy maker chooses $t_j^* = 0$ in every state, with assumption 2 guaranteeing that this so in state 2. Thus $(t_j, T_j) = (t_{0j}^*(K), T_{0j}^*(K)) = (0, 0)$ for $j = 1, 2, 3, 4$. In the investment stage, citizens anticipate no redistribution and given assumption 1 this implies that investment decisions obey (3.4). ■

Proof of Benchmark 2 Result: With $\gamma = 1$, the policy maker chooses $(t_j^*, T_j^*)_{j=1}^4$ to maximize $V_j^A(W_A, K_A, t, T)$. Since $W_A < W_B$ the policy maker has an ex ante motive to redistribute. In states 1 and 4 the investment returns are identical across sectors and $\mu = 0$. In state 3 investment favors sector B which raises sectoral inequality, with sector A citizens receiving $\bar{t}(1 - \pi_A) \Delta_L$ of the additional sector B investment returns. In state 2 the investment returns favors sector A reducing the incentive to redistribute. Sector A individuals receive $\Delta_L + \bar{t}(- (1 - \pi_A) \Delta_L)$ of their additional investment return. At the investment stage citizens anticipate the redistribution associated with each state. From assumption 3 we know that in states 1 and 4, positive redistribution will not prevent citizens from investing in the sector with the highest investment return. In states 2 and 3 citizens continue to invest in their own sector. Therefore individuals maintain the same investment decisions as with no redistributive taxation. ■

Proof of Proposition 1: Suppose that the beliefs are :

$$\begin{aligned} \sigma_j(m_j) &= 1 \text{ for } m_j = j \text{ for } j = 1, \dots, 4 \\ \sigma_j(m) &= \frac{1}{4} \text{ for all } m_j \in \mathcal{M} / \{1, 2, 3, 4\}. \end{aligned}$$

The belief structure is such that any off-the-equilibrium-path messages are interpreted as uninformative and are clearly admissible. We now that they support the equilibrium described. Assumption 4 says that this will result in individuals investment in their own sectors only. The argument in Benchmark result 1 allows us to conclude that, under Assumption 2, the optimal redistribution associated with $\gamma = 0$ is $(t_j, T_j) = (t_{0j}^*(K_j), T_{0j}^*(K_j)) = (0, 0)$ for all $j = 1, 2, 3, 4$. Hence citizens anticipate no redistribution on or off the equilibrium path. Assumption 4 tells us that for any deviation from the messages specified in the statement of the

Proposition, individuals will invest in their own sectors regardless of the information. Given the beliefs about the meaning of messages, it is clear the investors use their full information investment strategies on the equilibrium path. Hence, to complete the proof, all we need to show is that the policy maker prefers to send the informative message rather than transmitting no information. We show this state-by-state. We first show that no off-the-equilibrium path message is preferred and then that no deviation to another equilibrium message is optimal for the policy-maker in any state. We use the fact that in every state of the world the policy-maker sets $(t_j, T_j) = (0, 0)$. With $\gamma = 0$, the policy-maker chooses messages to maximise the welfare of a representative sector B individual $(V_j^B(w_B, K_B, t, T))$.

In state 1, the policy-maker will never deviate to off-the-equilibrium path message as $\Delta_H > \delta$ implies that

$$v(w_B) + r_{A1} - \delta > v(w_B) + r_{B1} \quad (3.11)$$

where the LHS expression is a Sector B individual's payoff on the equilibrium path and the RHS is the payoff after the posited deviation. In states k ($= 2, 3$ and 4) a Sector B individual's payoff is the same on and off the equilibrium path at

$$v(w_B) + r_{Bk}$$

Therefore, the policy-maker is indifferent between sending the informative message and an uninformative one.

Now consider the policy-maker's incentives to deviate to other on-the-equilibrium-path messages. In state 1, deviating to announce state 2 or state 3 or state 4 has occurred results in the same investment strategy as announcing an off-the-equilibrium-path message. Thus by the inequality in (3.11) this is never a profitable deviation. Now consider the remaining three states. In state 2 or state 3 or state 4 announcing that state 1 has occurred strictly lowers the Sector B individual's payoff as $\Delta_L < \delta$ implies that

$$v(w_B) + r_{A2} - \delta < v(w_B) + r_{B2}$$

Announcing state 3 or state 4 has occurred in state 2 (or state 2 or 4 in state 3; or state 2 or 3 in

state 4) leaves the investment strategy unaltered and therefore the Sector B individual's payoff. It follows that the most informative message sequence which can be sustained in equilibrium is $m_j = j$ for $j = 1, \dots, 4$. ■

Proof of Lemma 1

With incomplete information and $\gamma = 1$, a sector B individual's optimal investment choice solves

$$\tilde{K}_B \left(q; \{t_{1j}, T_{1j}\}_{j=1}^4 \right) = \arg \max_{k \in \{0,1\}} \sum_{j=1}^4 q_j (v((1-t_{1j})w_B) + (1-t_{1j})[r_{Aj}k_i + r_{Bj}(1-k_i)] - \delta k_i + T_{1j})$$

We first show that $\hat{K}_B(1, q) > \hat{K}_B(1, q')$ implies $\hat{K}_A(1, q) = 1$.

Let $\phi_j^B(\xi) = \sum_{j=1}^4 \xi_j (v((1-t_{1j})w_B) + T_{1j} + r_{Bj})$ and define

$$\bar{V}^B(\xi) = \phi_j^B(\xi) + \sum_{j=1}^4 \xi_j (1-t_{1j}) [(r_{Aj} - r_{Bj})k_i] - \delta k_i$$

to be a sector B individual's expected utility with probability vector ξ . Now let (q, q') be such that $\hat{K}_B(1, q) > \hat{K}_B(1, q')$. This requires that

$$\begin{aligned} \sum_{j=1}^4 q_j (1-t_{1j}) [(r_{Aj} - r_{Bj})] - \delta &> 0 \text{ and} \\ \sum_{j=1}^4 q'_j (1-t_{1j}) [(r_{Aj} - r_{Bj})] - \delta &< 0, \text{ which implies that:} \\ \sum_{j=1}^4 q_j (1-t_{1j}) [(r_{Aj} - r_{Bj})] &> \delta > \sum_{j=1}^4 q'_j (1-t_{1j}) [(r_{Aj} - r_{Bj})]. \end{aligned}$$

A sector A individual's expected utility can be written as

$$\bar{V}^A = \phi_j^A(\xi) - \delta + \sum_{j=1}^4 q_j (1-t_{1j}) [(r_{Aj} - r_{Bj})k_i] + \delta k_i$$

Observe that $\sum_{j=1}^4 q_j (1-t_{1j}) [(r_{Aj} - r_{Bj})] > \delta$ implies $\hat{K}_A(1, q) = 1$ as claimed.

To complete the proof, we show equilibrium messages such that $q(m_1^*, p, \sigma) = q$ and $q(m_2^*, p, \sigma) =$

q' are not possible. Consider the policy-maker's payoff in state 2 when $\gamma = 1$. That is, the policy-maker maximises a Sector A individual's payoff such that

$$\begin{aligned}\widehat{G}_2(1, \xi) &= v\left(\left(1 - t_{12}\left(\widehat{K}(1, \xi)\right)\right) w_A\right) + \\ &\quad \left(1 - t_{12}\left(\widehat{K}(1, \xi)\right)\right) \left[r_{A2}\widehat{K}_A(1, \xi) + r_{B2}(1 - \widehat{K}_A(1, \xi))\right] \\ &\quad - \delta\left(1 - \widehat{K}_A(1, \xi)\right) + T_{12}\left(\widehat{K}(1, \xi)\right)\end{aligned}$$

We will show that $\widehat{G}_2(1, q) > \widehat{G}_2(1, q')$. There are two cases to consider. First, consider the case where $\widehat{K}_A(1, q') = 1$. Then $t_{12}\left(\widehat{K}(1, q)\right) = \bar{t}(0) > t_{12}\left(\widehat{K}(1, q')\right) = \bar{t}(-(1 - \pi_A)\Delta_L)$. Hence,

$$\begin{aligned}\widehat{G}_2(1, q) &= v\left(\left(1 - \bar{t}(0)\right) w_A\right) + \left(1 - \bar{t}(0)\right) r_{A2} \\ &\quad + \bar{t}(0) \left[\pi_A w_A l_A^* \left(\left(1 - \bar{t}(0)\right) w_A\right) + (1 - \pi_A) w_B l_B^* \left(\left(1 - \bar{t}(0)\right) w_B\right)\right] \\ &\leq v\left(\left(1 - \bar{t}(-(1 - \pi_A)\Delta_L)\right) w_A\right) + \left(1 - \bar{t}(-(1 - \pi_A)\Delta_L)\right) r_{A2} \\ &\quad + \bar{t}(-(1 - \pi_A)\Delta_L) \left[\pi_A w_A l_A^* \left(\left(1 - \bar{t}(-(1 - \pi_A)\Delta_L)\right) w_A\right) \right. \\ &\quad \left. + (1 - \pi_A) w_B l_B^* \left(\left(1 - \bar{t}(-(1 - \pi_A)\Delta_L)\right) w_B\right)\right] \\ &< v\left(\left(1 - \bar{t}(-(1 - \pi_A)\Delta_L)\right) w_A\right) + \left(1 - \bar{t}(-(1 - \pi_A)\Delta_L)\right) r_{A2} \\ &\quad + \bar{t}(-(1 - \pi_A)\Delta_L) \left[\pi_A w_A l_A^* \left(\left(1 - \bar{t}(-(1 - \pi_A)\Delta_L)\right) w_A\right) \right. \\ &\quad \left. + (1 - \pi_A) w_B l_B^* \left(\left(1 - \bar{t}(-(1 - \pi_A)\Delta_L)\right) w_B\right) - (1 - \pi_A)\Delta_L\right] \\ &= \widehat{G}_2(1, q')\end{aligned}$$

Thus $\widehat{G}_2(1, q) > \widehat{G}_2(1, q')$. Now consider the case where $\widehat{K}_A(1, q') = 0$. Then $t_{12}\left(\widehat{K}(1, q)\right) = \bar{t}(0) = t_{12}\left(\widehat{K}(1, q')\right)$. Therefore

$$\begin{aligned}\widehat{G}_2(1, q) &= v\left(\left(1 - \bar{t}(0)\right) w_A\right) + \left(1 - \bar{t}(0)\right) r_{A2} \\ &\quad + \bar{t}(0) \left[\pi_A w_A l_A^* \left(\left(1 - \bar{t}(0)\right) w_A\right) + (1 - \pi_A) w_B l_B^* \left(\left(1 - \bar{t}(0)\right) w_B\right)\right] \\ &< v\left(\left(1 - \bar{t}(0)\right) w_A\right) + \left(1 - \bar{t}(0)\right) r_{B2} - \delta \\ &\quad + \bar{t}(0) \left[\pi_A w_A l_A^* \left(\left(1 - \bar{t}(0)\right) w_A\right) + (1 - \pi_A) w_B l_B^* \left(\left(1 - \bar{t}(0)\right) w_B\right)\right] \\ &= \widehat{G}_2(1, q')\end{aligned}$$

Thus $\widehat{G}_2(1, q) > \widehat{G}_2(1, q')$ in this case too.

Now suppose that (m_1^*, m_2^*) exist s.t. $q(m_1^*, p, \sigma) = q$ and $q(m_2^*, p, \sigma) = q'$. Then, for all σ ,

$$\widehat{G}_2(1, q(m_1^*, p; \sigma)) > \widehat{G}_2(1, q(m_2^*, p; \sigma)) = \arg \max_{m \in \mathcal{M}} \left\{ \widehat{G}_2(1, q(m, p; \sigma)) \right\}$$

— a contradiction. This proves the lemma. ■

Proof of Proposition 2: We construct beliefs such that the equilibrium is as described.

Suppose that these are

$$\begin{aligned} \sigma_j(m_j) &= 1 \text{ when } m_j = j \text{ and } j = 3, 4 \\ \sigma_j(m_j) &= \frac{1}{2} \text{ when } m_j = \{1 \cup 2\} \text{ and } j = 1, 2 \\ \sigma_k(m_j) &= \frac{1}{4} \text{ for all } k \text{ and for other } m_j \in \mathcal{M} \end{aligned}$$

We now need to show three things: that the posited investment strategies form an investment equilibrium, that the redistribution strategies and messages are optimal for a policy maker with $\gamma = 1$. $\gamma = 1$ implies that the policy-maker maximises a Sector A individual's payoff. Given the beliefs, on hearing the message that either state 1 or state 2 has occurred, investors update such that

$$q_1(1 \cup 2) = \frac{p_1}{p_1 + p_2} \text{ and } q_2(1 \cup 2) = \frac{p_2}{p_1 + p_2}$$

Now consider the decision to invest in sector A by sector B individuals. They invest in sector A general if and only if $\sum_{j=1}^4 q_j (1 - t_j) [(r_{Aj} - r_{Bj})] > \delta$. When the message is $1 \cup 2$ this boils down to $(1 - \bar{t}(0)) [p_1 \Delta_H + p_2 \Delta_L] > (p_1 + p_2) \delta$ which is the condition in the Proposition. States 3 and 4 are fully revealed in the posited equilibrium bringing forth full information investment strategies. Hence, we have shown that the investment strategies with these beliefs are:

$$\begin{aligned} \widehat{K}_A(1, q(m_j, \sigma)) &= 1, \text{ for } j = 1, 2, 3, \text{ and } \widehat{K}_A(1, q(4, \sigma)) = 0 \\ \widehat{K}_B(1, q(m_j, \sigma)) &= 1, \text{ for } j = 1, 2 \text{ and } \widehat{K}_B(1, q(m_j, \sigma)) = 0, \text{ for } j = 3, 4. \end{aligned}$$

Turning now to redistribution, it is easy to check that the redistribution strategies which follow

(3.5) are

$$\begin{aligned}(t_j, T_j) &= (\bar{t}(0), \bar{T}(0)) \text{ for } j = 1, 2, 4 \\ (t_3, T_3) &= (\bar{t}((1 - \pi_A) \Delta_L), \bar{T}((1 - \pi_A) \Delta_L))\end{aligned}$$

The final step must show that the messages posited are a best response. We need to show that no off-the-equilibrium-path message is preferred and that no deviation to another equilibrium message is optimal for the policy maker in any state. First recall, that from Assumption 4, any deviation to any other message results in an investment strategy where each individual always invests in their own sector. Using this, we can show that the policy maker will never prefer to deviate to such a message. In states 1 and 2, this follows since

$$\begin{aligned}& v((1 - \bar{t}(0)) w_A) + (1 - \bar{t}(0)) r_{Ak} \tag{3.12} \\ & + \bar{t}(0) [\pi_A w_A l_A^* ((1 - \bar{t}(0)) w_A) + (1 - \pi_A) w_B l_B^* ((1 - \bar{t}(0)) w_B)] \\ \geq & v((1 - \bar{t}(-(1 - \pi_A) \Delta_j)) w_A) + (1 - \bar{t}(-(1 - \pi_A) \Delta_j)) r_{Ak} \\ & + \bar{t}(-(1 - \pi_A) \Delta_j) [\pi_A w_A l_A^* ((1 - \bar{t}(-(1 - \pi_A) \Delta_j)) w_A) \\ & + (1 - \pi_A) w_B l_B^* ((1 - \bar{t}(-(1 - \pi_A) \Delta_j)) w_B)] \\ > & v((1 - \bar{t}(-(1 - \pi_A) \Delta_j)) w_A) + (1 - \bar{t}(-(1 - \pi_A) \Delta_j)) r_{Ak} \\ & + \bar{t}(-(1 - \pi_A) \Delta_j) [\pi_A w_A l_A^* ((1 - \bar{t}(-(1 - \pi_A) \Delta_j)) w_A) \\ & + (1 - \pi_A) w_B l_B^* ((1 - \bar{t}(-(1 - \pi_A) \Delta_j)) w_B) - (1 - \pi_A) \Delta_j],\end{aligned}$$

where the first expression is a Sector A individual's payoff along the equilibrium path and the last is payoff after the posited deviation when the state is either 1 ($k = 1$ and $j = H$) or 2 ($k = 2$ and $j = L$). In state 3, it is clear that the policy maker is indifferent between this message and an uninformative one. In state 4, he prefers to announce that state 4 has occurred as

$$\begin{aligned}& v((1 - \bar{t}(0)) w_A) + (1 - \bar{t}(0)) r_{B4} - \delta \\ & + \bar{t}(0) [\pi_A w_A l_A^* ((1 - \bar{t}(0)) w_A) + (1 - \pi_A) w_B l_B^* ((1 - \bar{t}(0)) w_B)] \\ > & v((1 - \bar{t}((1 - \pi_A) \Delta_H)) w_A) + (1 - \bar{t}((1 - \pi_A) \Delta_H)) r_{A4}\end{aligned}$$

$$\begin{aligned}
& +\bar{t}((1-\pi_A)\Delta_H) [\pi_A w_A l_A^* ((1-\bar{t}((1-\pi_A)\Delta_H)) w_A) \\
& + (1-\pi_A) w_B l_B^* ((1-\bar{t}((1-\pi_A)\Delta_H)) w_B) + \Delta_H].
\end{aligned}$$

Now consider incentives to deviate to other on-the-equilibrium-path messages. In states 1 and 2, deviating to announce that state 3 has occurred follows the same logic as a deviation to a message interpreted as uninformative as it results in the same investment decisions as in the case of uninformed investing. Thus the inequality in (3.12) is relevant. For a deviation to announce state 4 in states 1 or 2, it is clear that this is undesirable since redistribution is the same and $(1-\bar{t}(0))r_{B4} - \delta > (1-\bar{t}(0))r_{A4}$. Now consider state 3. Deviating to the message that state 1 or 2 has occurred is not optimal as

$$\begin{aligned}
& v((1-\bar{t}(0))w_A) + (1-\bar{t}(0))r_{A3} \\
& + \bar{t}(0) [\pi_A w_A l_A^* ((1-\bar{t}(0))w_A) + (1-\pi_A) w_B l_B^* ((1-\bar{t}(0))w_B)] \\
< & v((1-\bar{t}((1-\pi_A)\Delta_L))w_A) + (1-\bar{t}((1-\pi_A)\Delta_L))r_{A3} \\
& + \bar{t}((1-\pi_A)\Delta_L) [\pi_A w_A l_A^* ((1-\bar{t}((1-\pi_A)\Delta_L))w_A) \\
& + (1-\pi_A) w_B l_B^* ((1-\bar{t}((1-\pi_A)\Delta_L))w_B) + \Delta_L].
\end{aligned}$$

A deviation to announce state 4 in state 3 is not desirable as $(1-\bar{t}(0))r_{B3} - \delta < (1-\bar{t}(0))r_{A3}$ and the level of redistribution falls from $\bar{t}((1-\pi_A)\Delta_L)$ to $\bar{t}(0)$. Finally, consider state 4. A deviation to announcing state 3 yields the same investment profile as the uninformative case which we have already shown to be undesirable. Now consider a deviation to announcing that state 1 or 2 has occurred. This is not desirable since redistribution is unchanged and $(1-\bar{t}(0))r_{B4} - \delta > (1-\bar{t}(0))r_{A4}$. ■

Proof of Proposition 3: The method of proof is essentially the same as proposition 2. The beliefs described in that Proposition can also support the equilibrium in this case. The main difference from proposition 2 is that as $(1-\bar{t}(0))[p_1\Delta_H + p_2\Delta_L] < (p_1 + p_2)\delta$ when $m_j = \{1 \cup 2\}$ and $j = 1, 2$ sector B investors continue to invest in their own sector. Therefore, the equilibrium investment profile now is

$$\widehat{K}_A(1, q(m_j, \sigma)) = 1, \text{ for } j = 1, 2, 3 \text{ and } \widehat{K}_A(1, q(m_4, \sigma)) = 0$$

$$\widehat{K}_B(1, q(m_j, \sigma)) = 0, \text{ for } j = 1, 2, 3, 4.$$

and the corresponding tax profile:

$$\begin{aligned} (t_1, T_1) &= (\bar{t}(-(1 - \pi_A) \Delta_H), \bar{T}(-(1 - \pi_A) \Delta_H)) \\ (t_2, T_2) &= (\bar{t}(-(1 - \pi_A) \Delta_L), \bar{T}(-(1 - \pi_A) \Delta_L)) \\ (t_3, T_3) &= (\bar{t}((1 - \pi_A) \Delta_L), \bar{T}((1 - \pi_A) \Delta_L)) \\ (t_4, T_4) &= (\bar{t}(0), \bar{T}(0)) \end{aligned}$$

We now show that the posited messages remain an equilibrium in this case by checking that the policy-maker does not have an incentive to deviate to off-the-equilibrium-path messages or to other equilibrium messages. Since the investment profile in this equilibrium is the same as in the case where no information is passed except in state 4, the policy maker is indifferent between this and an uninformative equilibrium in all other states.

In states 1, 2 and 3 the investment strategies and therefore the level of redistribution are unaffected by a deviation to an off-the-equilibrium-path (uninformative) message and therefore the policy-maker is indifferent between sending the equilibrium messages and any other. In state 4, the policy-maker strictly prefers revealing the state as

$$\begin{aligned} &v((1 - \bar{t}(0)) w_A) + (1 - \bar{t}(0)) r_{B4} - \delta \\ &+ \bar{t}(0) [\pi_A w_A l_A^* ((1 - \bar{t}(0)) w_A) + (1 - \pi_A) w_B l_B^* ((1 - \bar{t}(0)) w_B)] \\ > &v((1 - \bar{t}((1 - \pi_A) \Delta_H)) w_A) + (1 - \bar{t}((1 - \pi_A) \Delta_H)) r_{A4} \\ &+ \bar{t}((1 - \pi_A) \Delta_H) [\pi_A w_A l_A^* ((1 - \bar{t}((1 - \pi_A) \Delta_H)) w_A) \\ &+ (1 - \pi_A) w_B l_B^* ((1 - \bar{t}((1 - \pi_A) \Delta_H)) w_B) + \Delta_H]. \end{aligned}$$

Now consider the incentives to deviate to other on-the-equilibrium-path messages. In states 1 and 2 announcing state 3 has occurred leaves investment strategies unaffected. The policy-maker is therefore indifferent between the messages announcing that the state is either 1 or 2 and that state 3 has occurred. However, in states 1 and 2 a deviation to announcing state 4 is strictly undesirable as redistribution is unchanged but $(1 - \bar{t}(0)) r_{Bk} - \delta < (1 - \bar{t}(0)) r_{Ak}$

for $k = 1, 2$. In state 3 announcing state 1 and 2 has occurred leaves investment strategies unaffected. The policy-maker is therefore indifferent between the messages $(1 \cup 2)$ and (3). However announcing state 4 is strictly undesirable as redistribution is unchanged but $(1 - \bar{t}(0)) r_{B3} - \delta < (1 - \bar{t}(0)) r_{A3}$. In state 4, a deviation to announcing states 1 and 2 or state 3 yields the same investment profile as in the uninformative case which we have already shown is undesirable. ■

Proof of Proposition 4: It is easy to prove that full information is dominant state by state. In states 2, 3 and 4, the redistribution, investment strategies are the same in the full information and incomplete information case — they are those given in Proposition 3. Hence, the ex post payoffs in both sectors are the same in these states. In state 1, however, sector B individuals will invest at the tax rate $\bar{t}(-(1 - \pi_A) \Delta_H) < \bar{t}(0)$ by assumption 2. This generates a Pareto improvement in that state since this raises mean income. Hence, for a given tax rate, sector A and sector B individuals gain if $\bar{t}(-(1 - \pi_A) \Delta_H) > 0$. Otherwise sector B individuals gain and sector A individuals are as well off. ■

Proof of Proposition 5: To see this, observe that in investment and redistributive strategies will be identical under incomplete and full information in states 1, 3, and 4. Hence, the only possible difference arises in state 2. Under full information, the sector B individuals will choose not to invest in sector A . This makes sector B individuals better off and sector A individuals worse off. Hence, to generate a Pareto improvement a variation in the tax rate must be found that compensates the sector A individuals. It is easy to see that this is impossible. Let

$$H^A(t) = v((1-t)w_A) + t[\pi_A w_A l_A^*((1-t)w_A) + (1-\pi_A)w_B l_B^*((1-t)w_B)].$$

It is clear that $\bar{t}(0)$ maximizes $H^A(t)$ for $t \in [0, 1]$. Hence,

$$H^A(\bar{t}(0)) > H^A(t) - t\Delta_L(1 - \pi_A)$$

for all $t \in [0, 1]$. But $H^A(\bar{t}(0)) + \Delta_L$ is a sector A individual's state 2 payoff under incomplete information and $H^A(t) + \Delta_L - t\Delta_L(1 - \pi_A)$ is their state 2 payoff under full information. Hence, it is impossible to compensate sector A individuals for the move to full information ■

Chapter 4

Technology Adoption in Agriculture and Industrialisation: Analysing the Role for Government Intervention

4.1 Introduction

‘Traditional agriculture is niggardly in the meaningful sense that it is an expensive source of growth ’ T.W.Schultz (1964)

That processes of development are characterized by increased industrialisation and a decrease in agriculture’s share of total output¹ is a folk theorem in development economics. Empirical evidence also suggests that periods of rapid industrialisation are usually either preceded by or accompanied by changes in methods of production in agriculture. Examples include the increased mechanisation of agricultural production in England prior to the Industrial Revolution (Nurkse 1953), and in Japan at the turn of the century (Ohkawa and Rosovsky, 1973).

These features of development have influenced the form of many public policy interventions in underdeveloped agrarian countries². In the 1920s the Russian government tried to affect

¹Kuznets (1959) synthesis of the stylised facts of the structural transformation of economies during the process of modern economic growth is among the best known expositions of this.

²This issue formed the basis of the famous Corn law debate between Malthus and Ricardo

industrialization by deliberately altering the terms of trade between agriculture and industry (on this 'price scissors debate' see Sah and Stiglitz 1984). Similarly, during the Great Leap Forward the Chinese government sought to alter methods of production in agriculture as a way of heralding in industrialisation (Lin 1990). Comparable examples exist for other developing countries.

Yet the appropriate design of public policies which seek to affect industrialisation by altering the methods of agricultural production remains poorly understood. The cost of this lack of understanding is possibly high. Over the last four decades low income countries have seen the adoption of different kinds of labour augmenting technologies in agriculture. However, in marked contrast to industrialised countries these countries have seen only very limited adoption of mechanised technologies in agriculture.³ Figures 4.1 and 4.2 provide a graphical illustration of the same.

Figure 4.1 graphs the capital labour ratio in the agricultural sector for a set of African, East Asian and other Asian countries between 1960 and 1990. Figure 4.2 graphs the proportion of labour force employed in the agricultural sectors of these countries for the same period. The figures show that the East Asian miracle countries experienced a sharp fall in the use of labour in agriculture and a rise in the agricultural capital-labour ratio between 1960-1990. In contrast, African and other Asian countries did not see large changes in the size of their agricultural labour force during this period. Further, while agricultural methods of production became more capital intensive in all countries during this period, the extent of capitalisation showed significant cross-country variation (figure 4.1). While these countries may have seen the adoption of labour augmenting technologies during this period, the graphs suggest that the extent of agricultural mechanisation remained limited. Since processes of development have usually been accompanied by increased mechanisation of agricultural production it is therefore relevant to enquire how public policy may affect citizens' decision to adopt improved agricultural and industrial technologies.

One reason for our limited understanding of such public policies is the lack of an academic or policy consensus on the causal links between changes in agricultural methods of production

³A large empirical literature examines the relative importance of factor accumulation and technological progress in explaining the East Asian miracle. Papers such as Chang-Tai Hsieh (1998) argue that technological progress play a key role in explaining the industrial revolution in East Asia.

and industrialisation in an economy. Supply side theorists (Lewis 1955, Hirschman 1958) suggest that changes in methods of agricultural production aid industrialisation by transferring resources, especially labour to it. Others (Johnston and Mellor 1961, Murphy, Shleifer and Vishny 1989a) argue that changes in agricultural methods of production promote industrialisation by increasing the (agricultural) demand for industrial goods. The two views have very different implications for public policy design.

A second reason concerns the implementation of such policies. Processes of industrialisation are, in general, not distribution neutral. That is, while increased industrialisation of an economy improves some citizens' well-being it renders others worse off. In countries where the potential for redistribution is limited this feature of industrialisation may render the possibility of policy driven industrialisation unviable. This is particularly likely to be true in representative democracies where the policy-maker is electorally accountable.

This chapter provides a formal analysis of these issues. The model used to explore these issues is constructed along the following lines. A two sector model of the economy is developed. The agricultural sector in the economy produces food, and the manufacturing sector an industrial good. Landowners in the agricultural sector face a choice between traditional agricultural methods and investing in a mechanised agricultural technology. The latter uses the industrial good as an input. This characterisation of production technologies implies that both supply and demand linkages may exist between the two sectors. The analysis identifies conditions under which this economy may exhibit multiple investment equilibria. Specifically, for the same set of endowments and production technologies the economy may either be characterised by the practice of traditional agriculture and low levels of industrialisation, or by mechanised agricultural production and high industrialisation.

The chapter analyses the possibility of government-led investment coordination in this economy. The policy-maker's identity is determined in an election. Two alternative public policy interventions are considered. To identify how changes in the income distribution affect the possibility of policy led industrialisation the possibility of coordination is considered for both an equal and an unequal society. Whilst the social surplus maximising technology is always implemented in an equal society, this is not true of unequal societies. For a large set of parameter value either the no coordination outcome persists, or mechanised agricultural production

occurs but workers are rendered worse off.

The explanation for the continued agricultural stagnation and industrial backwardness of some low income agrarian economies developed in this chapter is related to 'big push' models of industrialisation⁴ (Murphy, Shleifer and Vishny 1989b). These models explain how a coordination failure between investors in the industrial sector may limit industrialisation. In these models the move to the more industrialised equilibrium is strictly welfare enhancing. Therefore, a common policy prescription in most 'big push' models is that governments should act as coordinators of investment activity.

Whilst well-placed to explain instances of successful government led industrialisation programmes (e.g. the experience of some East Asian countries), these models shed little light on the dismal performance of government initiated investment coordination programmes in many low income countries (see Bardhan 1984 for a lucid description of India's failed industrialisation program).⁵ One contribution of this chapter is to identify reasons why policy led investment coordination was successful in some, but not all, developing countries.⁶ In particular, this chapter argues that the distributional consequences of industrialisation may affect both the possibility and the welfare implications of policy led industrialisation in an underdeveloped economy.

There exists a literature which examines how political economy concerns may prevent the adoption of potentially Pareto superior technologies (Dixit and Londegran 1995; Fernandez and Rodrik 1991). However, unlike the research reported in this chapter, this literature has tended to focus on economic environments in which unique equilibria exist. This chapter shows that the role of public policies in affecting investment is sensitive to the existence of multiple

⁴The idea that an economy may be stuck at a low level of industrialisation as a result of policy rather than of resource constraints was first discussed by Rosenstein Rodan (1943).

⁵A cross country comparison often made in this connection is between Korea and Philippines. Benabou (1996) details the difference in initial conditions for Korea and Philippines, 'During the last quarter century, Korea's average growth rate was 6 percent while that for Philippines was 2 percent, .. even though in the early 1960s the two countries were similar with respect to GDP per capita, population and urbanisation.. Philippines was however characterised by a more unequal income distribution. The ratio of the income shares of the top twenty percent to the bottom twenty percent was about twice as large in the Philippines....Similar disparities characterised land ownership: the Gini coefficient for farmland was 38.7 for Korea and 53.4 for the Philippines in 1960 and 1961 respectively.'

⁶In a series of papers Sah and Stiglitz (1984, 1987) examine the relationship between policy led changes in the terms of trade between agriculture and industry and industrialisation. They show that variations in the terms of trade can influence the extent of industrialisation. They note that policies that engender industrialisation may influence worker income adversely but do not examine how these adverse distributional consequences may affect the feasibility of public policies for industrialisation.

investment equilibria.

The ideas developed in this chapter also relate to papers which analyse the relationship between an economy's income distribution and the possibility of industrialisation (Murphy, Shleifer and Vishny 1989a; Baland and Ray 1991). These papers examine how changes in a country's income distribution alter the demand for industrial goods and thereby the level of industrialisation. In contrast, this chapter focuses on how political economy concerns engendered by changes in an economy's income distribution may affect the possibility of industrialisation.

Overall, this chapter makes two contributions to the existing literature. It develops a model to explain why processes of development in most countries have been accompanied by structural changes in both their agricultural and industrial sectors, and identifies the conditions under which such a structural transformation may be inhibited by a coordination failure amongst investors in the agricultural sector. The chapter then examines the possibility of policy led industrialisation in such a situation, and identifies reasons why the possibility of successful policy led industrialisation may depend on the economy's initial income distribution. By doing so it provides one explanation for why both history and expectations have been critical determinants of development processes in many countries (Krugman 1991).

The rest of the chapter is organised as follows. Section 4.2 develops a two sector model in which landowners face a choice of agricultural technology. The model is used to characterise the relationship between landowners' investment decisions in the agricultural sector and the economy's level of industrialisation. Section 4.3 turns to analysis of the role of the government as a coordinator of investment activity. Section 4.4 concludes. All proofs are in the appendix.

4.2 The Model

This section develops a simple model of an economy in which demand and supply linkages exist between production in the agricultural and industrial sectors. The model is used to analyse the relationship between landowners' choice of agricultural technology and the economy's level of industrialisation. In keeping with some of the recent literature on industrialisation (Krugman and Venables 1995, Rodriguez-Clare 1996) high industrialisation is associated with the production of increased varieties of the industrial good.

4.2.1 Economic Environment

The economy consists of N citizens, indexed by $j \in \mathcal{N} = \{1, \dots, N\}$ and lasts a single period. The total stocks of labour and land in the economy are $L > 1$ units of labour and one unit of land. Citizens differ in their endowments of labour and land. Citizen j 's share of the labour and land stocks is denoted as α_j and β_j respectively. Citizens' inelastically supply all their labour such that citizen j 's final income is $y_j \equiv \alpha_j w L + \beta_j \pi$, where π is the return on land and w the wage rate. Citizens' use their income to buy two kinds of goods— *food* (denoted as F) and *manufactures* (denoted as M). A citizen's preferences over these goods take the form $u_j = F^\nu Q^{1-\nu}$.

Food production is undertaken by landowners (i.e. citizens with $\beta_j > 0$) in the agricultural sector. For simplicity, I assume that landowners have identical land endowment, and that there is no trade in land. A landowner can produce food by one of two fixed factor production technologies— *basic* or *advanced*. The technologies are indexed by $\tau \in \{b, a\}$ and are given by

$$F_b = \min(l, h)$$

$$F_a = \min\left(\frac{l}{\gamma}, h, \frac{M}{\kappa}\right)$$

l denotes the labour requirement and h the land requirement. $\gamma \in [0, 1[$ and $\kappa \in [0, 1]$ are parameters which characterise the production function. I assume that $M > \kappa$, and that land supply is the limiting factor on food production. Hence, irrespective of the agricultural technology used, one unit of food is produced in equilibrium.⁷

Use of the advanced technology is associated with an additional demand for κ units of manufactures, and a reduced labour demand of $\gamma < 1$ units. Therefore the land rents (π) associated with the two technologies differ. Specifically, $\pi_b = 1 - w_b$ and $\pi_a = 1 - \gamma w_a - \kappa P_a$; where the price of food is normalised to unity, and P is the manufactures price.

Manufactures are produced in the industrial sector which is characterized by monopolistic

⁷The corner solution of zero food production is ruled out by the assumption that $\nu > 0$ in agents' utility function. More general specifications of the agricultural production function like CES ensure interior solutions for food production and allow factor demands to vary smoothly with prices. However such changes in specification do not affect the paper's main results.

competition. A continuum of firms indexed by $i \in \mathcal{N} = \{1, 2, \dots, n\}$ produce different varieties of manufactures. Specifically, firm i produces quantity x_i of variety i and prices it at p_i . These varieties are then aggregated into a single manufactures good. Aggregation is via a production function which exhibits constant elasticity of substitution in the quantities of each product type (Dixit and Stiglitz 1977, and Ethier 1982). That is,

$$M \equiv \left(\int_{i \in n} x_i^{\frac{\varepsilon-1}{\varepsilon}} di \right)^{\frac{\varepsilon}{\varepsilon-1}} \quad \text{and} \quad P \equiv \left(\int_{i \in n} p_i^{1-\varepsilon} di \right)^{\frac{1}{1-\varepsilon}}$$

where n is the set of varieties produced in equilibrium and ε is the elasticity of substitution across varieties. I assume $\varepsilon > 1$ such that product varieties are imperfect substitutes. $\rho \equiv \frac{\varepsilon-1}{\varepsilon}$ measures citizens' intensity of preference for variety. Whilst the number of varieties produced is determined in equilibrium, I assume that a sufficiently large number of industrial varieties exist. Hence the elasticity of inverse demand⁸ faced by a producer can be approximated as $1 - \rho$ (Dixit and Stiglitz 1977). Costless product differentiation on part of the firms implies that no two firms will produce the same variety.

At the firm level, I assume identical production functions for all product varieties⁹. Firm level production is characterised by economies of scale. Production of variety i involves a fixed cost of δ labour units and a constant marginal cost of ϕ units of output. Firm i 's production function is

$$x_i = \frac{l_i - \delta}{\phi} \text{ for } l_i > \delta; 0 \text{ otherwise}$$

with firm i 's associated profits given by $p_i x_i - w(\phi x_i + \delta)$. Monopolistic competition implies that in equilibrium variety i 's price will equate marginal revenue (ρp_i) and marginal cost. Hence, $p_i \left(\frac{\varepsilon-1}{\varepsilon} \right) = \phi w$. For notational simplicity I choose units such that $\phi = \frac{\varepsilon-1}{\varepsilon}$. Thus variety i 's price equals the wage rate in the economy, or

$$p_i = w \tag{4.1}$$

Monopolistic competition in the industry implies that in equilibrium $p_i x_i = w(\phi x_i + \delta)$.

⁸This property of CES indices is discussed in Dixit and Stiglitz (1977).

⁹The industry wide demand for labour is $l^d = \frac{n p x}{w}$.

Solving this, we find that the output per firm is constant at

$$x_i = \frac{\delta}{1 - \phi} \quad (4.2)$$

Firms produce the same quantity of output per variety— x and price them identically at the price p .¹⁰ Therefore, we can simplify the manufactures production function to $M = n^{\frac{\epsilon}{\epsilon-1}} x$ (with $P = n^{\frac{1}{1-\epsilon}} p$). It is clear from this expression that for a given n manufactures production exhibits constant returns to scale. However, for a rise in n it displays increasing returns to scale.

4.2.2 Choice of Technology

This section examines the relationship between landowners' choice of agricultural technology and the economy's level of industrialisation. I first characterize the production and consumption decisions associated with the use of either agricultural technology, and then examine landowner's choice of agricultural technology.

I assume full labour mobility across the two sectors. Whilst total labour supply is fixed, agricultural labour demand is sensitive to the choice of technology. Hence wage rates vary with the choice of agricultural technology. Specifically, equating labour demand and supply gives

$$w_b = \frac{x n_b p_b}{L - 1} \text{ and } w_a = \frac{x n_a p_a}{L - \gamma} \quad (4.3)$$

From equation (4.1) we know that $p_\tau = w_\tau$. Therefore, substituting for p_τ in equation (4.3) allows us to recover the expressions for the number of industrial varieties produced with either agricultural technology in use. That is,

$$n_b = \frac{L - 1}{x} \text{ and } n_a = \frac{L - \gamma}{x} \quad (4.4)$$

since $\gamma < 1$ by assumption, it follows that the use of the advanced technology leads to the production of an increased number of industrial varieties. This discussion is summarized by

¹⁰The symmetric way in which the different industrial varieties enter the formulation of M and convexity ($0 < \rho < 1$) implies that citizens consume the same amount of each variety.

Proposition 1.

Proposition 1: *Relative to the basic agricultural technology use of the advanced agricultural technology is associated with the production of an increased number of industrial varieties.*

Use of the advanced technology in the agricultural sector frees up an additional $(1 - \gamma)$ units of labour. The main issue is whether this increase in industrial labour supply only alters factor prices or also increases the level of industrialisation. Proposition 1 tells us that the latter occurs. That is, the number of industrial varieties produced in the economy is increasing in the industrial labour supply. To understand the reason for this note that industrial varieties are imperfect substitutes ($\rho < 1$). This leads to a love for variety on the part of consumers. Consequently, returns from the division of labour in the production of industrial varieties exist. Hence the extent of industrialisation in the economy is limited, not by the size of total demand, but by labour availability.

Increased industrialisation of the economy is also accompanied by the use of a more efficient agricultural production process. This is because the use of the advanced agricultural technology partially substitutes use of the factor input of labour away from a constant returns to scale sector (agriculture) to an increasing returns to scale sector (industry). It is worth noting that this prediction of the model finds empirical support. Figure 4.3 plots the change in a country's agricultural productivity between 1960 and 1990 against the change in in the capital labour ratio in agriculture. For both Asian and African countries agricultural productivity and the extent of capitalisation in agriculture are positively correlated.

More generally, proposition 1 provides two empirically testable predictions. First, increased mechanisation of agricultural production in a country should be correlated with increased industrialisation. This phenomenon has been extensively documented for a number of countries (Chenery, Robinson and Syrquin 1986)¹¹. Second, this transformation in agricultural methods of production should be accompanied by a shift of labour from agriculture to industry. It is well known that in most countries periods of agricultural transformation and industrialisation were accompanied by large scale labour movement. For instance, in the US agricultural workers

¹¹For instance, in the US the sharp rise in total factor productivity growth in agriculture between the 1860s and World War 1 was accompanied by the increased mechanisation of agricultural production (Oshima 1984; Kawagoe, Otsuka and Hayami 1986). Examples of such mechanisation included the widespread replacement of horse drawn equipment by equipment powered by internal combustion.

comprised more than half the labour force in 1870. By the turn of the century their number had fallen to less than 40 percent. Finally, the model also predicts that this sectoral shift of labour should be driven by changes in agricultural methods in production. However, this last prediction is difficult to test since changes in agricultural and industrial production have been near simultaneous in most countries.

Whilst proposition 1 identifies the relationship between landowners' choice of agricultural technology and the level of industrialisation in an economy, it is silent regarding the determinants of landowners' choice of agricultural technology. To examine this I first characterise the relationship between the choice of an agricultural technology and factor prices in the economy. To focus on the aggregate effects of landowners' decentralised investment decisions I make a large economy assumption. That is, I assume that no single landowner's investment decision can influence factor prices in the economy.

The final demand for variety x in the economy is

$$x = \left(\frac{P_\tau}{p_\tau} \right)^\varepsilon \frac{E_\tau}{P_\tau} \quad (4.5)$$

where E_τ is the total expenditure on manufactures, and potentially consists of consumer and agricultural sector expenditure. Consumer expenditure¹² is given by $\sum_{j=1}^N (1-\nu)y_j$. Use of the advanced agricultural technology generates an agricultural sector expenditure on manufactures of κP_a units. Therefore, E_τ may be written as:

$$E_b = (1-\nu)((L-1)w_b + 1) \quad (4.6)$$

$$E_a = (1-\nu)((L-\gamma)w_a + 1) + \kappa\nu P_a$$

Combining equations (4.5) and (4.6) we get

$$p_b = \frac{1-\nu}{\nu n_b x} \text{ and } p_a = \frac{1-\nu}{\nu n_a (x - n_a^{\frac{\varepsilon}{1-\varepsilon}} \kappa)} \quad (4.7)$$

Changes in n affect p via three channels. For a constant E_τ , imperfect substitutability

¹²Given identical homothetic preferences, total consumer demand simply aggregates individual consumer's demand functions.

between industrial varieties implies that the efficiency of manufactures production is increasing in the number of varieties produced¹³. Therefore P falls as n rises. For firm i this fall translates into a negative product market effect since the profitability associated with producing variety i is reduced. This, in turn, reduces p .

On the other hand, a rise in n potentially creates two kinds of positive pecuniary externalities. A lower P reduces the cost of using the advanced agricultural technology and makes it more likely that landowners will adopt the advanced technology. Conditional on landowners doing so, the demand for manufactures will increase. This cost (or forward) linkage between firms and the agricultural sector enhances firm profits, and consequently raises p . By the same logic, an increase in n also raises consumer expenditure on manufactures (demand or (backward) linkage) and thereby p .

The higher is n , the smaller is the negative price effect. For large enough n the positive externalities associated with the use of the advanced technology can outweigh the negative product market effect. This implies that landowners' choice of agricultural technology is affected by the relative strengths of the negative product market effect and positive pecuniary externalities.

Proposition 2: *Landowners optimal investment decision varies with the strength of inter-sector linkages (as defined by κ) such that,*

(i) *Landowners invest in the advanced technology if $\kappa < (1 - \gamma)n_b^{\frac{1}{\epsilon-1}}$*

(ii) *Landowners invest in the basic technology if $\kappa > (1 - \gamma)n_a^{\frac{1}{\epsilon-1}}$*

(iii) *Multiple investment equilibria exist such that landowners either invest in the basic or the advanced technology if*

$$(1 - \gamma)n_a^{\frac{1}{\epsilon-1}} \geq \kappa \geq (1 - \gamma)n_b^{\frac{1}{\epsilon-1}}$$

Proposition 2 tells us that for low values of κ the advanced agricultural technology minimises landowner's factor costs¹⁴. Irrespective of other landowners' investment decision, a landowner's best response is to invest in the advanced technology. This leads to a unique advanced agri-

¹³ Given imperfect substitutability between varieties, the lower is n the more intensively consumers substitute for missing inputs in their consumption of the manufactures aggregate.

¹⁴ The factor prices and labour demand associated with the modern technology are lower than those associated with the basic technology and the additional manufacturing aggregate demand of κ units is also low.

cultural technology investment equilibrium. However, as $\frac{\partial p_a}{\partial \kappa} > 0$ this is not true for high values of κ . Specifically, for high enough κ the positive pecuniary externalities are insufficient to compensate for the higher factor prices associated with the use of the advanced technology. In this case investing in the basic agricultural technology is a dominant strategy for every landowner.

For intermediate values of κ increasing returns in the manufacturing sector combined with the possibility of pecuniary externalities creates the possibility of multiple investment equilibria. If landowners invest in the basic technology, then few industrial varieties are produced at a relatively high cost. Given the resulting price structure, a landowner's best response is to invest in the basic technology. The result is an investment equilibrium in which all landowners invest in the basic technology. If landowners instead invest in the advanced technology more industrial varieties are produced. This reduces the cost associated with adoption of the advanced technology. In addition, consumer demand for manufactures rises. This makes the combination of landowners investing in advanced technology and a higher level of industrialisation a self sustaining outcome for the economy.

The economy's level of industrialisation depends on landowners' choice of agricultural technology. In a world with no externalities, we would expect landowners to invest in the most efficient technology. However, this Coasian rationale may fail to hold in the presence of pecuniary externalities as the market prices may not signal the true resource cost of alternative investment decisions. This, in turn, creates the possibility of multiple investment equilibria. Coupled with a coordination failure among landowners, this can lead to landowners' investing in the relatively inefficient agricultural technology.

That an economy may be stuck at low levels of industrialisation due to investors inability to coordinate investment has been the subject of recent 'big push' models of industrialisation¹⁵ (Murphy, Shleifer and Vishny 1989b). 'Big push' models examine the relationship between investors decisions in the industrial sector and the economy's level of industrialisation. This chapter extends the ambit of such research by focussing on the relationship between landowners choice of agricultural investment and the level of industrialisation in the economy. It identifies

¹⁵A number of different economic environments in which coordination failures among investors may arise have been identified in the literature. For instance, an economy in which production is characterised by increasing returns to scale may have multiple equilibria if technological externalities (Romer 1990), demand complementarities (Murphy, Shleifer and Vishny 1989b) or interfirm linkages leading to division of labour (Rodriguez Clare 1996) exist.

reasons for why changes in methods of production in agriculture may affect both agricultural productivity and industrialisation. This line of research is also related to papers by Matsuyama (1992a) and Duranton (1998). These authors examine the role of agricultural productivity in economic development, but differ from this chapter in that they consider changes in agricultural productivity to be exogenous.

This chapter considers an economy's level of agricultural productivity as endogenous. It's predictions regarding the determinants of agricultural innovation are consistent with existing empirical evidence which suggest that the adoption of new agricultural technologies is often associated with significant externalities (Besley and Case 1993). Our model predicts that the existence of such externalities creates the possibility of an investment coordination failure in the agricultural sector. This, in turn, limits processes of economic development for two reasons. First, efficient agricultural technologies may not be adopted. Second, the economy's level of industrialisation may be adversely affected.

4.3 Coordination, Welfare and the Political Process

A common policy conclusion in most 'big push' models is that the possibility of investment coordination failures creates a role for the government as a coordinator of economic activity.¹⁶ For example Murphy, Shleifer and Vishny (1989b) write, 'The analysis may have implications for the role of government in the development process. First, a program that encourages industrialisation in many sectors simultaneously can substantially boost income and welfare even when investment in any one sector appears unprofitable.'¹⁷

The example of successful government led coordination usually cited in this literature is

¹⁶An early argument for this was offered by Scitovsky (1954), 'In the market economy prices are the signalling device that informs each person of other people's economic decision and thus guides production and investment decisions. Market prices however reflect the economic situation as it is and not as it will be. For this reason they are more useful for coordinating current production decisions .. than .. for coordinating investment decisions which have delayed effects .. and should be governed by what the future economic situation is expected to be .. hence the belief that there is need either for centralised investment planning or some additional communication system to supplement the pricing system as a signalling device.'

¹⁷In a similar vein Rodrik (1996) writes, 'In such settings, government policy may have a role to play in helping speed up the transition to the high income equilibrium. In an influential book Wade (1990) also argued for such a 'governed market' interpretation of the East Asian miracle. He writes, 'they (the East Asian governments) probably helped those conditions (of growth) to be realised and sustained. The way remains open for a reasonable person to believe that governing the market is too important to ignore in even a parsimonious explanation of East Asian success.'

the East Asian miracle (Rodrik 1996). A number of East Asian countries saw a sharp increase in their growth rates in the 1960s and 1970s (World Bank 1993). During this period the governments in many of these countries were actively involved in overseeing the form and level of investment undertaken by the private sector. For instance, Japan's Ministry of International Trade and Industry provided investment relevant information to the private sector via *deliberation* councils. In Korea, a similar job was performed by *chabeols* (Amsden 1989).

The generalisability of such policies to other countries, however, remains unclear. Theoretically, it is unclear why investors should find it harder to coordinate investment so as to achieve the superior outcome (on this, see Matsuyama 1992b). Or to put it another way, these models suggest that countries should randomly switch between the good and bad equilibrium. However, a large macroeconomics literature testifies to the fact that a country's initial conditions are an important determinant of its subsequent growth performance (Benabou 1996). Further there are numerous examples of countries where government attempts to direct private sector investment was an abysmal failure. For instance, while both India and South Korea went in for government led investment planning in the late 1950s, only South Korea saw a subsequent takeoff in productivity. One reason could be that the resource base of countries where government led investment planning failed was inadequate to support large scale industrialisation. However, an alternative explanation is that the form and level of policy intervention adopted by some countries was inappropriate.

This section examines the merits of the latter argument. To do so, it focuses on the relationship between an economy's initial asset distribution, the choice of policy-maker and the possibility of policy led coordination of investment.¹⁸ To simplify the analysis I assume that (i) multiple investment equilibria exist in the economy (i.e. $(1 - \gamma)n_a^{\frac{1}{1-\varepsilon}} \geq \kappa \geq (1 - \gamma)n_b^{\frac{1}{1-\varepsilon}}$) and (ii) absent coordination landowners invest in the basic technology.

To examine how a country's income distribution affects the possibility of government led coordination of investment activity two alternative income distributions (or societies) are considered—equal and unequal.¹⁹ In an equal society citizens enjoy identical property rights' and earn $y_j =$

¹⁸There exists a related literature which analyses the dynamics of industrialisation (Matsuyama 1992b, Gans 1998). These papers also identify reasons for why the initial conditions of an economy may affect the level of industrialisation in the economy.

¹⁹As I do not consider cases in which the choice of technology alters the income distribution, the existence

$\frac{1}{N\nu} \forall j \in \mathcal{N}$. In an unequal society citizens either own land or work as wage labourers.²⁰ Within each class of citizens, there is complete homogeneity such that a landowner ℓ ($\in \mathcal{K} = \{1, \dots, k\}$) owns $\frac{1}{k}$ units of land and earns $y_\ell = \frac{\pi\tau}{k}$, while a worker ω ($\in \mathcal{W} = \{k+1, \dots, N\}$) supplies $\frac{L}{N-k}$ labour units, and earns $y_\omega = \frac{w\tau L}{N-k}$.

The time line of events considered is as follows. First, citizens elect a coordinator. Post elections the coordinator announces the parameters of a policy intervention (to be defined below). Then landowners invest in an agricultural technology and finally, payoffs are realised.

The political economy framework considered is the citizen candidate model (see Besley and Coate 1997) in which citizens choose whether to stand for election. Two key assumptions underlie this model. First, the coordinator is a citizen elected from the polity. Second, candidates cannot commit to the form of the policy intervention prior to the election. Therefore, the elected coordinator will in choosing the form and level of policy intervention seek to implement the technology which maximises her private return. Anticipating this, citizens will condition their vote on the policy interventions associated with each candidate.

The analysis restricts attention to one candidate political equilibria in which a single member of the majority group stands for election and wins. Such an equilibrium exists as long as one group of citizens constitute a strict population majority and the cost of standing for election is not too high (for details, see Besley and Coate 1997). I assume that these conditions are always satisfied.

In an equal economy the elected coordinator shares the representative citizen's identity. The lack of policy commitment implies that in selecting the policy intervention the policy-maker will seek to implement the agricultural technology τ^* which solves

$$\tau^* = \arg \max \frac{1}{N\nu} P_\tau^{-(1-\nu)} \quad (4.8)$$

In a unequal economy the elected coordinator will instead seek to implement the technology

of multiple Nash equilibria remains independent of the precise income distribution considered (Bergstrom and Varian 1985).

²⁰That is, in an egalitarian economy $\alpha_j = \beta_j = \frac{1}{N} \forall j \in \mathcal{N}$. In a polarised economy for all landowners $\alpha_j = 0$ and $\beta_j = \frac{1}{k}$. For all workers $\alpha_j = \frac{1}{N-k}$ and $\beta_j = 0$.

τ^* which solves:

$$\tau^* = \arg \max \left(X \left(\frac{w_\tau L}{N - k} \right) + (1 - X) \left(\frac{\pi_\tau}{k} \right) \right) P_\tau^{-(1-\nu)} \quad (4.9)$$

where $X = \{0, 1\}$, depending on whether the elected coordinator is a landowner or a worker. The identity of the elected coordinator will depend on whether workers or landowners constitute a strict majority. The analysis considers both cases.

Finally, I define the class of policy interventions for this economy. I consider examples of policy interventions which satisfy two properties— (i) they are budget balancing and (ii) they are strongly anonymous, in the sense that any citizen's final payoff only depends on her strategy.²¹ The specific interventions considered are described below.

Before analysing the possibility of policy led coordination of economic activity in this economy it is useful to characterise the relationship between the multiplicity of equilibria and the welfare ranking of these equilibria on the basis of social surplus. In this economic environment social surplus (SS) is defined as the sum of citizens' indirect utilities, and is given as—

$$SS_b = \frac{1}{\nu} \left[\frac{\nu n_b \frac{\epsilon}{\epsilon-1} x}{1 - \nu} \right]^{1-\nu} \quad \text{and} \quad SS_a = \frac{1}{\nu} \left[\frac{\nu (n_a \frac{\epsilon}{\epsilon-1} x - \kappa)}{1 - \nu} \right]^{1-\nu} \quad (4.10)$$

Total social surplus in the economy is increasing in the number of industrial varieties produced and decreasing in the strength of inter-sector linkages (as captured by κ). The former effect arises from consumers' 'love of variety', and the latter from the fact that $\frac{\partial p_a}{\partial \kappa} > 0$. If inter-sectoral linkages are very strong then the negative price effect may overwhelm the positive love of variety effect such that the advanced technology will fail to maximise social surplus.

Lemma 1: *Use of the advanced agricultural technology maximises social surplus in the multiple equilibria regime*

In general, the multiplicity of equilibria in the economy is independent of the welfare ranking of equilibria. The former is engendered by the possible existence of pecuniary externalities combined with increasing returns to scale in manufactures production. The latter depends on the relative price and output increases associated with the use of the advanced technology.

²¹See Piketty (1993) for a discussion of the realism of this assumption.

Therefore, the advanced technology maximises social surplus only if the efficiency gains from reduced labour use outweigh the potential price increases associated with its use. Lemma 1 tells us that this always holds in our model.

This result suggests that in face of a coordination failure a benevolent social planner with access to lump sum tax and transfers should be able to implement the Pareto superior outcome for the economy. However, we shall argue below that (i) political economy concerns and (ii) reasonable assumptions regarding the set of feasible policy instruments often limit an elected policy-maker's ability to affect such coordination.

The rest of this section proceeds as follows. I first characterise investment coordination in a socialised economy. Whilst the actual coordination of economic activity is trivial, the analysis helps identify the relationship between an economy's income distribution and the welfare implications of government led coordination. After this, I consider government led coordination in an economy with decentralised investment.

I assume that in the absence of government led coordination landowners invest in the basic technology. Therefore, in comparing the welfare implications of government led coordination the post coordination investment outcome is always compared to the basic technology equilibrium.

4.3.1 Socialisation of Investment

Investment in the economy is *socialised* if the elected policy-maker directly invests in the agricultural technology. In this case, the sequence of events in the economy is— a single candidate from the majority group stands for election and is elected coordinator.²² She then directly invests in the agricultural technology.

Remark: *In an equal economy socialisation of investment achieves a Pareto superior outcome.*

The elected policy-maker's payoff is a constant share of the social surplus. She will, therefore, invest in the agricultural technology which maximises social surplus. From Lemma 1 we know this is the advanced technology. As citizens returns coincide with the coordinator's this delivers

²²This equilibrium can be justified as follows: by assumption the policymaker cannot commit to the choice of agricultural technology during the election campaign. Therefore, citizens' will anticipate candidate's policy preferences and vote for the candidate who shares their preferences. For low entry costs this will lead to an equilibrium in which a candidate from the population majority group will stand for election and win. Anticipating this outcome no other candidate will stand for election.

a Pareto improvement for the economy.

Proposition 3: *In a unequal economy socialisation of investment never yields a Pareto superior outcome. Instead either a worker is elected coordinator and the no coordination outcome results, or a landowner is elected coordinator, the advanced technology is chosen and workers are worse off.*

Proposition 3 is particularly striking given that the advanced technology maximises social surplus in the economy (Lemma 1). Proposition 3 is a direct consequence of the fact that the use of the advanced technology reduces the relative price of manufactures. This raises landowners profit. However, the price wage equality in the economy²³ implies that the choice of the advanced technology leaves workers worse off. Therefore, depending on the demographic composition of the polity one of two outcomes result. Either a landowner is elected policy-maker, the advanced technology is chosen and workers are worse off, or a worker is elected and the use of the less efficient basic technology persists.

Our finding that industrialisation may leave some group of citizens worse off is in marked contrast to most ‘big push’ models. Our results suggest that the reason for this derives from the distributional consequences of industrialisation. As the price of manufactures varies across technologies, changes in the agricultural technology affect the terms of trade between agriculture and industry. This affects the well-being of workers and landowners differentially, such that the choice of the advanced technology leaves a subset of citizens worse off.

Since total social surplus is higher under the advanced technology, one may hope to avoid the adverse distributional consequences associated with use of the advanced technology by the appropriate choice of a redistributive policy. Therefore, I examine the case where the coordinator selects a policy intervention \mathcal{P} which includes the choice of agricultural technology (τ), and the parameters of an anonymous budget balancing tax and transfer schedule. The parameters of the tax and transfer schedule are denoted by (t, T) and satisfy the budget constraint (that is, $t \sum_j y_j = NT$). The coordinator’s indirect utility from selecting the policy vector $\mathcal{P} = (\tau; (t, T))$ is denoted as $v^c(\tau; (t, T))$.

Both in an equal and in an unequal society with a landowner elected coordinator the equi-

²³This was derived from a firm’s break even condition, and is given by equation (4.1).

librium policy outcome is $\{a; (0, 0)\}$. In an equal economy, zero redistribution is optimal as citizens enjoy the same income. In a unequal economy, with the advanced technology in use, a landowner's income is higher than a worker's (i.e. $\pi_a > w_a$ — for details, see the proof of Proposition 3). Therefore, she selects zero redistribution and workers are rendered worse off. Hence, the possibility of redistribution fails to lead to a Pareto improvement.

The remaining case to consider is when a worker is elected policy-maker in a unequal economy. As $\pi_a > w_a$ a worker-coordinator²⁴ will choose $\mathcal{P} = \{a; (1, 1)\}$ whenever $v^c(a; (1, 1)) > v^c(b; (0, 0))$. This constitutes a Pareto superior outcome only if a landowner's profits from using the basic technology are less than her share of total surplus with the advanced technology in use and full redistribution. Proposition 4 provides a sufficient condition for this.

Proposition 4: *Worker socialisation and redistribution yields a Pareto superior outcome if the factor returns associated with the no coordination outcome are relatively low. A sufficient condition for this is that the ratio of industrial labour supply to total population in the no-coordination outcome be relatively high such that*

$$\frac{L-1}{N} > \max\{(\nu L - 1), (1 - \nu)\}$$

The condition identified in Proposition 4 ensures (via the labour market clearing conditions) that the factor returns associated with the no coordination outcome are dominated by the post redistribution return associated with the use of the advanced technology. If this condition is violated then worker socialisation may lead to the advanced technology being chosen, but with landowners being rendered worse off.

Therefore, even with income redistribution socialisation of investment need not lead to a Pareto superior outcome. The demographic composition of the economy and citizens' relative preference for food and manufactures are key determinants of whether socialised investment and redistribution brings about industrialisation and improves individual well-being.

²⁴The assumption that advanced technology maximises social surplus implies that $v^c(a; (1, 1)) > v^c(b; (1, 1))$

4.3.2 Decentralised Investment and Coordination

I now analyse government led coordination when investment decisions remain decentralised, i.e. are chosen privately by landowners. I continue to assume that absent coordination landowners invest in the basic technology. To focus on the aggregate investment effects of government led coordination I assume that the total population size is large ($N \rightarrow \infty$), and that landowners and workers population shares are fixed. This has two implications for the subsequent analysis. First, factor prices are invariant to any single investor's actions. Second, in situations where income redistribution occurs via an anonymous tax and transfer scheme changes in a citizen's pre-tax income (holding other citizens income constant) do not affect the income transfer she receives.

The generic sequence of events considered is — a policy-maker is elected via the political process. She announces the parameters of a public policy intervention \mathcal{P} . Landowners observe \mathcal{P} and then invest in an agricultural technology. Citizens then receive their final payoff. I restrict attention to budget balancing policy interventions. In the analysis I distinguish between two cases, depending on whether or not the policy-maker can commit to a redistributive schedule prior to investment.

This section examines whether the appropriate use of a public policy intervention \mathcal{P} by a coordinator may lead to a Pareto superior outcome wherein landowners invest in the advanced technology. From Proposition 3 it is clear that some amount of redistribution is necessary if investment in the advanced technology is to constitute a Pareto improvement. Given the large economy assumption it is sensible to allow for such redistribution via the use of an anonymous tax and transfer scheme. Lemma 2 states that the sole use of such a (linear) scheme is insufficient to influence landowners' investment choice.

Lemma 2: *Landowners' investment choices cannot be affected by the sole use of a budget balancing anonymous tax and transfer scheme.*

I prove this Lemma by showing that the basic technology equilibrium is not affected by the use of a tax and transfer scheme. Use of such a scheme implies that a citizen's final income (denoted as y_j^c) only depend on her initial income y_j^e and total income in the economy (i.e. $y_j^c = f(y_j, Y)$). Conditional on other investors choosing the basic technology, an investor's income (y_j) is always lowered by a deviation to the advanced technology. This is as the deviation

leaves factor prices and transfers which only condition on income outcomes unaffected. Hence, it cannot constitute a profitable deviation.²⁵

In general, multiple investment equilibria arise in situations where an individual's optimal strategy depends on everyone else's strategy (Cooper and John 1988). If a policy intervention is to affect coordination it must make investing in the advanced technology a dominant strategy for an investor (and therefore, by destroying the interdependence of investor strategies destroy the multiplicity of equilibria). Linear income based interventions (of the kind considered in Lemma 1) fail to do so.

Therefore I now consider the possibility of investment coordination via the joint use of price subsidies and a linear tax and transfer scheme. The restriction that policy interventions should not condition on any investor's identity implies that I focus on a very simple form of price subsidy — the case where the coordinator announces a single set of prices for the economy (i.e. price subsidies are not conditioned on any single investor's investment choice).

In an economic environment characterised by multiple equilibria it is unclear whether it is appropriate to impose a budget balancing requirement on the policy intervention at every stage of the game. Here, I simply assume that a policy intervention is feasible only if it is budget balancing in equilibrium. Hence I place no requirements on budget balancing off the equilibrium path. This is similar to the restrictions assumed in the Ramsey capital accumulation model.

The set of policy interventions available to the coordinator is denoted as $\mathcal{P} = \{\tilde{p}, (t, T)\}$, where $\tilde{p} \equiv \{p_\tau, P_\tau\}$ is the vector of announced prices and (t, T) are the parameters of an anonymous tax and transfer scheme. From the equilibrium characterisation we know that $P_a < P_b$ and $p_a < p_b$ (for details, see proof of proposition 3). Therefore the following sequence of events constitutes an equilibrium in an equal society.

A citizen j stands for election and is elected coordinator. She announces the set of policy interventions: $\{\tilde{p}, (t, T)\} = \{(p_a, P_a), (0, 0)\}$. At these prices and given zero redistribution a landowner's dominant strategy is to invest in the advanced technology. Therefore, in equilibrium all landowners invest in the advanced technology such that the announced prices are the

²⁵If the economy is so small that an investor's actions affect her transfer then the same argument holds. In this case, the total income and hence transfers are reduced. It is also worth noting that the reasoning for Lemma 2 is similar to the argument provided by Murphy, Shleifer and Vishny (1989b) for why profit spillovers are never sufficient to engender multiple equilibria.

market equilibrium prices. Therefore, the announced policy intervention is budget balancing and coordination via the use of price subsidies leads to a Pareto superior outcome. As no redistribution can be maintained as an optimal strategy for the coordinator, this equilibrium is robust to whether the level of redistribution is announced before or after investment.

Now consider a unequal society in which a landowner is elected coordinator. Her optimal policy intervention is $\{(p_a, P_a), (0, 0)\}$. By the same logic as above, faced with this price schedule landowners will invest in the advanced technology. However, unlike in an equal society such coordination leaves workers worse off. Once again, this equilibrium is robust to whether the level of redistribution is announced before or after investment.

The final case is when a worker is elected coordinator in a unequal society. We are interested in identifying whether a worker coordinator can choose policies such that a Pareto superior equilibrium in which the advanced technology is selected results. In this case it is necessary to distinguish between two cases. First, when prior to investment the coordinator cannot commit to a redistributive schedule other than her most preferred one. Second, when such policy commitment is possible.

It is clear that conditional on investors selecting the advanced technology a worker coordinator favours full redistribution. In the absence of policy commitment this implies that the coordinator will choose full redistribution whenever landowners invest in the advanced technology. Lemma 3 tells us that this, in turn, renders coordination infeasible.

Lemma 3: *In the absence of policy commitment if prices are subsidised such that investors select the advanced technology then the policy maker will select full redistribution. However, the policy intervention $\{\tilde{p}, (t, T)\} = \{(p_a, P_a), (1, \frac{1}{N\nu})\}$ is ex ante infeasible.*

The proof is as follows— the large economy assumption combined with full redistribution implies that the policy intervention $\{(p_a^*, P_a^*), (1, \frac{1}{N\nu})\}$ leaves a landowner's final income independent of her actions. Therefore, both investing in the basic or in the advanced technology constitute a (weakly) dominant strategy for a landowner. Hence, the existence of multiple investment equilibria is robust to the implementation of this policy intervention. Since the proposed policy intervention does not satisfy the budget constraint in the basic investment equilibria, it is ex ante infeasible.

This Lemma has important implications for the possibility of investment coordination via

the use of price subsidies. It is often the case that policymaker's cannot credibly commit to the parameters of the redistributive policy prior to investment. Lemma 3 tells us that in such situations coordination via the use of price subsidies cum redistribution is infeasible in this case.

The second case to consider is when there exist political institutions capable of enforcing full commitment. In this case, prior to investment the coordinator can credibly commit to less than full redistribution is feasible. In which case proposition 4 tells us that for some parameter values there will exist a $t \in]0, 1[$ such that the combination of price subsidies and income redistribution achieves investment coordination and a Pareto superior outcome obtains for the economy. Proposition 4 identified a sufficient condition for workers and landowners to be better off with the advanced technology in use and full redistribution. Since $\pi_a > w_a$ it follows that landowners are better off with the advanced technology in use and $t < 1$. Therefore, we only need to check whether there exists some $t < 1$ for which workers are better off with the advanced technology in use. It is clear that there will exist some $t = 1 - \varepsilon$ (with ε sufficiently small) such that this holds.

Therefore, if the conditions identified in Proposition 4 hold then the following investment sequence constitutes an equilibrium. The worker coordinator announces $\tilde{p} = (p_a; P_a)$ and $t = 1 - \varepsilon$. Faced with this policy intervention the dominant strategy for a landowner is to invest in the advanced technology. In equilibrium the price subsidy scheme is budget balancing, and a Pareto superior outcome results for the economy.

Overall, the results in this section provide mixed support for government led coordination programmes. It is clear that public policy can be used to achieve coordination of investment decisions in the economy. However, the success of any such public policy scheme in realising a Pareto superior outcome for the economy depends on a number of factors—the initial conditions of the economy (or history), the policymaker's identity, and on how successful the chosen policy intervention is in altering an individual investor's strategy profile (or expectations).

4.4 Discussion

This chapter puts forward an explanation for the lack of industrialisation of some underdeveloped agrarian economies—the possibility of a coordination failure amongst investors in the agricultural sector. In such situations government led coordination of investment activity leads to a Pareto superior outcome in equal societies. However, this is not always true for unequal societies.

There are at least two reasons for this. First, in an unequal society the most efficient agricultural technology may fail to maximise citizens' returns. Therefore an elected policy-maker concerned with maximising her own private returns may not select the socially optimal policy. This is true even when we allow for the possibility of redistribution. The second reason relates to the interaction between a policymaker's choice of redistributive policy and the existence of multiple equilibria. Multiple investment equilibria arise when an investor's optimal investment choice depends on all other investors investment decision. In the chapter we show that policy interventions which leave factor prices unaffected and (or) are associated with transfer based on population averages (e.g. linear income based interventions) will, in general, fail to coordinate investment. Importantly, if the set of policy instruments include income based redistribution and policy commitment is not possible then these may be the only kind of transfers which are feasible. This, in turn, may render the possibility of government led coordination of economic activity infeasible.

This analysis suggests two avenues of future research. First, it would be interesting to take some of the predictions of this theory to the data. The main empirical prediction that one would wish to test is the potential existence of multiple equilibria in technology adoption in agriculture (for an overview of the empirical literature on technology adoption in agriculture see Besley and Case 1993). As is well known, the main problem with a direct test of this hypothesis is that the counterfactual (i.e. the existence of an alternative equilibrium) is never observed for the same economy.

However, it remains possible to undertake indirect tests of this hypothesis. A necessary condition for the existence of multiple investment equilibria is that any single landowners' returns from adopting a new agricultural technology should be increasing in the total number of users. Therefore, one possibility would be a two stage estimation procedure using farm

level data on agricultural technology. At the first stage, one could estimate the price of the manufactures input as a function of the number of farmers' using the advanced technology (i.e. the technology which uses manufactures more intensively). In the second stage, we can then estimate a landowner's probability of using a technology as a function of the estimated price.

The second avenue for future research suggested by this chapter is a more detailed analysis of policy-making in economic environments characterised by multiple investment equilibria. Economists have noted the existence of multiple equilibria in many economic markets (Cooper and John 1988). In many of these cases moving the economy out of the 'low level equilibrium' constitutes a Pareto improvement for all citizens. However, analyses of the relevant policies which may be used to ensure such a shift have been limited.²⁶ In addition, the existing literature analysing government led coordination of investment activity has tended to ignore two important constraints on policy implementation. The first is political economy constraints. These have been analysed in some detail in this chapter. The second set of constraints which arise in the case of price based policy intervention are the appropriate budget balancing conditions which such a policy intervention should satisfy both on and off the equilibrium path. This chapter has assumed away this problem but clearly it merits further academic attention.

²⁶ Attention has however been restricted to the class of linear redistributive schemes. Clearly, it will be interesting to explore a wider class of policy interventions.

4.5 Appendix

Proof of Proposition 1

From equation (4.1) $p_\tau = w_\tau$. This, together with the wage equation (equation (4.3)) gives us:

$$n_b = \frac{L-1}{x} \text{ and } n_a = \frac{L-\gamma}{x} \quad (4.11)$$

As $\gamma < 1$, the number of industrial varieties produced is strictly higher when landowners use the advanced technology. Since food production is unaltered, aggregate production efficiency rises ■

Proof of Proposition 2

Consider an investment equilibrium in which all landowners invest in the basic technology. We examine landowner j 's incentives to instead invest in the advanced technology. She will not do so iff $\beta_j \pi_b \geq \beta_j \pi_a$ or

$$1 - w_b \geq 1 - \gamma w_b - \kappa P_b$$

Substituting for w_b and P_b a necessary condition for an equilibrium in which all landowners invest in the basic technology is

$$\kappa \geq (1 - \gamma)n_b^{\frac{1}{\epsilon-1}} \quad (4.12)$$

Now consider an investment equilibrium in which all landowners invest in the advanced technology. Landowner j will not deviate to investing in the basic technology iff $\beta_j \pi_a \geq \beta_j \pi_b$ or

$$(1 - \gamma w_a - \kappa P_a) \geq (1 - w_a)$$

this simplifies to

$$\kappa \leq (1 - \gamma)n_a^{\frac{1}{\epsilon-1}} \quad (4.13)$$

Comparing (4.12) and (4.13) as $n_a > n_b$ the economy is characterised by multiple investment equilibria if

$$(1 - \gamma)n_b^{\frac{1}{\epsilon-1}} \leq \kappa^* \leq (1 - \gamma)n_a^{\frac{1}{\epsilon-1}} \quad (4.14)$$

(sufficiency) From equations (4.12), (4.13) and (4.14) , the sufficient condition for a unique

equilibrium in which landowners invest in the basic technology is

$$\kappa > (1 - \gamma)n_a^{\frac{1}{(\varepsilon-1)}}$$

and a sufficient condition for a unique equilibrium in which landowners invest in the advanced technology is

$$\kappa < (1 - \gamma)n_b^{\frac{1}{(\varepsilon-1)}}$$

Proof of Lemma 1

The advanced technology maximises social surplus if $P_b > P_a$ or

$$\kappa < x(n_a^{\frac{\varepsilon}{\varepsilon-1}} - n_b^{\frac{\varepsilon}{\varepsilon-1}}) \quad (4.15)$$

From (4.14) and (4.15) it follows that the advanced technology maximises social surplus in the M.E. regime if

$$x(n_a^{\frac{\varepsilon}{\varepsilon-1}} - n_b^{\frac{\varepsilon}{\varepsilon-1}}) > (1 - \gamma)n_a^{\frac{1}{(\varepsilon-1)}}$$

rearranging this expression we get:

$$\frac{n_a^{\frac{\varepsilon}{\varepsilon-1}} - n_b^{\frac{\varepsilon}{\varepsilon-1}}}{n_a^{\frac{1}{\varepsilon-1}}} > \frac{1 - \gamma}{x} \quad (4.16)$$

note that $\frac{1-\gamma}{x} = \frac{(L-\gamma)-(L-1)}{x} = n_a - n_b$. Substituting this for the RHS in (4.16) and solving we get

$$n_a^{\frac{1}{\varepsilon-1}} > n_b^{\frac{1}{\varepsilon-1}}$$

which always holds. Hence the advanced technology maximises social surplus in the ME regime ■

Proof of Proposition 3

We first note that in the M.E. regime $p_a < p_b$. The reasoning is straightforward. From Lemma 1 we know that $P_a < P_b$ where $P_\tau = n_\tau^{\frac{1}{1-\varepsilon}} p_\tau$. Further proposition 1 tells us that $n_a > n_b$. Therefore, $P_a < P_b$ iff $p_a < p_b$

In this proof we show that the choice of advanced technology by the coordinator can never

lead to a Pareto superior outcome. The reason is that use of the advanced technology raises landowners indirect utility but reduces workers. That is:

$$\frac{Lw_a}{N-k}P_a^{-(1-\nu)} < \frac{w_bL}{N-k}P_b^{-(1-\nu)} \quad \text{and} \quad \frac{\pi_a}{k}P_a^{-(1-\nu)} > \frac{\pi_b}{k}P_b^{-(1-\nu)} \quad (4.17)$$

For notational simplicity, the rest of the proof will drop the wage and land rent share terms (i.e. $(\frac{L}{N-k})$ and $(\frac{1}{k})$) as they appear on both sides of the two inequalities respectively.

From Lemma 1 we know that $P_b > P_a$. Therefore, a necessary condition for $w_aP_a^{-(1-\nu)} < w_bP_b^{-(1-\nu)}$ to hold is that $w_a < w_b$. Importantly, this is also a sufficient condition. To see this note that $w_aP_a^{-(1-\nu)} < w_bP_b^{-(1-\nu)}$

$$\frac{P_a^{(1-\nu)}}{p_a} > \frac{P_b^{(1-\nu)}}{p_b} \Rightarrow n_a^{(1-\nu)(\varepsilon-1)}p_b^\nu > n_b^{(1-\nu)(\varepsilon-1)}p_a^\nu.$$

Since $n_a > n_b$ and $p_b > p_a$ this inequality holds. Therefore $w_a < w_b$ is a necessary and sufficient for $w_aP_a^{-(1-\nu)} < w_bP_b^{-(1-\nu)}$

On the other hand, a sufficient condition for $\pi_aP_a^{-(1-\nu)} > \pi_bP_b^{-(1-\nu)}$ is that $\pi_a > \pi_b$.

Therefore, we have proved our main claim if we can show that (i) $w_a < w_b$ and (ii) $w_a < w_b \Rightarrow \pi_a > \pi_b$. This combined with our above argument implies that in ME regime equation (4.17) holds.

To see (i) note that $w_\tau = p_\tau$. As $p_a < p_b$ in the multiple equilibrium regime, $w_a < w_b$.

(ii) $\pi_b < \pi_a \Rightarrow (\gamma w_a + \kappa P_a) < w_b \Rightarrow (\gamma + \kappa n_a^{\frac{1}{1-\varepsilon}})w_a < w_b$. Therefore

$$w_a < w_b \quad \text{and} \quad \pi_a > \pi_b \quad (4.18)$$

if $\max \left[w_a, (\gamma + \kappa n_a^{\frac{1}{1-\varepsilon}})w_a \right] < w_b$. Clearly if $(\gamma + \kappa n_a^{\frac{1}{1-\varepsilon}}) < 1$, then the sufficient condition for (4.18) to hold is that $w_a < w_b$.

Note that $(\gamma + \kappa n_a^{\frac{1}{1-\varepsilon}}) < 1 \Rightarrow \kappa < (1 - \gamma)n_a^{\frac{1}{\varepsilon-1}}$. But this condition always holds in the multiple equilibrium regime. Hence, $w_a < w_b$ implies that $\pi_a > \pi_b$.

Therefore, the choice of the advanced technology reduces worker indirect utility and raises landowners indirect utility ■

Proof of Proposition 4

Note that $\pi_a > w_a$. Therefore conditional on investing in the advanced technology, a worker-coordinator will always undertake full redistribution. This implies that relative to the no coordination outcome the policy intervention $(a; (1, \frac{1}{N\nu}))$ constitutes a Pareto superior outcome²⁷ iff

$$\begin{aligned} \frac{w_b L}{N-k} P_b^{-(1-\nu)} &< \frac{1}{N\nu} P_a^{-(1-\nu)} \\ \Rightarrow \frac{w_b L}{N-k} P_a^{(1-\nu)} &< \frac{1}{N\nu} P_b^{(1-\nu)} \end{aligned} \quad (4.19)$$

By assumption, $P_b > P_a$. Hence a sufficient condition for (4.19) to hold is that $\frac{w_b L}{N-k} < \frac{1}{N\nu}$.

For the policy intervention $(a; (1, \frac{1}{N\nu}))$ to lead to a pareto superior outcome for the economy it must also be the case that

$$\frac{\pi_b}{k} P_b^{-(1-\nu)} < \frac{1}{N\nu} P_a^{-(1-\nu)}$$

a sufficient condition for which is $\frac{\pi_b}{k} < \frac{1}{N\nu} \Rightarrow \frac{(1-w_b)}{k} < \frac{1}{N\nu}$.

Combining these two we have a sufficient condition for which simplifies to

$$\frac{1}{N\nu} > \max\left\{\frac{w_b L}{N-k}, \frac{(1-w_b)}{k}\right\} \quad (4.20)$$

Substituting for w_b this condition (4.20) simplifies to

$$\frac{L-1}{N} > \max\left\{\frac{\nu L-1}{k}, \frac{(1-\nu)L}{N-k}\right\}$$

that is, the ratio of workers in the industrial sector to the total population in the no-coordination equilibrium be sufficiently large ■

Proof of Lemma 2

To prove this lemma we show that the existence of the ‘basic technology’ investment equilibrium is invariant to the use of a policy intervention $\mathcal{P} \in \{t, T\}$. We show this is true even when total transfers are affected by an investor’s own action. It is easy to check that the argument goes through even when the latter doesn’t hold.

²⁷ where $\frac{1}{N\nu}$ is the transfer accruing to any individual when $t = 1$, and T satisfies the budget constraint condition: $t \sum_{j=1}^N y_j = NT$.

Consider the case where a policy intervention $\{t, T\}$ is introduced. Conditional on all other investors choosing the basic technology, we are interested in examining whether it may now be profitable for the marginal investor j to deviate to investing in the advanced technology. and a policy intervention. The use of an anonymous tax and transfer scheme implies that $y_j^c = f(y_j, Y)$. We now examine how y_j^c is affected by such a deviation. To do so, note that

$$\frac{\partial y_j^c}{\partial y_j} = \frac{\partial f(\cdot)}{\partial y_j} + \frac{\partial f(\cdot)}{\partial Y} \frac{\partial Y}{\partial y_j}$$

Budget balancing requires that (i) $\frac{\partial f(\cdot)}{\partial y_j} = \frac{\partial Y}{\partial y_j}$ and (ii) $\frac{\partial f(\cdot)}{\partial Y} > 0$. Further the large economy assumption implies that starting from an investment equilibrium changes in any single investor's investment decision cannot affect prices. Hence, $\frac{\partial Y}{\partial y_j} > 0$

Therefore $\frac{\partial y_j^c}{\partial y_j} > 0$. That is, a deviation from an investment equilibrium which reduces y_j will reduce y_j^c . Hence, investor j will never choose to deviate from the basic technology equilibrium ■

Fig. 4.1 Capital - Labour Ratio (No. of Threshers, Tractors & Harvesters used per 100 Agricultural Labour Force)¹

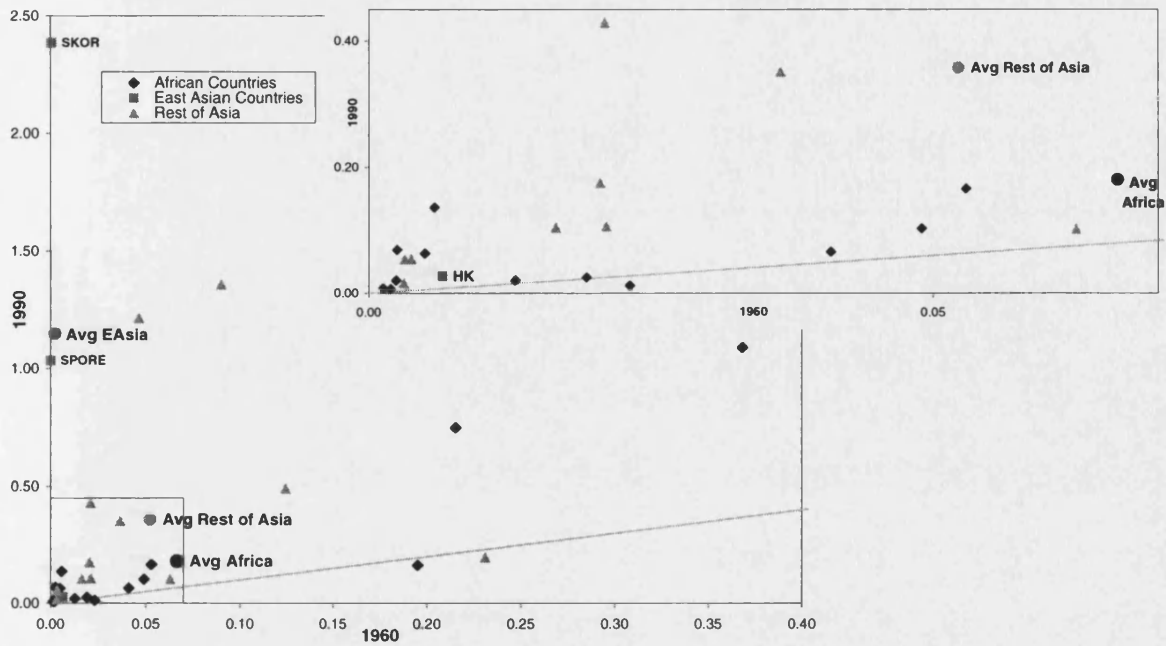
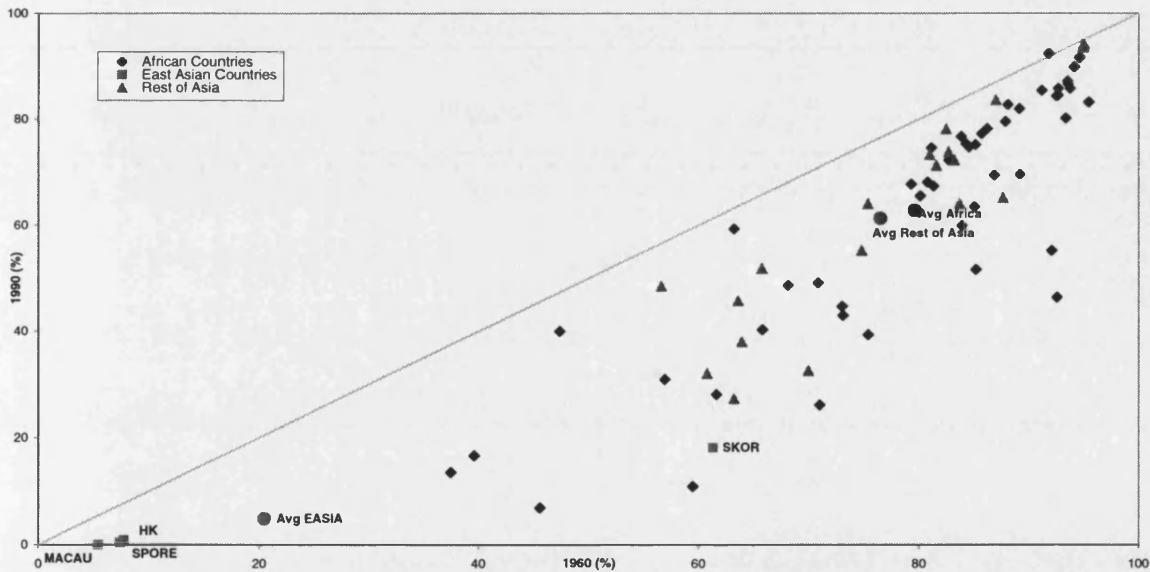


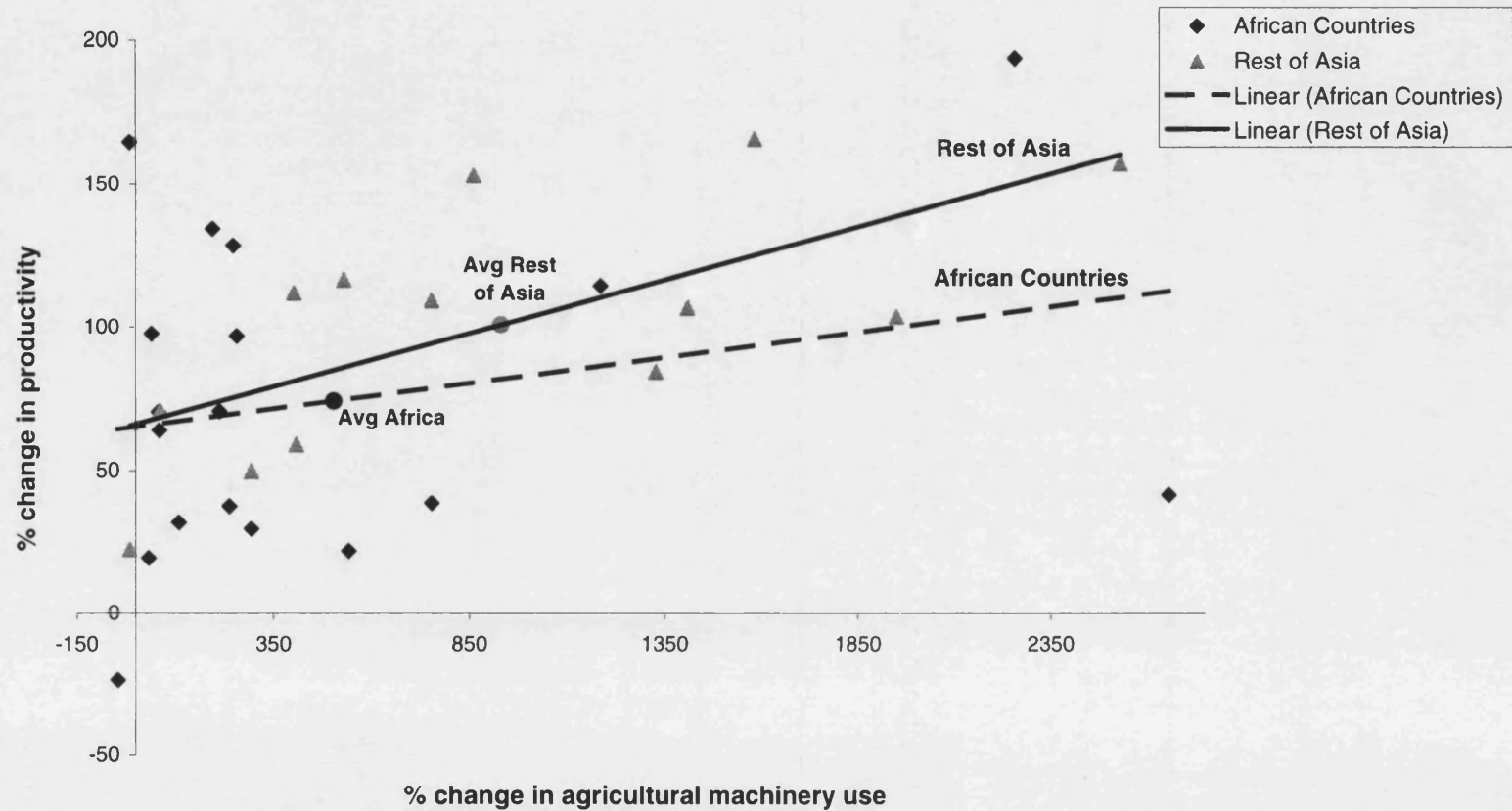
Fig. 4.2 Share of Agricultural Labour Force²



1. Data Source: Food & Agricultural Organisation (FAO) website <http://www.fao.org>. The capital-labour ratio of 1960 is the no. of threshers, tractors & harvesters used in 1961 divided by the agricultural labour force in 1960. The ratio of 1990 is derived from data in 1990. The countries studied are:
 African Countries: Central African Republic, Chad, Congo Republic, Egypt, Ethiopia PDR, Gambia, Ghana, Côte d'Ivoire, Kenya, Mali, Mauritania, Morocco, Senegal, Sudan, Uganda
 East Asian Countries: Hong Kong, Singapore, South Korea
 Rest of Asia: Bangladesh, China, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam

2. Data Source: FAO website (see footnote 1). The share of agricultural labour force is defined as the percentage of total labour force engaged in agricultural production. The countries studied are:
 African countries: Algeria, Angola, Botswana, Benin, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo Republic, Congo Dem Republic, Egypt, Eq Guinea, Ethiopia PDR, Gabon, Gambia, Ghana, Guinea, Côte d'Ivoire, Kenya, Lesotho, Liberia, Libya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Guinea-Bissau, Réunion, Rwanda, Senegal, Sierra Leone, Somalia, South Africa, Sudan, Swaziland, Tanzania, Senegal, Sierra Leone, Somalia, South Africa, Sudan, Swaziland, Tanzania, Togo, Tunisia, Uganda, Burkina Faso, Zambia, Zimbabwe
 East Asian Countries: Hong Kong, Macau, Singapore, South Korea
 Rest of Asia: Bangladesh, Bhutan, Cambodia, China, East Timor, India, Indonesia, Korea DPR, Laos, Malaysia, Maldives, Mongolia, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam

Fig. 4.3 Change in Agricultural Productivity (Production Indices/ Agricultural Land Use) vs Change in Agricultural Capital-Labour Ratio ³



3. Data Source: FAO website (see footnote 1). Agricultural production indices are based on the sum of price-weighted quantities of different agricultural commodities produced after deductions of quantities used as seed and feed weighted in a similar manner. They are calculated by the Laspeyres formula, with base period 1989-90. Productivity is measured as the production indices divided by agricultural land use. Capital-Labour ratio is defined as in figure 1 (see footnote 1). The period studied is 1960 -1990. The countries included are:
 African countries: Central African Republic, Chad, Congo Republic, Egypt, Ethiopia PDR, Gambia, Ghana, Côte d'Ivoire, Kenya, Madagascar, Mali, Mauritania, Morocco, Senegal, Sierra Leone, Sudan, Uganda, Zambia
 Rest of Asia: as in footnote 1.

Bibliography

- [1] Aghion, Philippe and Patrick Bolton (1998), 'Incomplete Social Contracts', mimeo UCL and Princeton.
- [2] Akerlof, George A. (1976), 'The Economics of Caste and of the Rat Race and Other Woeful Tales', *Quarterly Journal of Economics* 90(4), pages 599-617.
- [3] Akerlof, George A. (1978), 'The Economics of 'Tagging' as applied to the Optimal Income Tax, Welfare Programs, and Manpower Planning', *American Economic Review* 68(1), pages 8-19.
- [4] Aldrich, John H. (1995), *Why Parties?*, University of Chicago Press.
- [5] Alesina, Alberto (1988), 'Credibility and Policy Convergence in a Two-Party System with Rational Voters', *American Economic Review* 78(4), pages 496-805.
- [6] Alesina, A., Baqir R, Easterly, W. (1997), 'Public Goods and Ethnic Divisions', NBER working paper no. 6009.
- [7] Amsden, Alice H. (1989), *Asia's next giant : South Korea and late industrialization*, New York : Oxford University Press.
- [8] Arrow, K.J. (1963), *Social Choice and Individual Values*, 2d ed. New York: Wiley.
- [9] Atkinson, A. and J. Stiglitz (1980), *Lectures on Public Economics*, McGraw-Hill.
- [10] Austen-Smith, D.(1989), 'Sincere Voting in Models of Legislative Elections', *Social Choice Welfare* 6, pages 287-299.

- [11] Austen-Smith, David, (1990), 'Information transmission in debate', *American Journal of Political Science* 34, pages 124-152.
- [12] Bagwell, K and R. Staiger (1999), 'An Economic Theory of GATT', *American Economic Review* 89(1), pages 215-48.
- [13] Baland, Jean Marie and Debraj Ray (1991), 'Why Does Asset Inequality Affect Unemployment? A Study of the Demand Composition Problem', *Journal of Development Economics*; 35(1), pages 69-92.
- [14] Banerjee, Abhijit and Rohini Somanathan (1997), 'A Simple Theory of Voice,' typescript.
- [15] Bardhan, Pranab K (1984), *The Political Economy of Development in India*, Oxford, UK.
- [16] Bardhan, Pranab K (1996), 'Efficiency, Equity and Poverty Alleviation: Policy Issues in Less Developed Countries', *Economic Journal* 106.
- [17] Baxi, Upendra (1995), *Crisis and Change in Contemporary India*, Sage Publications: New Delhi.
- [18] Benabou, R. (1996), 'Inequality and Growth', *NBER Annual*
- [19] Bergstrom, Theodore C. and Hal R. Varian (1985), 'When Are Nash Equilibria Independent of the Distribution of Agents' Characteristics?', *Review of Economic Studies* 52(4), pages 715-18.
- [20] Besley, T. and Robin Burgess (1998), 'Land Reform, Poverty Reduction and Growth: Evidence from India', STICERD Development Economics Discussion Paper no. 13, LSE.
- [21] Besley, T. and Anne Case (1997), 'Women in Politics: Finding Instruments for Policy Analysis', typescript.
- [22] Besley, T. and Anne Case (1995), 'Does Electoral Accountability Affect Economic Policy Choices? Evidence from Gubernatorial Term Limits', *Quarterly Journal of Economics*, Vol. 110, pages 769-798.
- [23] Besley, T. and Anne Case (1993), 'Modeling Technology Adoption in Developing Countries', *American Economic Review* 83(2), pages 396-402.

- [24] Besley, Timothy and Stephen Coate (1997), 'An Economic Model of Representative Democracy' *Quarterly Journal of Economics*, 112(1), pages 85-114.
- [25] Besley, Timothy and Stephen Coate (1998a), 'Sources of Inefficiency in a Representative Democracy: A Dynamic Analysis', *American Economic Review* 88(1), pages 139-56.
- [26] Besley, Timothy and Stephen Coate (1998b), 'Political Competition and Economic Welfare', mimeo LSE.
- [27] Besley, Timothy and Stephen Coate (1998c), 'Analyzing the case for Government Intervention in a Representative Democracy' mimeo LSE.
- [28] Besley, Timothy and Stephen Coate (1999), 'Centralized versus Decentralized Provision of Local Public Goods: A Political Economy Analysis', mimeo LSE.
- [29] Caillaud, B. and J. Tirole (1998), 'Party Governance and Ideological Bias', mimeo.
- [30] Cameron Charles, David Epstein and Sharyn O'Halloran (1996), 'Do Majority-Minority Districts Maximise Black Representation in Congress?', *American Political Science Review* 90(4), pages 794-812.
- [31] Cashin, Paul and Ratna Sahay(1995), 'Internal migration, center-state grants and economic growth in the states of India' IMF working paper 95/66.
- [32] Chari, V.V., Jones, Larry E. and Ramon Marimon (1997), 'The Economics of Split Ticket Voting in Representative Democracies', *American Economic Review*; 87(5), pages 957-76.
- [33] Chenery, Hollis B.; Robinson, Sherman and Syrquin, Moshe (1986), *Industrialisation and Growth: A Comparative Study*, New York: Oxford University Press.
- [34] Coate, Stephen and Stephen Morris, (1995), 'On the Form of Transfers to Special Interests,' *Journal of Political Economy* 103, pages 1210-1235.
- [35] Commissioner of Scheduled Castes and Tribes, *Annual Reports*, Government of India publication various years.
- [36] Cooper, Russell and Andrew John (1988), 'Coordinating Coordination failures in Keynesian Models', *Quarterly Journal of Economics* 103(3), pages 441-63.

- [37] Crain, Mark. W. (1998), 'Districts, Diversity and Fiscal Biases: Evidence from the American States', mimeo George Mason University.
- [38] Crawford, Vincent and Joel Sobel, (1982), 'Strategic Information Transmission', *Econometrica* 50, pages 1431-1451.
- [39] Cutler, David M., Douglas W. Elmendorf, and Richard Zeckhauser (1993), 'Demographic Characteristics and the Public Bundle', *Public Finances* 48, pages 178-98.
- [40] Diamond, Peter and James Mirrlees (1971), 'Optimal Taxation and Public Production I: Production Efficiency and II: Tax Rules', *American Economic Review* 61, pages 8-27 and 261-78.
- [41] Diermeier, Daniel and Timothy Feddersen (1998), 'Cohesion in Legislatures and the Vote of Confidence Procedure', *American Political Science Review* 92(3), pages 611-21.
- [42] Dixit, A. and J. Stiglitz (1977), 'Monopolistic Competition and Optimum Product Diversity', *American Economic Review* 69(5), pages 961-63.
- [43] Dixit A. and John Londregan (1995), 'Redistributive Politics and Economic Efficiency', *American Political Science Review*, Vol.89, No.4
- [44] Downs, Anthony (1957), *An Economic Theory of Democracy*, New York: Harper Collins.
- [45] Duflo, Esther (1999), 'Child health and household resources in South Africa: evidence from the old age pension program', mimeo MIT.
- [46] Durantou, Gilles (1998), 'Agricultural Productivity, Trade and Industrialisation', *Oxford Economic Papers*, pages 220-236.
- [47] Dushkin, L. (1972), Scheduled Caste Politics in Mahar (ed.), *The Untouchable in Contemporary India*, The University of Arizona Press, Arizona.
- [48] Easterly, William and Levine, Ross (1997), 'Africa's Growth Tragedy: Policies and Ethnic Divisions', *Quarterly Journal of Economics* 112(4), pages 1203-50.
- [49] Ethier, Wilfred J (1982), 'National and International Returns to Scale in the Modern Theory of International Trade', *American Economic Review* 72(3), pages 389-405.

- [50] Feddersen, Timothy and Wolfgang Pesendorfer (1996), 'The Swing Voter's Curse', *American Economic Review* 86(3), pages 408-424.
- [51] Fernandez, Raquel and Rodrik, Dani (1991), 'Resistance to Reform: Status Quo Bias in the Presence of Individual Specific Uncertainty', *American Economic Review* 81(5), pages 1146-1154.
- [52] Galanter, M. (1978), 'Compensatory Discrimination in Political Representation: A Preliminary Assessment of India's Thirty-Year Experience with Reserved Seats in Legislatures', *Economic and Political Weekly*.
- [53] Galanter, M. (1984), *Competing Equalities*, Oxford: Oxford University Press.
- [54] Gans, Joshua S (1998), 'Time Lags and Indicative Planning in a Dynamic Model of Industrialization', *Journal of the Japanese and International-Economies* 12(2), pages 103-30.
- [55] Gans, Joshua and Michael Smart (1996), 'Majority voting with single-crossing preferences', *Journal of Public Economics* 59(2), pages 219-37.
- [56] Gelman, Andrew and Gary King (1994), 'Enhancing Democracy through Legislative Redistricting', *American Political Science Review*, September.
- [57] Gerber, Elisabeth, Rebecca Morton and Thomas Reitz (1998), 'Minority Representation in Multimember Districts', *American Political Science Review*.
- [58] Gelbach, J. and Lant Pritchett (1997), 'More for the Poor Is Less for the Poor- The Politics of Targeting', Policy Research Working Paper, The World Bank.
- [59] Gilligan Thomas and Kevin Krehbiel, (1989), 'Asymmetric Information and Legislative Rules with a Heterogenous Committee', *American Journal of Political Science*, 459-490
- [60] Grandmont, J.M. (1978), 'Intermediate preferences and the majority rule', *Econometrica* 46, pages 317-330.
- [61] Grofman, Bernard and Arend Lijphart (1994), *Electoral Laws and Their Political Consequences*, Agathon Press New York.

- [62] Grossman, Gene M. and Elhanan Helpman (1996), 'Electoral Competition with Policy Compromise', Princeton Woodrow Wilson School Discussion Paper in Economics 181.
- [63] Grossman, Gene and Elhanan Helpman, (1999), 'Competing for Endorsements,' *American Economic Review* 89(3), pages 501-24.
- [64] Guinier, Lani (1994), *The Tyranny of the Majority*, the Free Press, New York.
- [65] Hirschman, A.O(1958), *The Strategy of Economic Development*, New Haven: Yale University Press.
- [66] Horowitz, Donald L. (1985), *Ethnic groups in conflict*, Berkeley : University of California Press.
- [67] Hotelling, Harold (1929) , ' Stability in Competition', reprinted in Ricketts, Martin, ed. Neoclassical microeconomics. Volume 1. Schools of Thought in Economics series, no. 3.
- [68] Hsieh, Chang-Tai (1998), 'What Explains the Industrial Revolution in East Asia? Evidence from Factor Markets', mimeo University of California, Berkeley.
- [69] Husted, T and Lawrence Kenny (1997), 'The Effect of the Expansion of the Voting Franchise on the Size of the Government', *Journal of Political Economy* 105(1), pages 54-82.
- [70] Johnston and Mellor (1961), 'The Role of Agriculture in Economic Development', *American Economic Review* 51(4),.
- [71] Joshi, Barbara (1982), *Democracy in search of Equality: Untouchable Politics and Indian Social Change*, Hindustan Publishing Company.
- [72] Kalt, Joseph and Mark Zupan (1985), 'Capture and Ideology in the Economic Theory of Politics, *American Economic Review*, 74 (3) pages 279-300.
- [73] Kawagoe, Toshihiko, Otsuka Keijiro and Yujiro Hayami (1986), 'Induced Bias of Technical Change in Agriculture: The United States and Japan, 1880-1980,' *Journal of Political Economy* 94(3), pages 523-44.
- [74] Krugman, Paul (1991), 'History versus Expectations', *Quarterly Journal of Economics* 106(2), pages 651-67.

- [75] Krugman, P.R. and Anthony Venables (1995), 'Globalisation and the Inequality of Nations', *Quarterly Journal of Economics* 110(4), pages 857-80.
- [76] Kuznets, S. (1959), 'On comparative study of economic structure and growth of nations', in NBER, *The comparative study of economic growth and structure*.
- [77] Levitt, Steven (1996), 'How do Senators Vote? Disentangling the Role of Voter Preferences, Party Affiliation and Senator Ideology', *American Economic Review* 86(3), pages 425-41.
- [78] Levitt, Steven (1997), 'Using Electoral Cycles in Police Hiring to Estimate the Effect of Police on Crime', *American Economic Review*; 87(3), June , pages 270-90.
- [79] Lewis, W. Arthur (1955), *The Theory of Economic Growth*, London : Allen & Unwin.
- [80] Lin, Justin Yifu (1990), 'Collectivization and China's Agricultural Crisis in 1959-1961', *Journal of Political Economy* 98(6), pages 1228-52.
- [81] Lindbeck Assar and Jorgen Weibull (1987), 'Balanced-budget redistribution as the outcome of political competition', *Public Choice* 52, pages 273-297.
- [82] Matthews, Steven, (1989), 'Veto threats: rhetoric in a bargaining game', *Quarterly Journal of Economics* 104, pages 347-369.
- [83] Matsuyama, Kiminori (1992a), 'Agricultural Productivity, Comparative Advantage and Economic Growth,' *Journal of Economic Theory* 58, pages 317-334.
- [84] Matsuyama, Kiminori (1992b), 'The Market Size, Entrepreneurship and the Big Push', *Journal of the Japanese and International Economies* 6.
- [85] Meltzer, Allan H. and Richard, Scott F (1981), 'A Rational Theory of the Size of Government', *Journal of Political Economy* 89(5), pages 914-27.
- [86] Mendelsohn Oliver and Marika Vicziany (1998), *The Untouchables: Subordination, Poverty and the State in Modern India*, Cambridge University Press.
- [87] Miguel, Edward (1999), 'Ethnic Diversity and School Funding in Kenya', STICERD Discussion Paper #14.

- [88] Murphy, Kevin, Shleifer, Andrei and Vishny, Robert (1989a), 'Income Distribution, Market Size, and Industrialization', *Quarterly Journal of Economics* 104(3), pages 537-64.
- [89] Murphy, Kevin, Shleifer, Andrei and Vishny, Robert (1989b), 'Industrialisation and the Big Push', *Journal of Political Economy* 97(5), pages 1003-26.
- [90] Myerson, Roger (1995), 'Analysis of Democratic Institutions: Structure, Conduct and Performance', *Journal of Economic Perspectives* 9 (1), pages 77-89.
- [91] Narayana, G (1980), 'Rulemaking for Scheduled Castes, Analysis of Lok Sabha Debates, 1962-71', *Economic and Political Weekly*.
- [92] Nurkse, Ragnar (1953), *Problems of Capital Formation in Underdeveloped Countries*, Oxford University Press, New York.
- [93] Ohkawa, K. and Henry Rosovsky (1973), *Japanese Economic Growth; Trend Acceleration in the Twentieth Century*, Stanford University Press .
- [94] Osborne, M.(1995), 'Spatial Models of Political Competition under Plurality Rule: A Survey of Some Explanations of the Number of Candidates and the positions they take', *Canadian Journal of Economics*.
- [95] Osborne and Slivinski (1996), 'A Model of Political Competition with Citizen Candidates', *Quarterly Journal of Economics* 111(1), pages 65-96.
- [96] Oshima, Harry (1984), 'The Growth of U.S. Factor Productivity: The Significance of New Technologies in the Early Decades of the Twentieth Century', *Journal of Economic History*, Vol. XLIV.
- [97] Ozler Berk, Gaurav Datt and Martin Ravallion (1996), 'A Database on Poverty and Growth in India', mimeo World Bank.
- [98] Persson, Torsten and Guido Tabellini (1998), ' The size and scope of government: Comparative politics with rational politicians', *European Economic Review*.
- [99] Persson, Torsten and Guido Tabellini (1999), 'Political Economics and Public Finance' *NBER Working Paper #7097*.

- [100] Persson, Torsten, Roland G. and Guido Tabellini (1997), 'Separation of Powers and Political Accountability' *Quarterly Journal of Economics* 112(4), pages 1163-1202.
- [101] Piketty, Thomas (1993), 'Implementation of First-Best Allocations via Generalized Tax Schedules', *Journal of Economic Theory* 61(1), pages 23-41.
- [102] Pitkin, Hanna (1967), *The Concept of Representation*, University of California, Berkeley.
- [103] Pitt, Mark M. and Khandker, Shahidur R. (1998), 'The Impact of Group-Based Credit Programs on Poor Households in Bangladesh: Does the Gender of Participants Matter?', *Journal of Political Economy* 106(5), pages 958-96.
- [104] Poole, Keith and Howard Rosenthal (1997), *Congress: a political-economic history of roll call voting*, Oxford University Press.
- [105] Poterba, James (1997), 'Demographic Structure and the Political Economy of Public Education', *Journal of Policy Analysis and Management*, Vol. 16(1), pages 48-66.
- [106] Przeworski, Adam and Fernando Limongi (1993), 'Political Regimes and Economic Growth', *Journal of Economic Perspectives*, Volume 7.
- [107] Rao, Govinda M. and Tapas Sen (1993), 'Government Expenditure in India: Level, Growth and Composition', *National Institute of Public Finance and Policy*.
- [108] Roberts, Kevin W. S. (1977), 'Voting over Income Tax Schedules', *Journal of Public Economics* 8(3), pages 329-40.
- [109] Rodrik, Dani (1996), 'Coordination Failures and Government Policy: A Model with Applications to east Asia and Eastern Europe', *Journal of International Economics*(40), pages 1-22.
- [110] Rodriguez-Clare, Andres (1996), 'The Division of Labor and Economic Development', *Journal of Development Economics* 49(1), pages 3-32.
- [111] Roemer, John E (1994), 'A Theory of Policy Differentiation in Single Issue Electoral Politics', *Social Choice and Welfare* 11(4), pages 355-80.

- [112] Rogoff, Kenneth, (1990), 'Equilibrium Political Budget Cycles,' *American Economic Review* 80, pages 21-36.
- [113] Romer, Paul M. (1990), 'Endogenous Technological Change', *Journal of Political Economy* 98(5), Part 2, pages S71-102.
- [114] Rosenstein-Rodan P.N. (1943), 'Problems of Industrialisation of Eastern and South-Eastern Europe', *Economic Journal* 53.
- [115] Rule, Wilma and Joseph F. Zimmerman (ed) (1992), *United States Electoral Systems : Their Impact on Women and Minorities*, Greenwood Press, London.
- [116] Sah, Raaj Kumar and Stiglitz, Joseph E. (1984), 'The Economics of Price Scissors', *American Economic Review* 74(1), pages 125-38.
- [117] Sah, Raaj Kumar and Stiglitz, Joseph E (1987), 'Price Scissors and the Structure of the Economy', *Quarterly Journal of Economics* 102(1), pages 109-34.
- [118] Schultz T.W. (1964), *Transforming Traditional Agriculture*, New Haven: Yale University Press.
- [119] Scitovsky Tibor (1954), 'Two Concepts of External Economies', *Journal of Political Economy*.
- [120] Sencer, Stephen D (1991), 'Read My Lips: Examining the Legal Implications of Knowingly False Campaign Promises', *Michigan Law Review*; 90(2).
- [121] Stein, Jeremy, (1989), 'Cheap Talk and the Fed: A Theory of Imprecise Policy Announcements,' *American Economic Review* 79, 32-42.
- [122] Smith A. (1776), *An Inquiry into the Nature and Causes of the Wealth of Nations*.
- [123] Hollis Chenery, Sherman Robinson, Moshe Syrquin (1986), *Industrialization and Growth : A Comparative Study*, Published for the World Bank by Oxford University Press.
- [124] Wade, Robert (1990), *Governing the Market*, Princeton Press.

- [125] Weingast, BarryR., Shepsle, Kenneth A. and Johnsen, Christopher (1981), 'The Political Economy of Benefits and Costs: A Neoclassical Approach to Distributive Politics', *Journal of Political Economy*; 89(4).
- [126] White, MichelleJ. (1998), ' Why Don't More Households File for Bankruptcy?', *Journal of Law, Economics, and Organization* 14(2), pages 205-31.
- [127] Wittman, Donald A. (1977), 'Candidates with Policy Preferences: A Dynamic Model', *Journal of Economic Theory* 14(1), pages 180-89.
- [128] World Bank (1993), *The East Asian Miracle*, Oxford University Press.